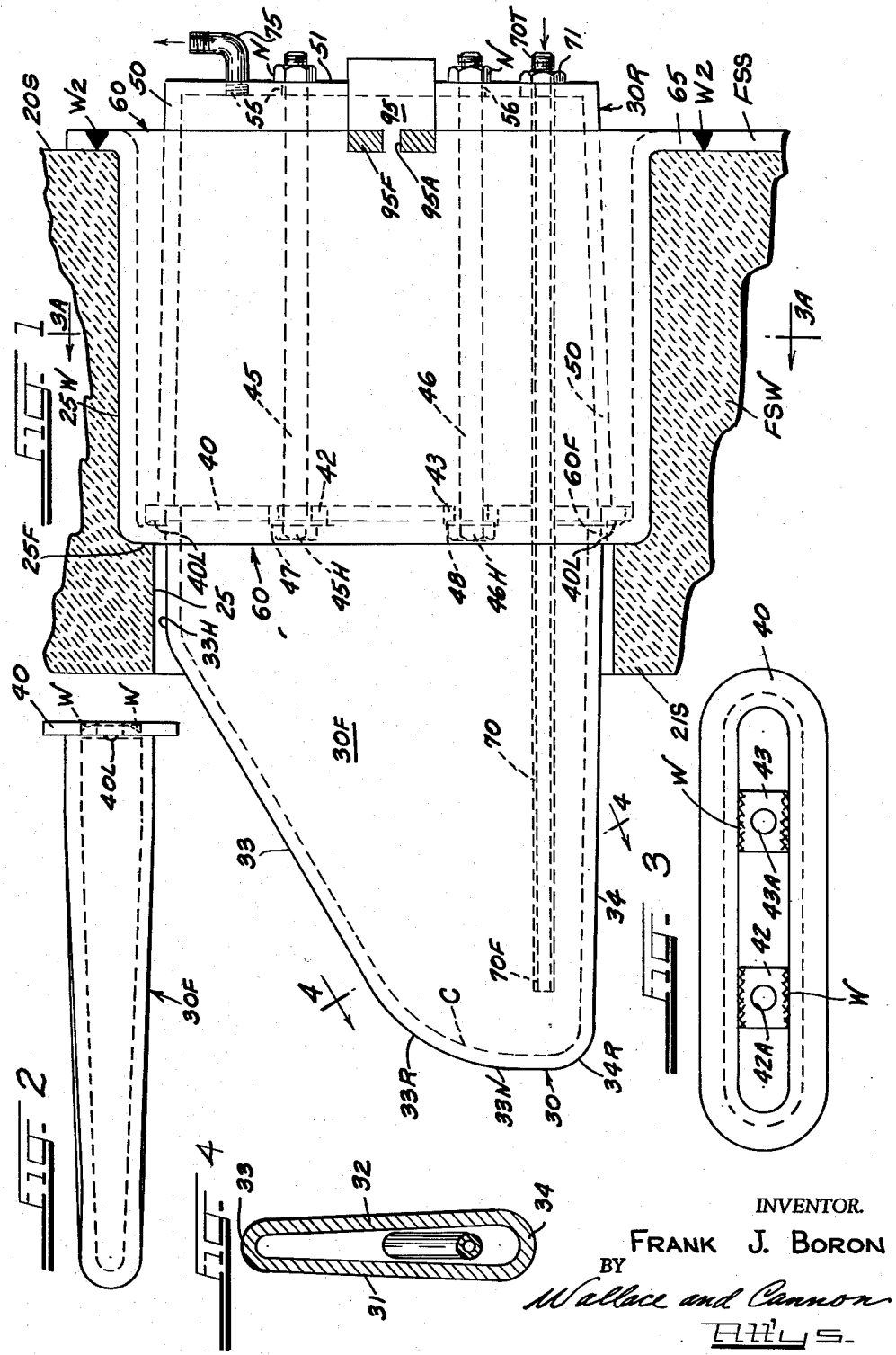
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FURNACE DIVIDER PLATES

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Fig. 3A

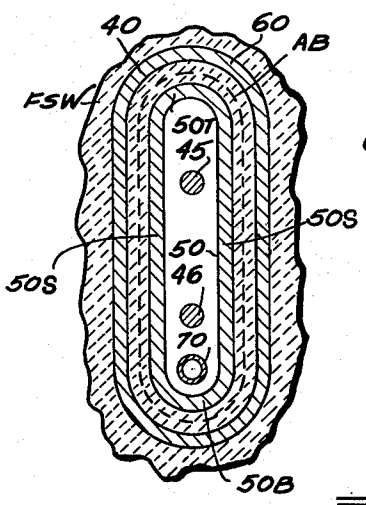


Fig. 5

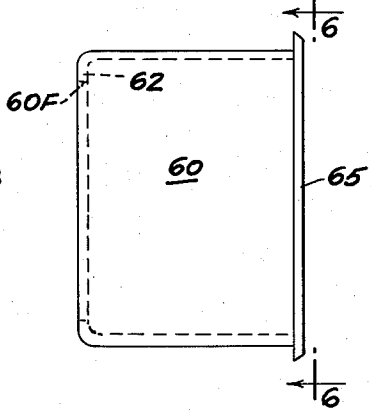


Fig. 6

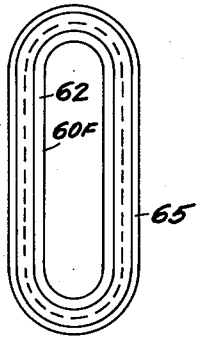


Fig. 8

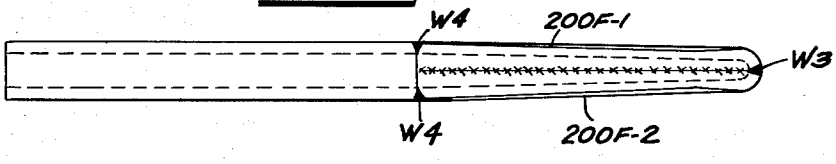
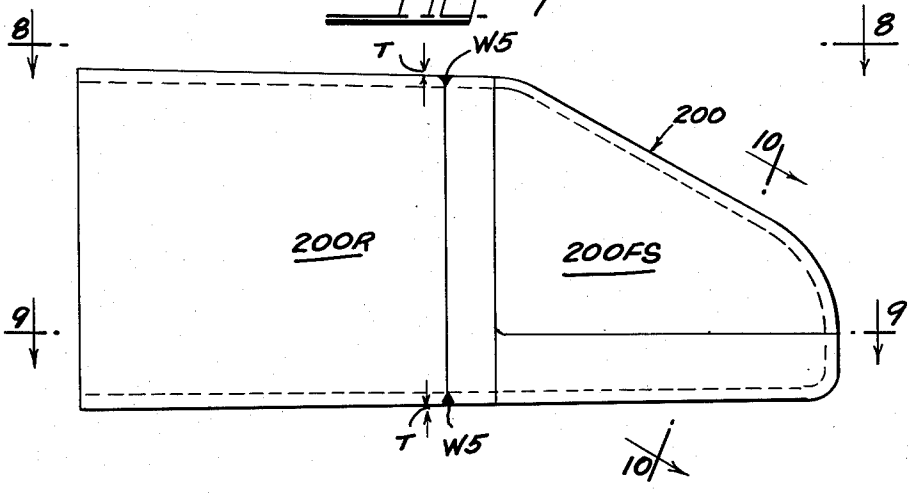


Fig. 7



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FIG. 9

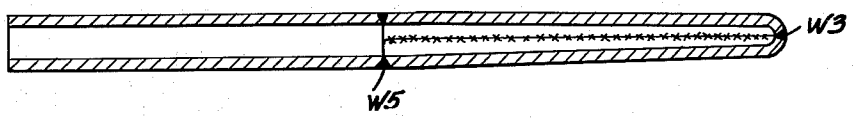


FIG. 10

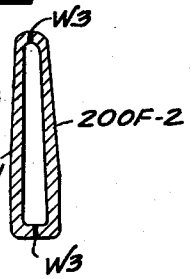


FIG. 11

FIG. 12

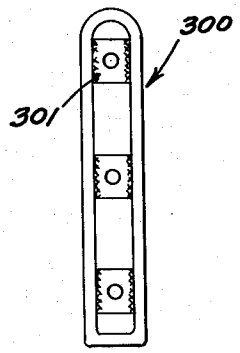
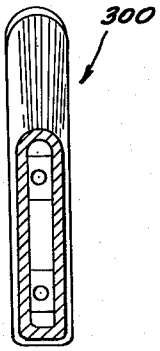


FIG. 13



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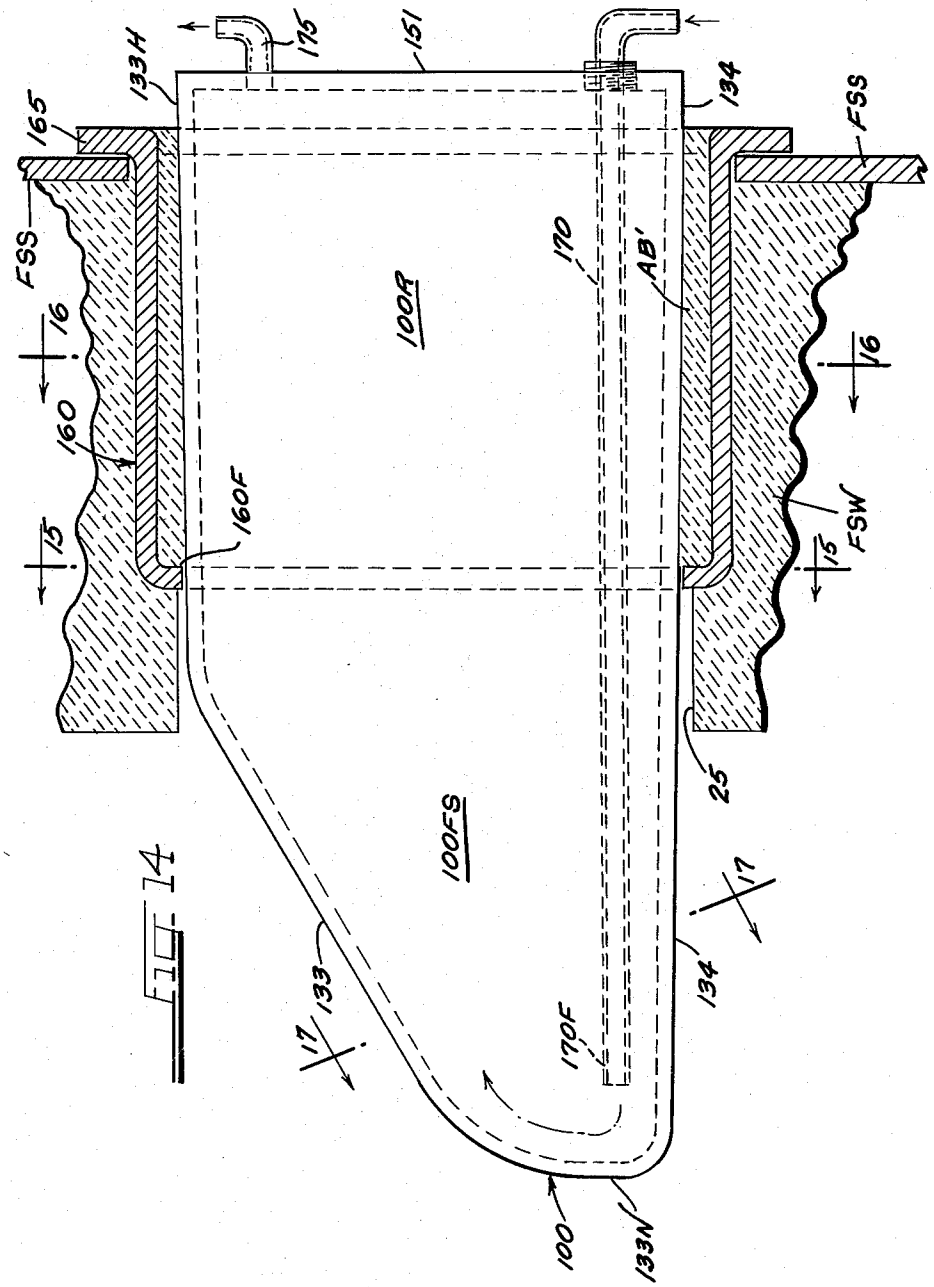


FIG. 14

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Fig. 15

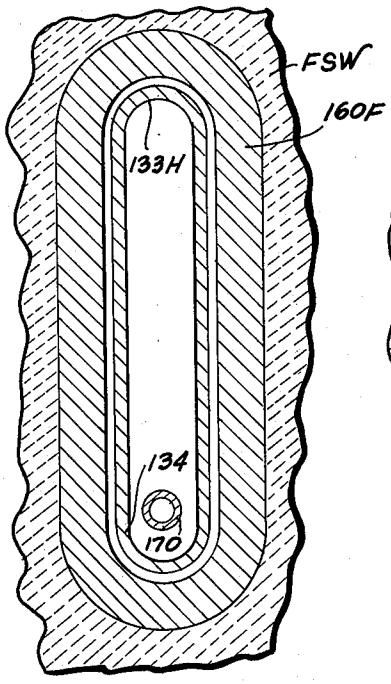


Fig. 16

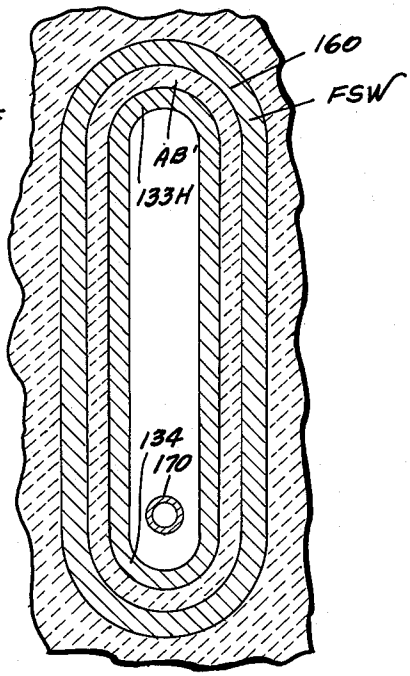
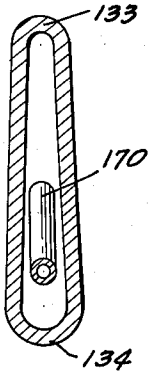


Fig. 17



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FURNACE DIVIDER PLATES

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Filed Mar. 5, 1958, Ser. No. 719,219
6 Claims. (Cl. 263—30)

This invention relates to the construction of furnaces used to treat ore material and to divider plates to be mounted on the side walls of such furnaces.

A modified form of a divider plate is disclosed in my co-pending application, Serial No. 733,958, filed May 8, 1958, now abandoned.

It is common practice in the processing of certain kinds of ores such as taconite pellets and the like to fire the ore as mined or in pellet form in a furnace to obtain sintered concentrations. It often happens that a crust forms on the top of the material in the furnace such as to interfere with the passage of the draft up through the furnace, and moreover the crust or hard cake that forms at the top of the bed of material in the furnace interferes with the proper introduction of additional ore material into the top of the furnace. In accordance with the present invention, divider plates of a particular construction to be described are mounted on the side walls of the furnace so as to project inwardly of the furnace in a vertical plane normal to the vertical plane of the furnace side wall. The divider plates are more or less rigidly mounted in place as will be described and are formed with a sloped upper wall or edge such that the divider plates tend to slice through the material being fired in the furnace thereby preventing the formation of a hard crust. The divider plates of the present invention are of hollow construction and are mounted in the furnace walls in such a manner as to enable cooling air to be directed into the interior of each divider plate thereby accounting for air cooling in a highly effective and expeditious manner, and this construction and arrangement constitutes the primary object of the present invention.

Thus, in accordance with the present invention, the operating life of a divider plate of the foregoing kind is materially increased by accounting for air cooling of the same, and this is important in view of the relatively high temperatures that are generated in a furnace of the foregoing kind and in view of the high initial cost of the divider plates which are made of expensive heat-resistant alloy. It is nevertheless inevitable that the divider plates must be removed and replaced once exhausted, and another object of the present invention is to enable the divider plates to be mounted in openings in the furnace wall for easy removal, while assuring that the adjacent furnace wall areas are sealed against escape of noxious gases from the furnace.

Other and further objects of the present invention will be apparent from the following description and claims and are illustrated in the accompanying drawings which, by way of illustration, show preferred embodiments of the present invention and the principles thereof and what is now considered to be the best mode contemplated for applying these principles. Other embodiments of the invention embodying the same or equivalent principles may be used and structural changes may be made as desired by those skilled in the art without departing from the present invention and the purview of the appended claims.

In the drawings:

FIG. 1 is a fragmentary view showing a section of a furnace wall and showing in side elevation a divider plate mounted in the furnace wall and constructed in accordance with the present invention;

FIG. 2 is a top plan view of the front section of a divider plate of the present invention;

FIG. 3 is an end view of the divider plate front section shown in FIG. 2;

FIG. 3A is a sectional view taken substantially on the line 3A—3A of FIG. 1, and being on a reduced scale;

FIG. 4 is a sectional view taken substantially on the line 4—4 of FIG. 1;

FIG. 5 is a side elevation of the housing for the divider plate shown in FIG. 1;

FIG. 6 is an end elevation taken substantially on the line 6—6 of FIG. 5;

FIG. 7 is a side elevational view of a modified form of divider plate;

FIG. 8 is a top plan view taken substantially on the line 8—8 of FIG. 7;

FIG. 9 is a sectional view taken substantially on the line 9—9 of FIG. 7;

FIG. 10 is a sectional view taken substantially on the line 10—10 of FIG. 7;

FIG. 11 is a side elevational view of still another modified form of divider plate;

FIG. 12 is an end view taken substantially on the line 12—12 of FIG. 11;

FIG. 13 is a sectional view taken substantially on the line 13—13 of FIG. 11;

FIG. 14 is a view similar to FIG. 1 showing further modifications of the present invention; and

FIGS. 15 to 17 are sectional views taken substantially on the lines 15—15, 16—16 and 17—17 of FIG. 14.

Several different embodiments of the invention are illustrated in the drawings, and in each instance there is afforded a furnace divider plate having front and rear sections of hollow internal construction, and the divider plate may be cast as an integral member or the two sections may be separately formed and joined in different ways. In any event, the front section of the divider plate is generally of triangular configuration, having a downwardly sloped upper surface which in effect causes the divider plate to slice through the pellets or other material fed into the furnace thereby preventing the formation of an impenetrable crust at the top of the furnace, that is, a crust which can be penetrated only with difficulty by the furnace draft and which slows down the movement of the pellets or other material downward toward the hearth of the furnace.

Divider plates of the kind contemplated by the present invention are cast of expensive heat-resistant alloy in view of the tremendous temperatures encountered in the furnace. It therefore becomes important to prolong the life of the divider plate, and this is accomplished under the present invention by so mounting the divider plate in the furnace as to enable a cooling fluid such as air under pressure to impinge on the internal surfaces of the divider plate at the portion of the divider plate which is innermost of the furnace. The sloped external configuration of the divider plate mentioned above also prevails within the hollow interior of the divider plate, and the coolant is so directed as to flow along the internal sloped surface of the divider plate and is then directed rearwardly into the hollow rear section of the divider plate where it flows into a return conduit.

The divider plate is mounted in the opening in the side wall of the furnace which is of larger cross-sectional area than the cross-sectional area of the portion of the divider plate mounted therein, and the portion of this mounting opening not occupied by the divider plate is at least in part packed with compressible packing preventing noxious fumes from escaping through the openings in the furnace side wall in which the divider plates are mounted.

Referring to FIG. 1 of the drawings, there is illustrated a portion of a furnace side wall FSW having an outside surface 20S and an inside surface 21S, the inside surface

of course representing the surface of the furnace side wall defining in part the internal cavity of the furnace where heat processing of ores and the like is to be carried out in a well known manner, taconite pellets being exemplary of the material thus to be subjected to heat processing. The side wall of the furnace is formed with an opening **25** adapted to receive a divider plate **30** of the present invention which includes a front section **30F** and a rear section **30R**, and the divider plate thus afforded is secured to the furnace wall and maintained accurately in position in a manner to be described below.

The divider plate **30** is a separable two-part construction, that is, the front and rear sections are separately joined by bolts as will be described in detail. Referring to FIGS. 1 to 4 inclusive, it will be observed that the front section **30F** is in the form of a hollow fin having a generally triangular external configuration. Thus, the divider plate front section **30F** is cast as a one-piece part including spaced apart side walls **31** and **32**, FIG. 4, which are joined by upper and lower walls or surfaces **33** and **34** respectively and which are generally rounded to accommodate advantageously thermal contractions and expansions. As will also be observed in FIG. 4, the side wall or surfaces **30** and **31** diverge downwardly in part accounting for easy movement of the material in the furnace past the divider plate, and this is also true of the divider plate shown in FIG. 8 and in FIG. 14 to be described in detail hereinafter.

The upper wall **33** of the divider plate front section is tapered downwardly as shown in FIG. 1 in a direction proceeding from the rear of the front section toward the forwardmost free end portion of the divider plate front section which will be innermost of the furnace interior or cavity. The rear of the upper surface **33** is generally horizontal at **33H**, and this portion of the divider plate front section is disposed entirely within the forward portion of the opening **25** in the furnace side wall. At its forward extremity, the upper surface of the divider plate section **30F** is curved at **33R** and merges into the nose **33N** of the divider plate which defines the forward-most free end of the divider plate.

As shown in FIG. 1, the lower surface **34** of the divider plate is generally horizontal, and the forward portion thereof is rounded at **34R** and merges into the vertical nose **33N** of the divider plate. Otherwise, the lower surface **34** is substantially unbroken in its horizontal characteristic, and the rear portion thereof projects rearwardly into the opening **25** in the furnace side wall.

The divider plate front section is hollow as shown in FIG. 4, and the front section **30F** is formed with a continuous annular flange **40**, FIGS. 2 and 3, this flange being disposed in a plane which is generally normal to the planes of the side walls **31** and **32**, and the flange **40** extends outwardly of the outer surfaces of the walls **31**, **32**, **33** and **34** of the front section **30F**.

A pair of plates **42** and **43** are welded at W, FIG. 3, to the internal surfaces of the walls **31** and **32** in alignment with the flange **40** as shown in FIGS. 2 and 3. The plates **42** and **43** are formed with apertures **42A** and **43A** respectively which enable bolts **45** and **46**, FIG. 1, to be passed therethrough with the heads **45H** and **46H** thereof disposed within the hollow interior of the front section **30F**, and retaining washers **47** and **48** are afforded between the heads of the bolts and the inside surfaces of the plates **42** and **43**.

The rear section **30R** of the divider plate **30** includes a cast steel housing **50** which is sleeve-like in cross section, including spaced top and bottom walls **50T** and **50B**, FIG. 3A, and spaced substantially parallel side walls **50S**, so as to be substantially complemental to the shape of the rear portion of the front section **30F**. Thus, the rear section **30R** has an open forward end adapted to neatly abut the rear face of the flange **40** radially inwardly of the outer edges of the flange **40** as shown in FIG. 1, thereby establishing communication between the hollow interiors of the front and rear sections of the divider plate **30**. The rear of the casting **50** is substantially closed off by a flat plate **51** which is welded to the inside of the casting **50**.

In assembling the front and rear sections of the divider plate **30**, the bolts **45** and **46** are located in the manner described above, and the open forward end of the rear section **30R** is passed forwardly over the bolts **45** and **46**, the threaded ends of the bolts **45** and **46** passing through openings **55** and **56** which are drilled in the plate **51**. The threaded ends of the bolts **45** and **46** extend outwardly of the plate **51**, and nuts N are turned thereon to tightly draw the forward end of the casting **50** flush against the rear surface of the flange **40**.

In the form of the invention shown in FIG. 1, the divider plate **30** thus assembled is adapted to be housed in part in a housing **60**, FIGS. 1, 5 and 6, which affords a hard surface enabling packing to be easily rammed in place between the divider plate and the opening in the furnace side wall as will be explained. The housing **60** is of hollow construction as shown in FIG. 6 to accommodate the assembled divider plate. The forward end thereof is formed with an opening **60F**, Figs. 5 and 6, and the dimensions and configurations of the housing **60** is such that the opening **60F** is surrounded by a continuous annular flange **62** adapted to be engaged by the forward surface of the flange **40** of the divider plate front section **30F** as shown in FIG. 1. Referring to FIGS. 1 and 2, it will be observed that the forward surface of the flange **40** at the upper and lower ends thereof is formed with rounded lugs **40L** which assist in centering and aligning the divider plate **40** relative to the flange **62** on the housing **60**. As will also be observed in FIG. 1, the opening **25** in the furnace side wall is enlarged so as to be complemental to the outside shape and configuration of the housing **60**. The opening **25** is enlarged to afford a shoulder **25F** engageable by the forward surface of the flange **62** on the housing **60**. Rearward of the enlargement **25F** the opening **25** is uniform at **25W** all the way to the outer surface **20S** of the furnace side wall, and within these regions of the opening **25** the housing **60** is fully complemental to the opening **25** so as to have a neat fit therein, the housing **60** in effect serving as a hard lining for the opening **25** between the shoulder **25F** thereof and the exterior or outer surface **20S** of the furnace side wall. To allow for differential thermal expansions, there is preferably some clearance between the flange **62** of the housing **60** and the opposed circumferential surface of the divider plate, and this is also true of the arrangement shown in FIG. 14.

The rear of the housing **60** is formed with an outwardly directed flange **65**, and this flange is of continuous annular form so as to engage the outer surface **20S** of the furnace side wall entirely about the boundary portion of outer surface of the furnace side wall surrounding the rear extremity of the opening **25**. The outer periphery of the flange **65** is chamfered as shown in FIGS. 1, 5 and 6, and this sloped surface is adapted to be disposed opposite an oppositely chamfered edge or surface on the furnace shell FSS, FIG. 1, the spacing between the chamfered surfaces thus provided being filled with weldment W2 to thereby secure the housing **60** in place within the opening **25**.

It will thus be seen that when the housing **60** has been mounted within the opening **25** and welded in place, and the divider plate assembled in the manner described above, the divider plate **30** is adapted to be passed through the housing **60** with the nose **33N** in leading position, and the parts are fully complemented when the lugs **40L** on the flange **40** of the divider plate engage the flange **62** of the housing **60**.

The front section **30F** of the divider plate **30** is cast of a heat-resistant alloy representing a somewhat expensive item, such alloy analyzing: chromium, 15 to 30 percent; nickel, 5 to 20 percent; carbon, 0.10 to 0.50 per-

cent; balance, iron. It therefore becomes important to prolong the life of this portion of the divider plate. In accordance with the present invention, the front section of the divider plate 30, as well as the divider plates to be described hereinafter, is subjected to air cooling, and in achieving this in the divider plate 30 a relatively large conduit 70, FIG. 1, is arranged within the hollow interior of the divider plate assembly with the forward end 70F thereof spaced slightly rearwardly of the inner surface of the nose 33N of the divider plate front section. The rear of the conduit 70 is threaded into a mounting boss 71, FIG. 1, which is mounted in a suitable opening in the plate 51 adjacent the bottom thereof. The rear end of the conduit 70 extends outwardly of the boss 71 and is threaded at 70T to receive a coupler which couples the conduit 70 to an air line for conducting air under pressure to the conduit 70 so that such air under pressure will impinge on the rear surface of the nose 33N adjacent the bottom thereof. The air thus impinged on the rear surface of the nose 33N will be deflected upwardly and rearwardly in part due to the curvature C, FIG. 1, of the inner surface of the nose 33N. In other words, since it is the nose 33N which is subjected to the most severe thermal stressing, the nose 33N is the part which is directly and immediately air cooled, but the coolant air is deflected by the internal curvature C so as to be passed up along the inner surface of the sloped top wall 33 thereby accounting for cooling of the sloped wall 33.

An elbow 75 or the like is threadedly mounted in an opening adjacent the top of the plate 51 serving as a rear wall for the housing 50, and the opposite end of this elbow or the like is adapted to be coupled to a return air line, and it will be realized that the air which was used to cool the front section of the divider plate in the foregoing manner will be directed out through the air return member 75 and into the air return line in turn connected to the member 75.

It is advantageous that the opening 25 in the furnace side wall be of greater cross sectional area than the divider plate, especially in view of the fact that the divider plate will be subjected to some thermal expansion when the furnace is in operation. Thus, as shown in FIG. 1, the rear areas of the front section of the divider plate are spaced from the opening 25 at all points, and there is also spacing between the outer surfaces of the rear section 30R of the divider plate and the internal surfaces of the housing 60.

The latter spacing of course represents an area of the opening 25 not occupied by the rear section of the divider plate. Hence it will be seen that there is a likelihood of fumes within the furnace escaping through the opening 25, and in order to prevent this to an appreciable order, asbestos packing AB, FIG. 3A, or the like is packed into the unoccupied areas of the opening 25 represented by the spacing between the opposed surfaces of the parts 30R and 60.

The completed assembly can be removeably held in place in various different ways, and one convenient way of doing this is to use a U-shaped bracket 95, FIG. 1, having a web portion spanning the plate 51 and having oppositely directed flange portions as 95F which are apertured at 95A to receive studs which secure the bracket to the furnace shell. In the event that repair or inspection is needed, the bracket 95 is removed, the packing AB is withdrawn by a hook, and the divider plate 30 is then withdrawn. If it is found that the front section 30F is no longer usable, the nuts N are backed off from the bolts 45 and 46, allowing the front and rear sections 30F and 30R to be separated, and a new front section as 30F having bolts 45 and 46 associated therewith is then assembled with the old rear section 30R.

The particular manner in which the front and rear sections 30F and 30R of the divider plate 30 are associated in the manner described above represents one convenient mode of construction, and in FIGS. 7 to 14 inclusive there are illustrated various modifications having to do with somewhat different modes of divider plate construction and mounting the divider plate in the furnace side wall. Thus, referring to FIG. 14, the divider plate 100 is cast from the above heat-resistant alloy entirely as a one-piece part such that in the event that the divider plate 100 needs to be repaired or replaced the entire divider plate 100, including the front section indicated generally at 100FS and the rear section indicated generally at 100R, is removed from the opening 25 in the furnace side wall FSW and is replaced by an entirely new divider plate of identical construction. It should be noted that the configuration of front section 100FS is identical to the front section 30F described above, including the downwardly sloped top wall and downwardly diverging side walls (FIGS. 14 and 17), except that the flange 40 is omitted and the horizontal portion of the top wall or surface indicated at 133H is continuous from the sloped portion of the top wall 133 to the rear of the divider plate; and in like manner, the bottom wall 134 is continuous from the nose 133N all the way to the rear extremity of the divider plate to afford the top and bottom walls of the rear section. The spaced side walls of the rear section of the divider plate 100 are substantially parallel as shown in FIGS. 15 and 16.

The divider plate 100 has a hollow interior throughout the length thereof as shown in FIGS. 15 and 16, and an end plate 151, FIG. 14, is welded to the open rear extremity of the rear section of the divider plate 100 in a manner identical to the welding of the plate 51 to the rear section 30R of the divider plate 30 described above.

Spaced openings are formed in the plate 151 enabling an inlet conduit 170 and an outlet conduit 175 to be mounted therein. As in the instance of the air inlet conduit 70, the conduit 170 extends through the rear section of the divider plate and is dimensioned so that the front end 170F thereof terminates slightly rearwardly of the inner surface of the nose 133N near the bottom thereof, and the conduits 170 and 175 enable cooling air to be directed against the rear surface of the nose 133N and to be exhausted from the interior of the divider plate in the manner explained above.

The divider plate 100, as well as those to be described hereinafter, is primarily retained frictionally in place within the opening in the furnace wall by asbestos packing AB^1, FIG. 14, and to this end the upper and lower walls 133H and 134, at least throughout the length of the rear section 100R of the divider plate 100, diverge proceeding in a rearward direction. As in the foregoing embodiment, the opening 25 in the furnace side wall is of greater cross-sectional area than the cross-sectional area of the rear section of the divider plate throughout the length of the rear section of the divider plate. A housing 160 of cast iron or steel, similar in dimension and configuration to the housing 60 described above, is mounted in an enlargement of the opening 25. Thus, the housing 160 is formed with a front flange 160F having an opening therein which is slightly larger in diameter than the minimum taper diameter or circumference of the walls 133F and 134 as shown in FIGS. 14 and 15. The housing 160 has a rear flange 165 adapted to be secured to the furnace shell FSS in any convenient fashion.

After the divider plate 100 has been associated with the housing 160 in the manner shown in FIG. 14, asbestos packing AB^1 is then packed tightly into the 360° taper space that is established between the opposing surfaces of the housing 160 and the rear section of the divider plate, this packing being jammed tightly into place as enabled by the packing compressing against the flange 160F. Because of the rearwardly diverging taper or wedge configuration imparted to the top and bottom walls of the rear section 100R, as shown in FIG. 14 of the drawings, the divider plate 100 can not become in-

advertently displaced beyond the original position prior to the packing being rammed in place.

Modified divider plates that can be substituted advantageously for the divider plate **100** are illustrated in FIGS. 7 and 11 respectfully. The divider plate illustrated at **200** in FIG. 7 embodies a rear section **200R** cast separately as a one-piece member and a separately cast front section **200FS** which consists of complemental half-castings **200F–1** and **200F–2**, FIG. 8, which are joined about their abutting peripheral edges by a weldment **W4**. When the front section **200FS** has been completed by joining the respective half castings, the rear peripheral edge of the front section and the front peripheral edge of the rear section are abutted and weldment **W5** is deposited in slots afforded by chamfering the opposed peripheral edges of the front and rear sections as shown in FIGS. 7 and 9.

As illustrated in FIG. 7, the top and bottom edges of the divider plate **200**, or at least the rear section **200R**, are tapered or back-drafted at T for the purpose described above in connection with the mounting of the divider plate **100** in the opening **25** in the furnace side wall shown in FIG. 14.

The divider plate **300** illustrated in FIGS. 11 to 13 is one wherein the front section **300FS** is bolted to the rear section **300R** to afford an integral structure. Thus, the front section **300FS** is identical to the front section **30F** except that again the flange **40** is omitted. A plurality of relatively short plates as **301** are welded to the inside surfaces of the front sections **300FS** at the exposed rear exterior as shown particularly in FIG. 12, and square-shanked bolts **305** are disposed non-rotatably in complemental openings formed in the plates **301** with the heads of the bolts facing the nose of the front section. Like plates **306** are welded in place within the open front interior of the rear section **300R**, and the shanks of the bolts **305** are extended through openings in the plates **306** so that the threaded ends of the bolts project rearwardly beyond the plates **306**. Nuts **307** are turned up on the threaded ends of the bolts **305** by means of a special wrench extended through the hollow rear section **300R**. The divider plate **300** is similar in dimensioning and configuration to the divider plate **133** and can be mounted in the furnace wall in the same manner as the divider plate **133** illustrated in FIG. 14.

It will be seen from the foregoing that in accordance with the present invention there is afforded a furnace divider plate of hollow internal construction enabling a stream of cooling air to be admitted into the interior of the divider plate and caused to impinge on the internal surface of the front nose portion of the front section of the divider plate. The divider plate is adapted to be mounted on the side wall of a furnace in different ways, but preferably, in any event, loose packing is jammed into place between the divider plate and a reinforced opening in the furnace to prevent noxious fumes from escaping through the opening in the furnace in which the divider plate is mounted. Additionally, the divider plate can be constructed either as a continuous one-piece casing of heat-resistant alloy of the kind mentioned above, or the divider plate can be constructed to have the two sections thereof formed separately and joined by welding or by a mechanical union, in which event the front section alone is cast of heat-resistant alloy and the rear section is separately cast of a less expensive ferrous material such as cast iron or cast steel. It will be recognized particularly from FIGS. 10 and 17 that the spacing between the side walls of the divider plate is quite close or narrow in comparison to the height or depth of the side walls, thereby imparting to the divider plate a blade-like or fin-like appearance in vertical section enabling the divider to slice through the charge or burden in the furnace. The upper wall of the front section is tapered downwardly in a forward direction, and the side walls of the front section diverge downwardly to enable the front section of the divider plate to, in effect, more easily slice through the material being fired in the furnace, and this particular construction also lessens the load on the divider plate. It should also be noted that by imparting a wedge-shape to the top and bottom walls of the rear section of the divider plate, the divider plate can be held in place with a wedging action on the packing jammed into place about the rear section of the divider plate and in engagement with the tapered surfaces of the rear section.

Hence, while I have illustrated and described the preferred embodiments of my invention, it is to be understood that these are capable of variation and modification, and I therefore do not wish to be limited to the precise details set forth, but desire to avail myself of such changes and alterations as fall within the purview of the following claims.

I claim:

1. In a furnace of the kind described having a vertical side wall, a divider plate mounted on the side wall and projecting into the interior of the furnace, said divider plate including a hollow front section defined by spaced vertical side walls and top and bottom walls which join the side walls, said side walls of the divider plate being disposed in vertical planes generally normal to the vertical plane of the furnace side wall and the top wall of the divider plate being sloped downward in a direction proceeding from the furnace side wall toward the front part of the divider plate which is innermost of the interior of the furnace, said bottom wall of the divider plate being generally horizontal, wall structure so joined to said bottom and top walls of the divider plate as to afford a nose portion defining the forwardmost part of the divider plate, said divider plate including a hollow rear section mounted within an opening in the furnace side wall which is of greater cross-sectional area than the cross-sectional area of said rear section, the spacing between the opening in the furnace side wall and the exterior of said rear section of the divider plate at least in part being filled with packing, said rear section of the divider plate having a substantially closed rear wall, an inlet conduit for coolant projected through said rear wall of said rear section and extended through both sections of the divider plate to terminate substantially at the inside surface of the nose portion of said divider plate to direct coolant thereagainst, an outlet means for coolant connected to said rear wall of said rear section, and means securing said divider plate to said furnace side wall.

2. In a furnace of the kind described having a side wall, a divider plate mounted on the side wall and having a substantially hollow front section projecting into the interior of the furnace and having a hollow rear section disposed within an opening in the furnace side wall, the front and the rear sections being detachable, one from the other, the front section of the divider plate having a sloped upper surface forming an upper and forward portion of said divider plate which slopes downwardly in a direction proceeding from the rear section of the divider plate toward the innermost part of the front section of the divider plate within the interior of the furnace, the rear of said rear section being substantially closed, inlet conduit means for coolant extended along the hollow interior of the divider plate to terminate substantially at the inside surface of the part of the divider plate which is innermost of the furnace interior, outlet means for coolant in communication with the hollow interior of the divider plate to receive coolant used to cool said inside surface, and means securing said divider plate to said furnace side wall.

3. In a furnace of the kind described having a vertical side wall, a divider plate mounted on the side wall and projecting into the interior of the furnace, said divider plate including a hollow front section defined by spaced vertical side walls and top and bottom walls which join

the side walls, said side walls of the divider plate being disposed in vertical planes generally normal to the vertical plane of the furnace side wall and the top wall of the divider plate being sloped downward in a direction proceeding from the furnace side wall toward the front part of the divider plate which is innermost of the interior of the furnace, said bottom wall of the divider plate being generally horizontal, wall structure so joined to said bottom and top walls of the divider plate as to afford a rounded nose portion defining the forwardmost part of the divider plate, said divider plate including a hollow rear section mounted within an opening in the furnace side wall which is of greater cross-sectional area than the cross-sectional area of said rear section and the exterior of said rear section being tapered in diverging manner from adjacent the front section toward the rear of the rear section of the divider plate, the spacing between the opening in the furnace side wall and the tapered exterior of said rear section of the divider plate at least in part being filled with packing, said rear section having a substantially closed rear wall, an inlet conduit for coolant extended through the hollow interior of said divider plate to terminate substantially at the inside surface of the nose portion of said divider plate to direct coolant thereagainst, an outlet means for coolant in communication with the hollow interior of said divider plate, and means securing said divider plate to said furnace side wall.

4. In a furnace divider plate of the kind described which is to be subjected to the load of the down-flow of material charged into a furnace, a hollow front section which is to project into the furnace cavity in contact with said material and having spaced side, top, front and bottom walls, said front section being joined to a rear section having side, top and bottom walls, the spacing between the front section side walls being narrow in comparison to the height of the front section side walls so as to afford a narrow, hollow fin divider plate for slicing through a load when charged into the furnace, said rear section being adapted for mounting on a side wall of the furnace so that the front section projects into the furnace cavity as aforesaid in a vertical plane, the top wall of the front section of the divider plate being sloped downwardly in a direction proceeding from the rear section of the divider plate toward the forwardmost part of the front section of the divider plate, and forming an upper and forward portion of said divider plate, the top and bottom walls of the front section being so joined at the forwardmost part thereof as to afford a rounded nose which internally is concave rearwardly and which merges into the internal surface of the sloped top wall, the side walls of the front section of the divider plate each being substantially smooth and mono-planar throughout, an inlet tube for coolant mounted on said divider plate and extended along the hollow interior of the divider plate front section to terminate substantially at the inside surface of said forwardmost part of the divider plate closely adjacent the front section bottom wall so that coolant emitted therefrom impinges on the inside of the nose concavity closer the bottom inside surface of the nose concavity than the top inside surface of the nose concavity and is deflected upwardly and rearwardly along said concavity, and outlet conduit means for coolant mounted on said divider plate and being in communication with the hollow interior of the divider plate to receive coolant used to cool said inside surface.

5. A divider plate according to claim 4 wherein the side walls of the front section diverge downwardly in a direction proceeding from the top wall to lessen the load on the divider plate as it slices through the load in the furnace.

6. In a furnace having vertical side walls and an open top into which ore material is to be charged from the top and fired therein to obtain an ore concentrate, a divider plate projecting inwardly from and removably secured to a side wall of the furnace in a vertical plane generally normal to that of the side wall so as to be exposed to the load of the down-flow of material charged into the furnace, said divider plate comprising: a hollow front section which projects innermost from the furnace side wall and being of a heat-resistant iron-chromium-nickel alloy which is to contact the ore material, said front section having spaced side, top, front and bottom walls, said front section being joined to a rear section having side, top and bottom walls, the spacing between the front section side walls being narrow in comparison to the height of the front section side walls so as to afford a narrow, hollow fin divider plate for slicing easily through any crust which forms in the ore material charged into the furnace, said rear section being disposed adjacent the side wall of the furnace, the top wall of the front section of the divider plate being sloped downwardly in a direction proceeding from the rear section of the divider plate toward the forwardmost part of the front section of the divider plate, and forming an upper and forward portion of said divider plate, the top and bottom walls of the front section being so joined at the forwardmost part thereof as to afford a rounded nose which internally is concave rearwardly and which merges into the internal surface of the sloped top wall, the side walls of the front section of the divider plate each being substantially smooth and mono-planar throughout and substantially in vertical planes, an inlet tube for coolant mounted on said divider plate and extended along the hollow interior of the divider plate front section to terminate substantially at the inside surface of said forwardmost part of the divider plate closely adjacent the front section bottom wall so that coolant emitted therefrom impinges on the inside of the nose concavity closer the bottom inside surface of the nose concavity than the top inside surface of the nose concavity and is deflected upwardly and rearwardly along said concavity, and outlet conduit means for coolant mounted on said divider plate and being in communication with the hollow interior of the divider plate to receive coolant used to cool said inside surface.

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