Feb. 18, 1958 E. C. WITTKE 2,823,629

CLOSURE MEANS INCLUDING FLUID SCREEN FOR ACCESS PASSAGEWAY INTO PRESSURIZED FURNACE AND THE LIKE

Filed June 13, 1955 3 Sheets-Sheet 1

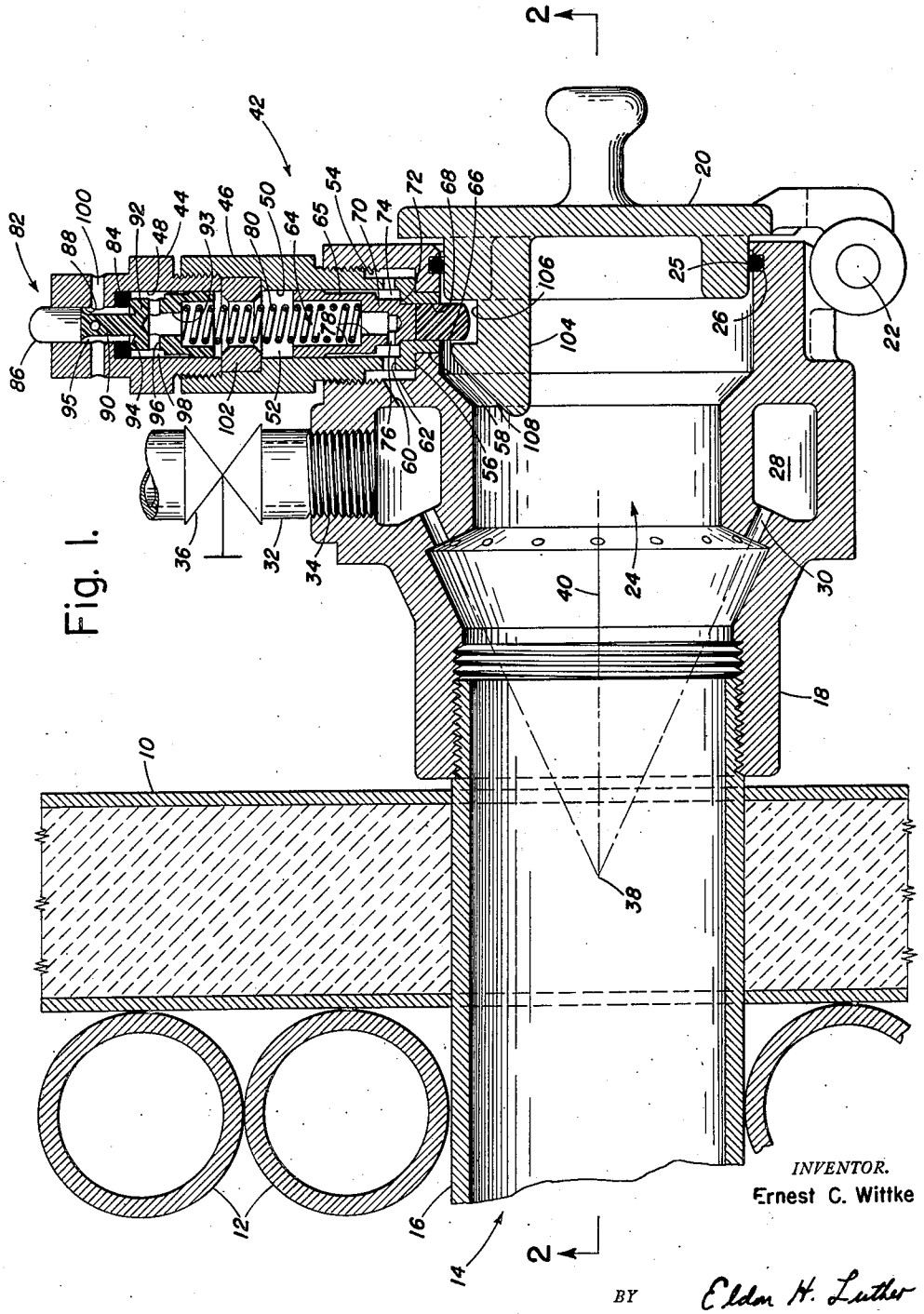


Fig. 1.

INVENTOR.
Ernest C. Wittke

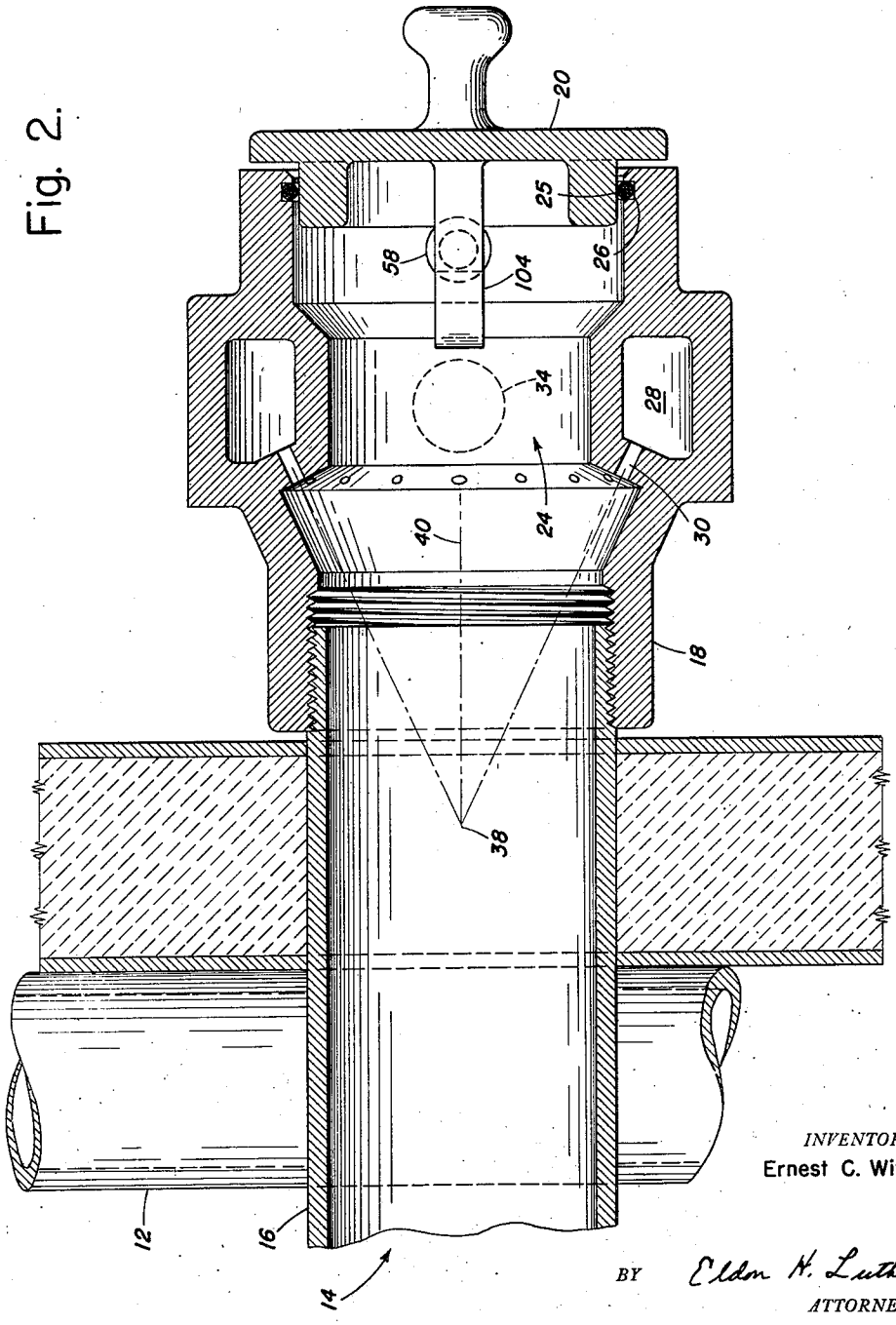
BY Elden H. Luther
ATTORNEY

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Fig. 2.



INVENTOR.
Ernest C. Wittke

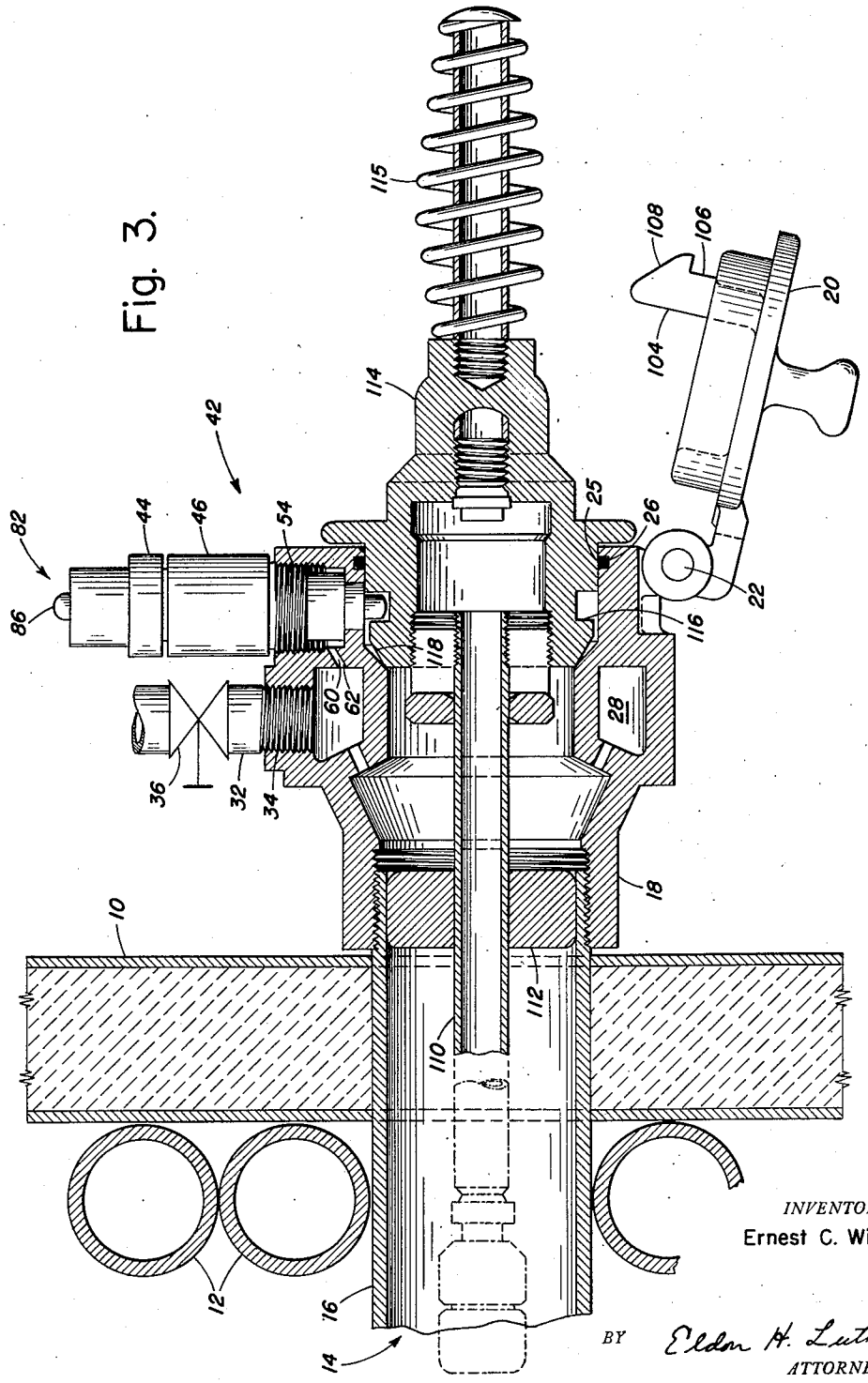
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ATTORNEY

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Filed June 13, 1955 3 Sheets-Sheet 3

Fig. 3.



INVENTOR.
Ernest C. Wittke

BY Eldon H. Luther
ATTORNEY

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2,823,629

CLOSURE MEANS INCLUDING FLUID SCREEN FOR ACCESS PASSAGEWAY INTO PRESSURIZED FURNACE AND THE LIKE

Ernest C. Wittke, Westbury, N. Y., assignor to Combustion Engineering, Inc., New York, N. Y., a corporation of Delaware

Application June 13, 1955, Serial No. 515,031

11 Claims. (Cl. 110—179)

The present invention relates to access passageways or openings provided in walls of furnaces and the like operating under superatmospheric internal pressures and has specific relation to such access openings wherein fluid screen means are provided to prevent the escape of fluid outwardly through the opening during periods when the access through the opening is had and to fluid pressure operated latching means operative to normally retain a removable member in closing relation with the opening.

Many processes are required to be carried out within chambers or vessels under a not too great superatmospheric internal presure. In order that access may be had to the interior of these chambers for the purpose of observing the action taking place therewithin as well as inserting various apparatus thereinto access openings are provided in the wall of the chamber with means for normally retaining these access openings closed to prevent the escape of fluid from within the chamber through these openings and also with means for forming a fluid screen within these openings when the same are open in order to provide access into the interior of the chamber with this screen being effective to prevent the escape of fluid from within the chamber out through these openings.

In accordance with the present invention there is provided such an access opening through the wall of a chamber which may be the furnace of a modern steam generator that is operated under a superatmospheric internal pressure. Surrounding the opening adjacent its outer end is a manifold to which a high pressure fluid, such as air, is supplied and which is provided with openings arranged so as to direct high velocity jets of this fluid inwardly of the opening toward a point lying along the axis of the opening to provide a fluid screen effective to prevent the escape of fluid from within the chamber out through the opening when the same is open in a manner well known in the art. Removably associated with the outer end of the opening is a member which may be either a cover or a portion of an apparatus inserted into the chamber through the opening with this member normally being retained in its closed position by means of a latch which is operated by a fluid pressure responsive device which in turn is operated by fluid pressure delivered to the manifold, with the latch being biased to its latching position. Valve means are provided to control the effectiveness of the pressure in the manifold for actuating this fluid pressure responsive device with the valve means being operative in one position to cause this fluid pressure to operate the pressure responsive device to move the latch to its unlatching position and in another position to cause the fluid pressure to be ineffective to move the pressure responsive device.

It is an object of the present invention to provide an improved apparatus through which access is had to the interior of a pressurized chamber.

It is a further object of this invention to provide such an apparatus with an improved latching mechanism for retaining mechanical means in closing relation with the opening.

Other and further objects of the invention will become apparent to those skilled in the art as the description proceeds.

With the aforementioned objects in view, the invention comprises an arrangement, construction and combination of the elements of the inventive organization in such a manner as to attain the results desired as hereinafter more particularly set forth in the following detailed description of an illustrative embodiment, said embodiment being shown by the accompanying drawing wherein:

Fig. 1 is a transverse sectional view through the wall of a pressurized furnace provided with the improved access opening organization of this invention.

Fig. 2 is a sectional view taken along line 2—2 of Fig. 1.

Fig. 3 is a view similar to that of Fig. 1 but showing the cover in its open position and an oil gun inserted within the access opening and effectively closing the outer end of the opening.

While the present invention will be described in connection with a pressurized furnace it is to be understood that the invention is not limited to use with furnaces but may be used with other and different organizations which have a chamber operating under superatmospheric internal pressures and into which access must be provided without relieving this pressure.

Referring now to the drawings, wherein like reference characters are used throughout to designate like elements, there is provided a wall 10, which in the illustrative organization represents the wall of the furnace of a steam generator with the furnace having a superatmospheric internal pressure and with the inner surface of the wall being lined with steam generating or other heat absorbing tubes 12. In order that access may be had to the interior of the furnace for the removal and insertion of an oil gun or burner or any other desired equipment as well as to provide an observation port to observe flame conditions within the furnace, wall 10 is provided with access opening 14 formed by cylindrical sleeve 16 positioned within and extending through the wall.

Threaded to the outer end of sleeve 16 is the frame or housing 18 to the outer end of which is pivotally secured cover 20 with this cover being pivotally movable about pin 22 to and from a closed position with respect to opening 24 provided in frame 18 and which forms a continuation or extension of opening 14. When in the closed position the cover engages the O-ring seal 25 retained in annular groove 26 provided in the wall of opening 24 to provide a substantially fluid tight seal.

In order to prevent the hot gases produced within the furnace from escaping outward through opening 14 when cover 20 is moved to its open position an annular ring of high velocity fluid jets are directed inwardly of opening 14 to form a fluid screen which effectively prevents flow of the hot gases through this opening. For this purpose frame 18 has formed in its wall annular manifold 28 from which extend, in a direction inwardly of opening 14, a ring of restricted openings 30. High pressure fluid, such as air, is delivered to manifold 28 through supply conduit 32 which has its inner end threaded into bore 34 extending laterally from the manifold and which is provided with valve 36 for controlling the delivery of the high pressure fluid to the manifold. Upon opening valve 36 this fluid enters manifold 28 so that the pressure within the manifold is greatly increased and the fluid is projected in high velocity jets through the restricted opening 30 toward the imaginary point 28 lying on axis 40 of the opening 14.

The cover is retained in its closed position against the internal pressure prevailing within the furnace by means of the latching mechanism generally designated 42. This mechanism is constructed and arranged so that it nor-

mally occupies its latching position and may not be moved to its unlatching position unless the aforementioned high pressure fluid supplied through conduit 22 is delivered to manifold 28 so that the fluid screen is in operation thereby preventing opening of cover 20 when this fluid screen is not functioning which, in the case of a furnace herein contemplated, may result in very serious injury to personnel.

This latching mechanism 42 comprises a body made in two sections 44 and 46 with the inner end of section 44 being threadedly received within the outer end of section 46. The adjacent ends of these sections 44 and 46 are provided with coaxial bores 48 and 50 which together form an elongated cylindrical chamber 52. Section 46 is threadedly received in the lateral bore 54 provided in frame 18 with the innermost end of this section being of reduced diameter to provide a shoulder 56 which engages a complementary shoulder at the end of bore 54 when the section is screwed into place with the innermost end of this section 46 extending through bore 58 provided at the inner end of bore 54. Communication between cylindrical chamber 52 and manifold 28 is had through passage 60 provided in frame 18 and the numerous radially arranged openings 62 formed in the wall of body section 46.

Reciprocally mounted within bore 50 is the pressure responsive device 64 which includes piston 65 having its outer end of enlarged daimeter for sliding engagement with the bore 50 in a substantially fluid tight manner. The inner end 66 of pressure responsive device 64, which is of reduced diameter, forms the latch pin of latching mechanism 42 and extends through bore 68 in a substantially fluid tight manner laterally into opening 24 with this latch pin being connected with the outer end of the piston 65 through a portion 70 of intermediate diameter thereby providing a radial shoulder 72 and an annular chamber 74 with this latter chamber being in direct communication with radial openings 62 formed in the wall of body section 46. Pressure fluid entering chamber 74 from manifold 28 through passage 60 and openings 62 is conveyed through bleed passage 76 of restricted section into recess 78 provided in the end of piston 65. The pressure responsive device 64 is biased toward its inward or latching position by means of spring 80 and in this position shoulder 72 is in engagement with the end of bore 50 and latch pin 66 extends laterally into the opening 24 so as to engage cover 20 and retain it in its closed position. This spring is also effective to urge the reciprocal push button operated valve 82 to its closed position in engagement with seat 84 provided at the outer end of bore 48.

As illustratively disclosed this valve 82 comprises a cylindrical portion 86 slidably received within bore 88 extending through the outer end of body section 44 in coaxial relation with bore 48. Extending inwardly of this cylindrical portion 86 is shank or stem 90 of substantially reduced diameter which carries at its inner end the valve head 42 which has valving shoulder 94 formed thereon and the inner end of which is bored at 93 to receive spring 80. Communication between annular passage 95 surrounding stem 90 and the interior of cylindrical chamber 52 is provided through radial opening 96 in the valve head which leads from this bore 93 into annular chamber 98 surrounding the outer end of this valve head. Extending outwardly from the annular chamber 95 are a plurality of passages 100 through which pressure fluid from cylindrical chamber 52 may be vented to atmosphere when valve 82 is opened.

Actuation of valve 82 is had by pushing downward upon cylindrical portion 86 to move valve shoulder 94 away from contact with valve seat 84 with the valve normally being biased to its closed position through the action of spring 80 which, in addition to being guided by the recesses within which it is disposed in both the pressure responsive device 54 and the valve 82, is guided by ring 102 firmly clamped between the body sections 44 and 46.

In the operation of latching mechanism 42, spring 80 is effective to normally retain valve 82 in its closed position and pressure responsive device 64 in its inward or latching position where latch pin 66 extends into opening 24 and is effective to lock cover 20 in its closed position. Thus when valve 36 is opened and fluid pressure admitted to manifold 28, which must be done before the latching mechanism may be withdrawn from its latching position, this pressure is conveyed through passage 60 and radial openings 62 into annular chamber 74 from which the pressure is bled through bleed passage 76 into recess 78 so that the fluid pressure on both sides of piston 65 are equalized resulting in this piston remaining in the position into which it is urged by spring 80. When it is desired to withdraw latch pin 66 from its latching to its unlatching position cylindrical portion 86 of valve 82 is pushed downward thereby opening this valve and venting the pressure acting on the outer end of piston 65 to atmosphere. This results in a substantial reduction in the pressure on this side of piston 65 so that the pressure in annular chamber 74 which acts against the inner end of this piston is effective to move the piston outwardly and into engagement with ring member 102 which acts as a stop for this outward movement of the piston. With the piston in this position latch pin 66 is withdrawn from chamber 24 and cover 20 may be pivoted to its open position. Piston 65 will remain in its outward or withdrawn position as long as valve 82 is held open. However, when cylindrical portion 86 of this valve is released, the valve will move to its closed position which will allow the pressure entering recess 78 through bleed 76 to again rise causing piston 65 to move to its inward position where latch pin 66 extends laterally into opening 24. If valve 36 is not open to admit the high pressure fluid to manifold 28 to thereby greatly raise the pressure in the manifold over that ordinarily prevailing therein the opening of valve 82 will have no effect on the latch mechanism and it will remain in its normally closed position wherefore the latch mechanism 42 may not be actuated and cover 20 may not be unlatched and opened when the fluid screen is not in operation.

In order that cover 20 may be moved into and locked in its closed position without necessitating the actuation of latch mechanism 42 by manipulation of valve 82 the cover is provided with keeper 104 having recess 106 provided therein for reception of the inner end of latch pin 66 and having camming surface 108 formed thereon effective to cam latch pin 66 outwardly as the cover is moved into its closed position with the latch pin dropping into recess 106 upon completion of the closing movement of the cover.

In Fig. 3 cover 20 is shown in its open position and an oil burner or gun is shown inserted into and extending through access opening 14 with this gun including oil delivery pipe 110 about which is disposed an annular guide member 112 and the outer end of which is connected to a generally cylindrical housing 114. In the periphery of this housing there is provided an annular groove 116 into which latch pin 66 is adapted to extend in the same manner it extends into recess 106 in keeper 104 and the inner end of this housing is formed with an annular bevelled cam surface 118 operative to cam latch pin 66 outwardly as the oil gun is inserted into access opening 14 enabling the oil gun to be inserted into place without activation of latch mechanism 42 and enabling the operator of the gun to make sure that it is securely latched in place before valve 36 is turned off and operation of the air screen terminated. The periphery of housing 114 engages O-ring 25 in a substantially fluid tight manner as does cover 20 and in order to facilitate handling the oil gun handle 115 is secured to and extends outwardly of housing 114.

It will thus be seen that with the present invention the latch mechanism may not be moved to its unlatching position to permit the withdrawal of the closure from the outer end of frame 18 whether the closure be a cover member or an oil gun unless the fluid screen which necessitates the supplying of high pressure fluid to manifold 28 is first in operation. However, in order to close the cover or insert the oil gun into their operative positions and lock the same in these positions it is not necessary to first actuate the latch mechanism. Furthermore, with the organization of this invention the cover and the oil gun are securely locked in their operative position within access opening 14 before the fluid screen is shut off or deactivated with this being a highly desirable and extremely important safety factor.

While I have illustrated and described a preferred embodiment of my novel organization it is to be understood that such is merely illustrative and not restrictive and that variations and modifications may be made therein without departing from the spirit and scope of the invention. I therefore do not wish to be limited to the precise details set forth but desire to avail myself of such changes as fall within the purview of my invention.

What I claim is:

1. In combination with a passageway adapted to lead into a pressurized furnace, a housing disposed at the outer end of said passageway and having an opening generally forming a continuation of said passageway, distributor means for directing a gaseous fluid under high pressure into said opening toward the inner end of said passageway in a manner to form a fluid screen effective to prevent escape of hot gas from the furnace through the passageway, valve means effective to control the delivery of said fluid to said distributor means and when open causing a high pressure to prevail in said distributor means, removable means effective to close said opening, movable means effective in one position to retain said removable means in its closed position and in another position releasing the same for movement from said closed position, means operated by fluid pressure for moving said movable means to its other position and another valve means for controlling said fluid pressure operated means when the first mentioned valve is open and the high pressure prevails in the distributor means, said other valve means being effective in one position to cause said high fluid pressure to operate the fluid pressure operated means to move the movable means to its other position and in another position to cause said high fluid pressure to be ineffective for this purpose.

2. In combination with a passageway adapted to lead into a pressurized furnace, a housing disposed at the outer end of said passageway and having an opening generally forming a continuation of said passageway, distributor means for directing a gaseous fluid under high pressure into said opening toward said passageway in a manner to form a fluid screen effective to prevent escape of hot gas from the furnace through the passageway, valve means effective to control the delivery of said fluid to said means and when open causing a high pressure to prevail in said distributor means, removable means effective to close said opening latch means spring biased to a position where it is effective to retain the removable means in its closed position but movable to a position where it is ineffective to so retain said movable means, said removable means having keeper means engaged by said latch means, said latch means and said keeper means being constructed and arranged to permit the removable means to be moved to and latched in the closed position when the latch means is in its latching position, means operated by fluid pressure for moving said latch means to its unlatching position and another valve means for controlling said fluid pressure operated means when the first mentioned valve is open and the high fluid pressure prevails in the distributor means, said other valve means being effective in one position to cause said high fluid pressure to operate the fluid pressure operated means to move said latch means to said unlatching position and in another position to cause said high fluid pressure to be ineffective for this purpose.

3. In a wall of a chamber having a superatmospheric pressure, a passageway extending through said wall, means for directing a gaseous fluid under high pressure into said passageway toward the inner end thereof to form a fluid screen to prevent fluid flow from said chamber out through said passage, valve means operative to control the delivery of the pressurized gaseous fluid to the directing means and when open causing a high pressure to prevail in said directing means, removable means for closing said passageway at a location outwardly of the introduction of the gaseous fluid thereinto, a latch operative to retain said removable means in its closed position, said latch being biased to its latching position but movable to an unlatching position, means operated by fluid pressure delivered to the directing means for moving said latch to its unlatching position and valve means operative to control the effectiveness of this fluid pressure the high fluid pressure prevailing in the directing means when the first mentioned valve is open to operate this fluid pressure operated means and accordingly control the operation of the latch.

4. In a wall of a chamber having a superatmospheric pressure, a passageway extending through said wall, means for directing a gaseous fluid under high pressure into said passageway toward the inner end thereof to form a fluid screen to prevent fluid flow from said chamber out through said passage, valve means operative to control the delivery of the pressurized gaseous fluid to the directing means and when open causing a high pressure to prevail in said directing means, removable means for closing said passage at a location outwardly of the introduction of the gaseous fluid thereinto, a latch operative to retain said removable means in its closed position, said latch being biased to its latching position, means operated by fluid pressure for moving said latch to its unlatched position, another valve means operative to control the effectiveness of the high fluid pressure prevailing in the distributing means when the first mentioned valve is open to operate this fluid pressure operated means and accordingly control operation of the latch, said removable means and said latch being constructed and arranged to permit said removable means to be moved to and latched in its closed position while said other valve means is in a position to render said fluid pressure operated means inoperative to move the latch to its unlatched position.

5. In a wall of a chamber having a superatmospheric pressure, a passageway extending through said wall, means for directing a gaseous fluid under high pressure into said passageway toward the inner end thereof to form a fluid screen to prevent fluid flow from said chamber out through said passage, valve means operative to control the delivery of the pressurized gaseous fluid to the directing means and when open causing a high pressure to prevail in said directing means, removable means for closing said passage at a location outwardly of the introduction of the gaseous fluid thereinto, a latch operative to retain said removable means in its closed position, said latch being biased to its latching position but movable to an unlatching position, means operated by fluid pressure for moving said latch to its unlatched position, another valve means controlling the operation of this fluid pressure operated means when the first mentioned valve is open and the high fluid pressure prevails in the directing means, said other valve means being effective in one position to cause said high fluid pressure to move said latch to its unlatching position and in another position to cause said high fluid pressure to be ineffective for this purpose, said valve normally occupying and being biased to said other position.

6. In a furnace operating under superatmospheric pressure and having an opening extending through a wall thereof, the combination of a means providing a manifold

about said opening for receiving a gaseous fluid under pressure, said manifold having openings provided therein and arranged to project high velocity jets of said fluid inwardly of said opening to form a fluid screen effective to prevent the escape of gases from the furnace through the opening, removable means for closing said opening at a location outwardly of the introduction of said fluid jets thereinto, a locking member movable between a position where it is effective to retain the removable means in its closed position and a position where it is in ineffective to retain said removable means in its closed position, said locking member being biased to its locking position, a pressure responsive motor operative to actuate said locking member, said motor having fluid pressure from said manifold admitted to both sides thereof and in a manner permitting the locking member to occupy its locking position, and valve means for controlling operation of the motor and effective when open to relieve the pressure on one side of the motor relative to the other side in a manner which will cause said motor to move to a position wherein the locking member occupies its unlocked position.

7. In a furnace operating under superatmospheric pressure and having an opening extending through the wall thereof, the combination of means providing a manifold about said opening for receiving a gaseous fluid under pressure, said manifold having openings provided therein and arranged to project high velocity jets of said fluid inwardly of said opening to form a fluid screen effective to prevent the escape of gases from the furnace through the opening, removable means for closing said opening at a location outwardly of the introduction of said fluid jets thereinto, a locking member movable between a position where it is effective to retain the removable means in its closed position and a position where it is ineffective to retain the removable means in its closed position, said locking member being biased to its locking position, a pressure responsive motor operative to actuate said locking member, said motor having fluid pressure from said manifold admitted to both sides thereof and in a manner permitting the locking member to occupy its locking position, and valve means for controlling operation of the motor effective when open to relieve the pressure on one side of the motor relative to the other side in a manner which will cause said motor to move to a position wherein the locking member occupies its unlocked position, said removable means having keeper means engageable by said locking member for retaining said removable means in its closed position, said keeper means and said locking member being constructed and arranged so that said removable means may be moved into and locked in its closed position while said valve means is in its closed position.

8. In a furnace operating under superatmospheric pressure and having an opening extending through a wall thereof, the combination of means providing a manifold about said opening for receiving a gaseous fluid under pressure, said manifold having openings provided therein and arranged to project high velocity jets of said fluid inwardly of said opening to form a fluid screen effective to prevent the escape of gases from the furnace through the opening, removable means for closing said opening at a location outwardly of the introduction of said fluid jets thereinto, a locking member mounted for movement laterally of said opening between a position where it is effective to retain the removable means in its closed position and a position where it is ineffective to retain said removable means in its closed position, said locking member being biased to its locking position, said removable means including keeper means engageable by said locking member for retaining said removable means in its closed position, a piston type pressure responsive motor for moving said locking member to its unlocking position, means for admitting pressure from said manifold to the side of said piston to effect such movement, a restricted passageway conveying said fluid pressure to the other side of said piston, and valve means operative to control the fluid pressure acting on said other side relative to said one side and effective to controllably vent to atmosphere fluid pressure supplied to said other side of the piston relative to said one side.

9. In a furnace operating under superatmospheric pressure and having an opening extending through a wall thereof, the combination of means providing a manifold about said opening for receiving a gaseous fluid under pressure, said manifold having openings provided therein and arranged to project high velocity jets of said fluid inwardly of said opening to form a fluid screen effective to prevent the escape of gases from the furnace through the opening, removable means for closing said opening at a location outwardly of the introduction of said fluid jets thereinto, a locking member mounted for movement laterally of said opening between a position where it is effective to retain the removable means in its closed position and a position where it is ineffective to retain said removable means in its closed position, said locking member being biased to its locking position, said removable means including keeper means engageable by said locking member for retaining said removable means in its closed position and having a camming surface formed thereon engageable with said locking member so as to cam the locking member from its locked position and permit said removable means to be moved into and locked in its closed position, and fluid pressure operated motor means operated by fluid pressure delivered to said manifold for actuating said locking member and normally being ineffective by the application of said fluid pressure to move said locking member to its unlocked position but being effective to so move said locking member upon venting said fluid pressure from a portion of said motor means and valve means controlling this venting of said fluid pressure.

10. In an organization of the type described wherein the wall of a pressurized chamber has an opening extending therethrough, the combination of means including a manifold generally coaxial with and surrounding said opening and through which a high pressure gaseous fluid is directed inwardly of said opening to form a fluid screen effective to prevent flow outwardly of the chamber through the opening, removable means for closing said opening at a location outwardly of the introduction of said high pressure fluid thereinto, a motor operated lock effective to releasably lock said removable means in said closed position and including a cylindrical chamber through one end of which extends a locking member for engagement with the removable means, a piston reciprocally mounted in said cylindrical chamber and connected to said locking member to move the same to and from said locking engagement with said removable means, a reciprocal valve mounted in the other end of said cylindrical chamber coaxial therewith and operative to control venting of said other end of said cylindrical chamber to atmosphere, a spring interposed between said piston and said valve operative to bias said valve toward the closed position and the piston toward said one end of the cylindrical chamber with this bias of said piston being effective to urge the locking member into its locking position, means admitting fluid pressure from said manifold to said cylindrical chamber intermediate said piston and said one end, and a restricted passageway effective to admit this fluid pressure to the other side of said piston.

11. In a wall of a chamber having a superatmospheric pressure, a passageway extending through said wall, means providing a manifold about the outer end of said passageway for receiving a gaseous fluid under high pressure, said manifold having openings therein arranged to project high velocity fluid jets inwardly of said opening to form a fluid screen to prevent the escape of fluid from the chamber through the passage, valve means operative to control the delivery of the pressurized gaseous fluid to the manifold and when open causing a high pressure to prevail in

said manifold, removable means for closing said passage at a location outwardly of the introduction of the gaseous fluid thereinto, a locking member movable between a position where it is effective to retain the removable means in its closed posittion and a position where it is ineffective to retain said removable means in its closed position, said locking means being biased to its locking position, motor means for actuating said locking means including a fluid pressure responsive member disposed in a separate chamber, a passageway leading from said manifold to said chamber and another valve means for controlling said fluid pressure responsive member when the first mentioned valve is open and the high fluid pressure prevails in the manifold, said other valve means being operative in one position to render this pressurized gaseous fluid in said

manifold ineffective to cause this pressure responsive member to move the locking member to its unlocked position and effective in another position to render this pressurized gaseous fluid in the manifold effective to so move the locking member, said other valve means being biased to its said one position.

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