Dec. 25, 1956 A. V. ALEXEFF ET AL 2,775,216

CLOSURE MEANS FOR CHAMBER WALL OPENING

Filed Sept. 12, 1952 2 Sheets-Sheet 1

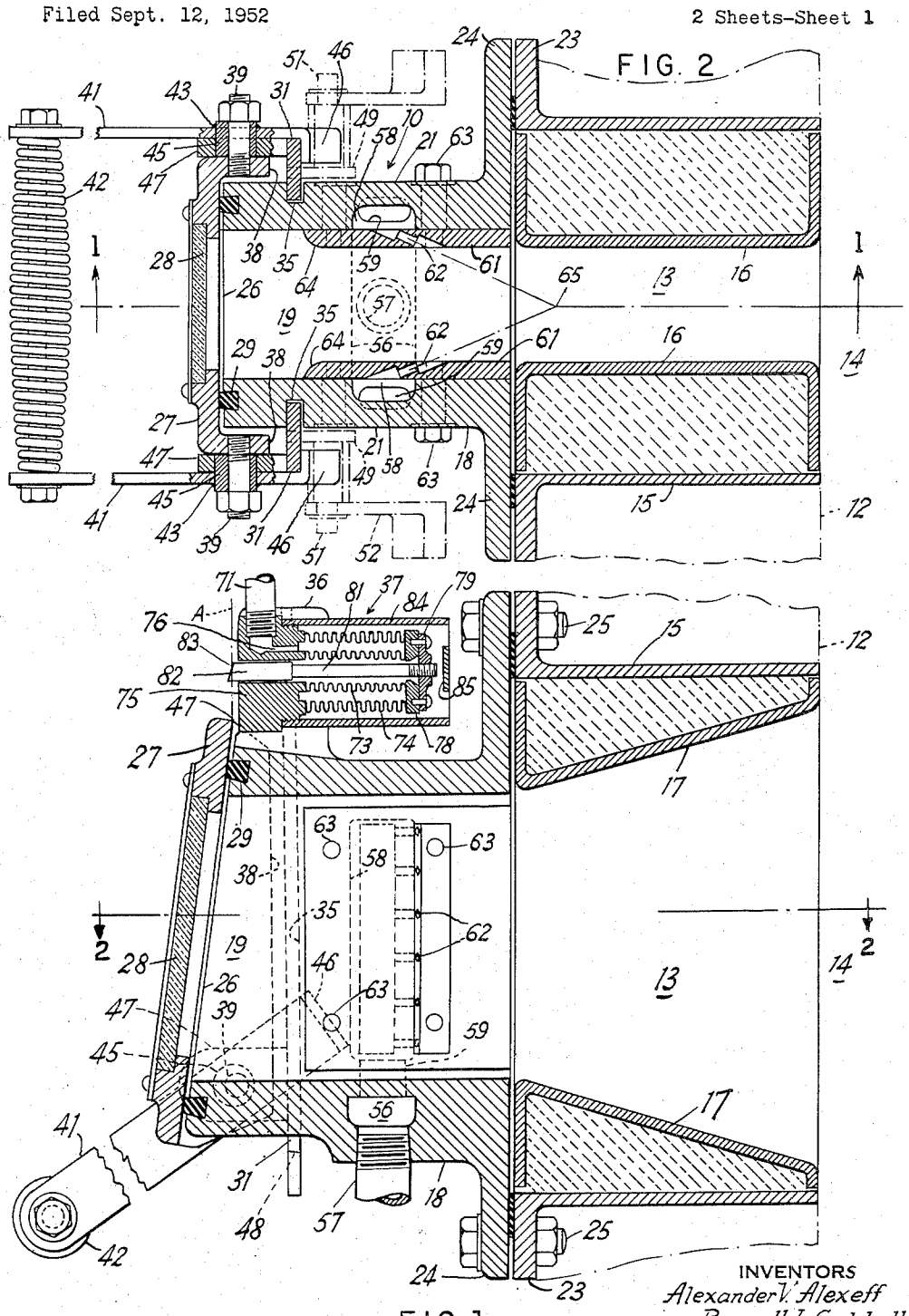


FIG. 1

FIG. 2

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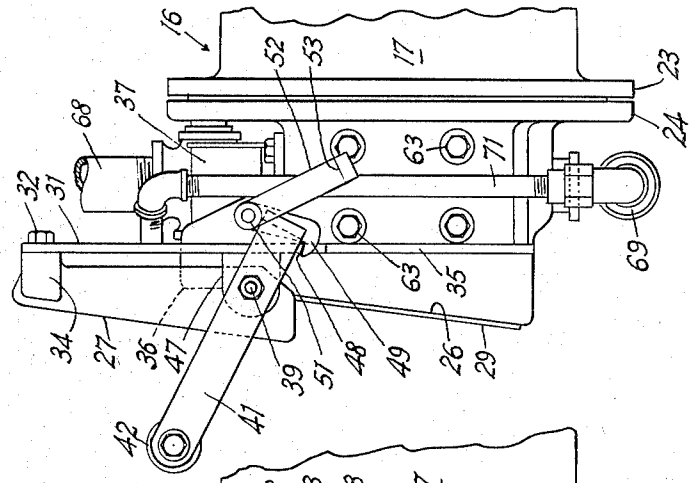


FIG. 5

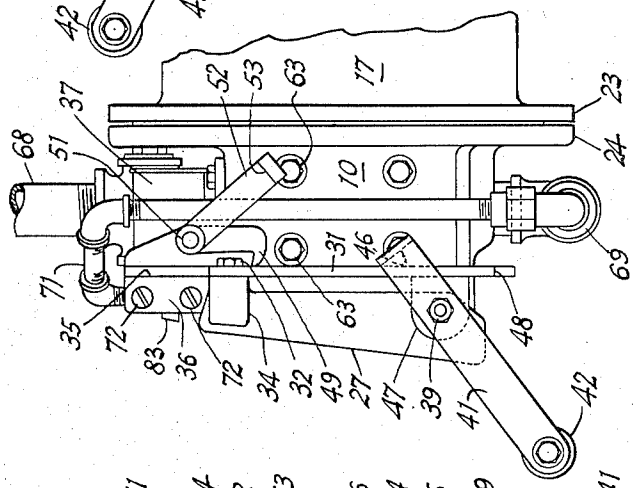


FIG. 4

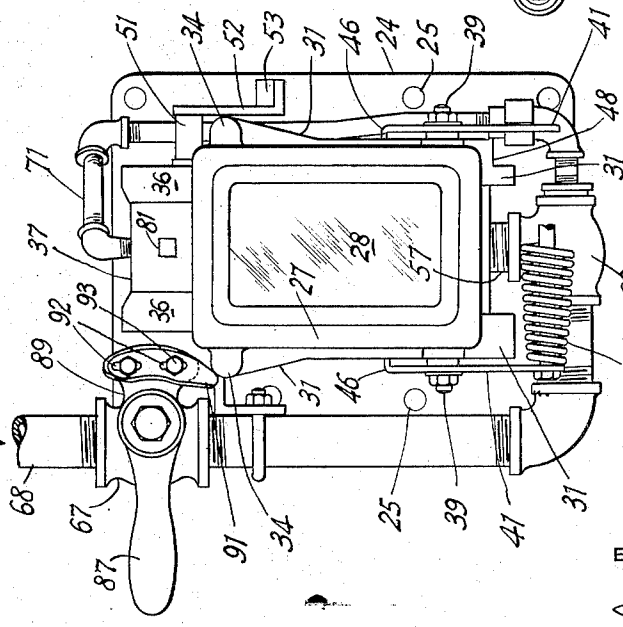


FIG. 3

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CLOSURE MEANS FOR CHAMBER WALL OPENING

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8 Claims. (Cl. 110—179)

The present invention relates in general to closure means for openings formed in the walls of furnaces or other chambered structures operating under relatively high internal gaseous pressures, such openings permitting access to the interior of the furnace usually for the purpose of dislodging slag or other accumulated solids from heat absorbing surfaces. In many instances, such cleaning operations are performed during normal furnace operation from the exterior of the furnace, and since the tools are ordinarily manually operated, provision is made to adequately control or to actually prevent the discharge of hot products of combustion when the closure means is moved to expose the opening.

The invention therefore contemplates the provision of a closure means adapted for mounting exteriorly of a furnace and formed with a passage through which the furnace wall opening is rendered accessible, and through which gaseous fluid is directed in jets inwardly toward the furnace chamber in opposition to gases tending to discharge therefrom. A door which is provided at the outer end of the passage is automatically restrained from moving into the open position until the jet action has been established. Upon movement into the open position, the door is automatically latched and thereby maintained open to permit the cleaning operations to be performed. When it is desired to close the passage, the latching mechanism is manually tripped and the door permitted to return by gravity to its original closed position. The supply of gaseous fluid is then cut off until door opening movement is to be again effected.

The various features of novelty which characterize our invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, its operating advantages and specific objects attained by its use, reference should be had to the accompanying drawings and descriptive matter in which we have illustrated and described a preferred embodiment of our invention.

Of the drawings:

Fig. 1 is side view, in section, of a closure means constructed in accordance with the invention;

Fig. 2 is a plan view of the closure means, in section, along line 2—2 of Fig. 1;

Figs. 3 and 4 are exterior views of the closure means, as seen from the front and side, respectively, showing the door in closed position; and

Fig. 5 is exterior side view similar to Fig. 4, showing the door in open position.

In more detail, and referring to Figs. 1 and 2 in particular, a closure means **10** is shown in assembled relation to a furnace wall **12** through which a lance opening **13** is provided for access to the innter furnace chamber **14**. Suitably, the opening **13** is formed in an inner wall frame **15** which is incorporated in the furnace wall structure and provides parallel upright walls **16, 16** along opposite sides of the opening, and oppositely inclined walls **17, 17** along upper and lower boundaries thereof, whereby the opening **13** is of rectangular cross section throughout its

length, and of progressively increasing height and cross sectional area toward the furnace chamber **14**.

The closure means comprises a door frame **18** mounted exteriorly of the furnace wall **12** and formed with a rectangular opening **19** extending horizontally therethrough in registry with the outer end of the wall frame opening **13**, and forming an axial continuation thereof. The opposing side walls **21** are parallel and, in a preferred orientation of the assembly, are vertically disposed. The frames **15** and **18** are formed with flanges **23** and **24** respectively and maintained in assembled gas tight relationship by means of bolts **25**. The outer end of door frame **18** is formed with a planar door seat **26** which in the operative assembly is inclined from the vertical at an angle of about 7½ degrees, and thus at an angle of about 82½ degrees to the central axis of opening **13**. A door **27**, of a slidable type, and having a sight glass **28**, is provided at the outer end of the opening. A rim of packing **29** projects outwardly from the door seat **26**, as indicated, throughout the perimeter of the opening, for engagement by the planar seating surface of door **27** in its closed position over the opening.

The door **27** is arranged for opening and closing movement in a planar path extending transversely of the combined wall and frame opening **13, 19**. As a means for guiding the door **27** during such movements, guide bars **31** are secured to the door adjacent the upper end thereof by means of bolts **32** screwed into side bosses **34**; the bars **31** extending along opposite margins of the door and being received in slots **35** formed in opposite side walls of frame **18** for slidable movement of the door in an upright plane substantially at right angles to the axial length of the frame opening **19**; the slots **35** continuing throughout the height of frame **18**, including the horizontally spaced upper extension **36** thereof, by and between which a pressure responsive safety latch **37** is supported for a purpose to be later set forth.

The door **27** is formed with side flanges **38** which extend laterally adjacent the door frame **18** at opposite sides, as seen in Fig. 2. Studs **39** are threadably secured in the respective door flanges and extend outwardly therefrom in alignment, one with the other, to provide pivotal supports for arms **41** of a spring handle **42** by which the door is operated. However, the arms **41**, instead of directly engaging the studs **39**, are secured as by welds **43** to eccentrics **45** which in turn are rotatably supported on the studs. Each handle arm **41** is formed at its inner end with an inturned angle portion **46** as part of a means for increasing the pressure of the door against its seat in the closed position. For this purpose, the guide bars **31**, adjacent their lower ends, are formed with lugs **47** which extend forwardly at right angles to the bars, parallel to frame **18**, and which are formed with circular openings therein for assembly on eccentrics **45** between the door flanges **38** and the handle arms **41**.

In order to move the door from its closed position indicated in Fig. 1, an upward force is applied to the handle **42** causing it to be rotated about the studs **39** into a position in which the bottom edges of the inturned handle arm ends **46** are brought into contact with the inner sides of guide bars **31**, at an elevation below the pivotal axis provided by studs **39**. Continued application of the upward force causes the door to be moved into the open position indicated in Fig. 5 where a bottom slot edge portion **48**, of a guide bar **31**, is engaged by a pawl **49** which is freely movable about a pivotal support **51** horizontally mounted on one of the upper frame extensions **36**; the pawl **49** being counter-weighted by an arm **52**, having a lower end portion **53** projecting sidewardly therefrom. By applying a force to the arm portion **53**, the pawl may be tripped out of engagement with the guide bar latching surface **48** and the door thus per-

mitted to drop by its own weight into the closed position. The inclination of the door seat **26** outwardly from the guide slots **35** in a downward direction results in a wedging action which automatically causes the door to tightly engage the seat. The pressure of the door against its seat may be further increased by forcing the handle **42** downwardly, thereby moving the upper edges of the inturned handle arm ends **46** into forcible engagement with the inner sides of guide bars **31** and simultaneously causing the eccentrics **45** to be rotated on studs **39** in a direction causing the distance between the guide bars and studs **39** to be slightly decreased. As a result, the guide bars **31** are forced against the front walls of grooves **35** and the door **27** caused to forcibly engage the seat packing **29**.

The closure means **10** is further arranged to prevent escape of hot furnace gases and other products of combustion when the door **27** is open. Accordingly, means are provided for directing jets of air or other gaseous fluid at high velocity into the frame passage **19** in the direction of the furnace wall opening **13**. For this purpose, the outer door frame section **18** is formed with a fluid supply chamber **56** within its bottom and side walls; the chamber **56** thus being of generally U-shaped formation having a bottom inlet portion to which air or other gaseous fluid is admitted under pressure through a supply pipe **57**, and having upright outlet portions **58**, **58** in opposite side walls, with intermediate portions **59**, **59** interconnecting the bottom inlet portion with outlet portions **58**, **58** at opposite sides. In the side walls **21**, **21**, an interior liner means is provided in the form of perforated flat plates **61** which, in addition to providing the inner side walls of fluid supply chambers **58**, are formed with a series of spaced holes **62** therein through which fluid is directed into the frame opening **19** in a series of converging jets. Suitably, the liner plates **61** are secured to the wall by means of bolts **63** as indicated. The plates **61** extend to the inner end of the frame, in alignment with the sides of wall opening **13**, and have their outer edges **64** rounded to prevent obstruction to tools inserted for cleaning purposes interiorly of chamber **14**. Right angled recesses are formed in opposite sides of each plate, as indicated, to facilitate the drilling of holes **62** which are formed in parallel planes and directed to a common line of intersection **65** located beyond the frame **18** and preferably within the continuing length of furnace wall opening **13**.

The supply of gaseous fluid to jet holes **62** is under control of a valve **67** located in a pipe line **68** which includes a T-connection **69** with pipe **57** through which fluid is supplied to the interior fluid chamber **56**. An additional pipe line **71** leads from T **69** to the pressure responsive latch **37** which is secured by screws **72** to the upper frame extensions **36**.

The latch **37**, as seen in Fig. 1, comprises inner and outer cylindrical bellows **73** and **74**, circumferentially spaced and secured at one end to a supporting block **75** in which a passage **76** is formed for pressure fluid flow from pipe **71** to the annular space separating the two bellows. The outer end of the annular space is sealed by an annular plate **78** to which is attached a circular end plate **79**. A latch pin **81** is adjustably secured at one end in the end plate **79** and extends forwardly through the supporting block **75** in which it is slidably guided by an end portion **82** of rectangular cross section which, as hereinafter explained, is adapted to project into the planer path of door opening movement which is indicated by the vertical line A, parallel to guide slots **35**. However, the outer end surface **83** of the latch pin slopes downwardly and outwardly so as not to present an obstruction to the door during closing movement. The bellows assembly is shielded by a cylindrical housing **84** having attached thereto a stop bar **85** for preventing excessive expansion movement of the bellows. A minimum limit of expansion movement is nevertheless essential in order to withdraw the outer end **82** of the latch pin from its normal position across plane A where it prevents full opening movement of door **27**.

In the normal course of operation, when it is desired to open the door **27**, with chamber **14** under superatmospheric pressure, the supply of gaseous fluid is first made available in frame chamber **56** for establishing the fluid jet action through ports **62** before door **27** is moved to uncover the opening **19**. However, if the operator had failed to open the fluid supply valve **67**, the door could be moved a short distance in the opening direction when further opening movement would be prevented by the latch pin **81**. In this position, the door would be slightly spaced from its seat and thus permit hot gases to be discharged beyond the edges of the door and provide a corona of flame which would serve as a warning signal to open the fluid supply valve **67**. Then, with the gaseous fluid supplied at normal pressure to ports **62**, and simultaneously to the safety latch **37**, the normal jet action is established and the latch pin **81** withdrawn so as to permit the door to be opened to fully expose the opening **19** and permit lancing operation to be performed with safety.

In order to provide for a situation in which the operator had failed to first open the valve **67**, the valve handle **87** may be formed with an opposite arm portion **89** to which may be secured a stop plate **91** adapted to engage an upper portion of door **27**, as indicated in Fig. 3, and thereby prevent door opening movement until the valve handle is turned through 90 degrees in a clockwise direction to the open position, in which position the stop plate **91** is moved out of the path of door movement. Furthermore, when the valve handle **87** is in the open position, with door **27** open, the valve handle is prevented by the door from being returned to its closed position, at right angles to pipe **68**. The stop plate **91** may be adjustably positioned on the handle extension **89** suitably by providing slotted openings **92** through which holding bolts **93** extend. As will be understood, the valve **67** may be arranged so as to cause the handle **87** to move in a vertical plane either parallel to the guide slots **35** or in angular relation thereto, depending for example on the specific piping and valve arrangement.

While in accordance with the provisions of the statutes we have illustrated and described herein the best form of the invention now known to us, those skilled in the art will understand that changes may be made in the form of the apparatus disclosed without departing from the spirit of the invention covered by our claims, and that certain features of the invention may sometimes be used to advantage without a corresponding use of other features.

What is claimed is:

1. Closure means for a chamber wall opening comprising interrelated members one of which is formed as a frame providing a passage therethrough for registry with said opening, another of said members constituting a door for said passage at the outer end of said frame, means including a guide bar on one of said members for restricting total opening and closing movement of said door substantially to a single upright plane, said other member being formed with a guide slot in which said guide bar is slidably received throughout its path of travel therein, said guide bar in the closed position of said door being arranged to releasably engage only that side of said slot which is nearer said outer end of said frame, the outer end of said frame being formed with a door seat inclined with respect to the length of said passage, said guide slot being formed with substantially parallel sides arranged in diverging relation to said seat in the direction of closing movement of said door, and means for releasing said guide bar from engagement with said side of said slot prior to opening movement of said door.

2. Closure means as defined in claim 1 and further including door operating means pivotally supported on

said door and movable into engagement with said guide bar for increasing the pressure of said door against said seat upon movement of said door into the closed position.

3. Closure means for a chamber wall opening comprising a frame providing a passage therethrough for registry with said opening, a door for said passage at the outer end of said frame, said frame providing a seat for said door inclined to the length of said passage, means including a guide bar movable with said door and slidable in a groove in said frame for restricting opening and closing movement of said door substantially to a single plane disposed in angular relation to said seat, said guide bar in the closed position of said door being arranged to forcibly engage a side of said groove and only that side which is nearer said outer end of said frame, and means pivotally supported on said frame for maintaining said door in an open position, said pivotally supported means being formed as a pawl normally engaging a side of said guide bar and having an upwardly facing surface portion arranged to automatically engage an under surface portion of said guide bar upon movement of said door into said open position.

4. Closure means for a chamber wall opening comprising a frame providing a passage therethrough for registry with said opening, a door for said passage at the outer end of said frame, said frame providing a seat for said door inclined to the length of said passage, means including a guide bar movable with said door and slidable in a parallel-sided groove in said frame for restricting total opening and closing movement of said door substantially to a single upright plane extending transversely of said passage, liner means associated with walls of said passage and having openings extending therethrough for directing gaseous fluid into said passage when said door is in an open position, said liner means openings communicating at their outer ends with a gaseous fluid supply chamber formed exteriorly of said passage, and valve means for controlling the supply of gaseous fluid to said chamber, said valve means having a valve operating element which in its closed position is disposed in the path of door movement to prevent opening movement of said door.

5. Closure means as defined in claim 4 wherein said liner means openings are arranged in groups at opposite sides of said passage and directed in planes converging toward the inner end of said passage.

6. Closure means for a chamber wall opening comprising a frame providing a passage therethrough for registry with said opening, a door for said passage at the outer end of said frame, said frame providing a seat for said door formed in a plane inclined to the length of said passage, means including a guide bar movable with said door and slidable in a groove in said frame for restricting total opening and closing movement of said door substantially to a single plane extending transversely of said passage, said groove at the side toward said seat having its wall divergent with respect to said seat in the direction of closing movement of said door, means for admitting gaseous fluid under pressure into said passage toward the inner end of said passage, and latch means normally biased into the path of opening movement of said door and responsive to the pressure of said fluid for movement out of said path upon release of said fluid for admission to said passage.

7. Closure means for a chamber wall opening comprising a frame providing a passage therethrough for registry with said opening, a door for said passage at the outer end of said frame, said frame providing a seat for said door formed in a plane inclined to the length of said passage, means including a guide bar movable with said door and slidable in a groove in said frame for restricting total opening and closing movement of said door substantially to a single plane transversely of said passage, said groove at the side toward said seat having its wall planar and divergent with respect to said seat in the direction of closing movement of said door, means for admitting gaseous fluid under pressure into said passage toward the inner end of said passage, valve means operable to release said fluid for admission to said passage, and means associated with said valve means and movable into the path of door movement to provide an obstruction preventing opening movement of said door until said valve means is operated to release said fluid.

8. Closure means for a chamber wall opening comprising a frame providing a passage therethrough for registry with said opening, a door for said passage at the outer end of said frame, said frame providing a seat for said door inclined to the length of said passage, means including a guide bar movable with said door and slidable in a groove in said frame for restricting opening and closing movement of said door substantially to a single plane disposed in angular relation to said seat, a handle pivotally supported on said door for effecting opening movement thereof, and means including said handle for increasing the pressure of said door against said seat in the closed position, said last named means including a stud projecting sidewardly from said door and providing the axis about which said handle is pivotally movable, and eccentric rotatably supported on said stud and secured to said handle, and a lug secured to said guide bar and formed with a circular opening in which said eccentric is received for limited angular movement therein about said axis, said handle having an inturned end portion arranged to engage the inner side of said guide bar when said handle is moved in the direction of closing movement of said door.

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