June 16, 1936. H. S. WOODRUFF 2,044,555

CLOSURE FOR AN OBSERVATION OPENING

Filed Aug. 25, 1933

Fig. 1.

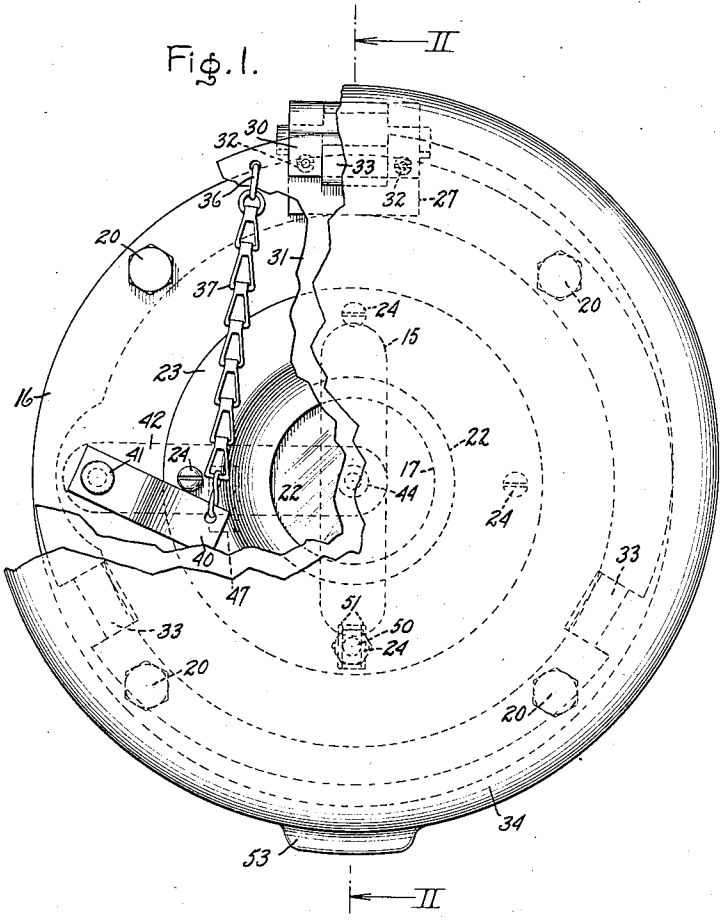


Fig. 2.

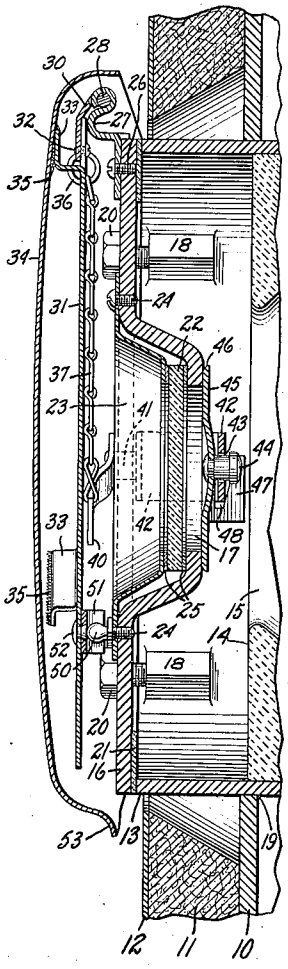
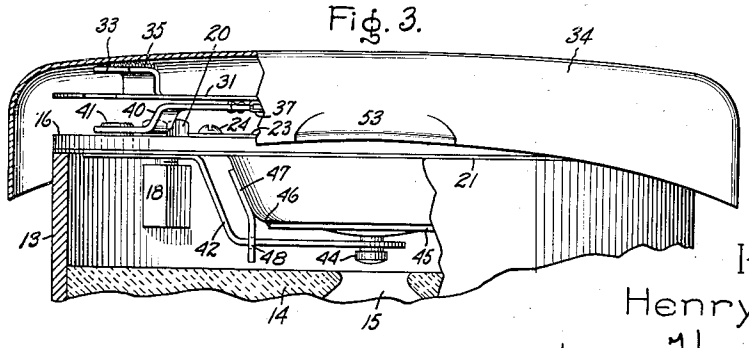


Fig. 3.



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CLOSURE FOR AN OBSERVATION OPENING

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Application August 25, 1933, Serial No. 686,713

15 Claims. (Cl. 126—200)

My invention relates to improvements in closure devices for observation openings and more particularly to an improved closure for a furnace peep-hole or sight door.

Although my invention will be illustrated and described in its preferred embodiment as applied to an observation or inspection opening of a furnace, it is to be understood that it may be applied with equal advantages and utility in any cases where similar problems are encountered.

An object of my invention is the provision of means by which an attendant may observe the internal conditions of a furnace without being subjected to heat and to danger from explosion of furnace gases and without causing detrimental influx of cold air to the furnace combustion chamber.

Another object of my invention is the provision of a transparent sight panel for the sealing of an observation or service opening of a furnace with movable protective covers for shielding both the internal and external surfaces of said panel.

An important object of my invention is the provision of operating means cooperating with an outer movable opaque cover shielding the outer surface of a transparent sight panel located in a service or observation opening of a furnace and with an inner movable opaque cover or shutter shielding the inner surface of the sight panel, whereby movement of said outer cover from its shielding position will cause simultaneous or concomitant movement of the inner cover or shutter from its shielding position to permit observation of the furnace interior through the transparent sight panel.

A further important object of my invention is the provision of a unitary closure device for sealing a furnace observation opening, comprising a transparent panel fixedly mounted in a supporting frame which may be detachably secured in or over the observation opening and which also has mounted thereon swingable opaque covers for the protection of the outer and inner faces of the panel and operating means for the covers, the said closure being conveniently detachable from the furnace to permit access to the furnace interior through the observation opening.

Other objects of my invention will become apparent hereinafter.

The manner in which the above objects are attained will be made clear from the following description taken in connection with the accompanying drawing in which

Fig. 1 is a front elevation partially cut away illustrating the preferred embodiment of my improved closure device in its relation to a furnace having an observation opening, the parts being shown in their normal position in which the observation opening is closed by opaque cover members;

Fig. 2 is a vertical sectional view taken along the line II—II of Fig. 1 showing the parts in the same relation as in Fig. 1 and

Fig. 3 is a bottom elevation, partially cut away, of the device as illustrated in Fig. 1.

While I have preferred to illustrate the observation opening as located in the wall of a metal walled furnace, it will be obvious that it may be located at any desired point in either the castings or doors of furnaces of various types of construction.

In the accompanying drawing 10 represents a portion of the metal wall of a furnace structure which is covered by suitable heat insulation material 11 and which has an overall sheet metal casing 12. Only the portion of the furnace surrounding the observation opening has been shown since a more complete illustration thereof is not necessary for a full disclosure of my invention. The furnace wall is provided with a service or observation opening 19 in which is tightly fitted a tubular member 13 the inner end of which is partially closed by means of a disc of refractory material 14 having an elongated inwardly tapered observation opening 15 in communication with the furnace interior. A supporting frame 16 of metal or other suitable material and provided with the sight aperture 17 is detachably secured over the outer end of the tubular member by means of screws 20 which engage threaded openings in the abutments 18 provided on the inner surface of the tubular member. A gasket 21 of heat insulation material is disposed between the outer edges of the tubular member and the edges of the supporting frame to insure a gas-tight seal therebetween and to impede the conduction of heat from the furnace interior to the supporting frame. It is to be understood that the tubular member and the supporting frame may be circular or rectangular or of any other desired shape and that the tubular member may be entirely dispensed with in which latter case the supporting frame would be secured directly to the furnace wall.

Although my improved closure device as herein described and illustrated in its preferred embodiment is provided with a supporting frame for detachably mounting it with relation to the obser-

vation opening, it is contemplated that it may be desired to fixedly attach the supporting frame to the furnace wall or even to entirely dispense with the supporting frame and mount the other elements of my closure device in their same relation to each other directly upon the furnace structure with a consequent sacrifice of the advantages hereinafter pointed out with respect to the feature of unitary removability. Such modifications would involve the exercise of mere mechanical skill and hence are believed to come within the scope of my invention.

The outer end of the sight aperture 17 is sealed by means of a transparent panel 22, which may be of glass, mica or other similar material, securely held in place by the clamping means 23 which is affixed to the supporting frame 16 by screws 24 engaging screw threaded openings in the supporting frame. Any other suitable means may equally well be utilized for fixedly mounting the transparent panel to seal the sight opening in the supporting frame so that when the frame is detachably mounted to close the observation opening of the furnace the transparent panel will cooperate therewith to seal the furnace opening. Gaskets 25 of heat insulating material are disposed between the clamping means and the transparent panel and between the transparent panel and the supporting frame respectively to insure a gas-tight seal for the sight aperture in the supporting frame. It is contemplated that the transparent panel may be constructed of either clear or colored material which should preferably be heat resistant.

At the upper edge of the supporting frame and mounted thereon by means of screws 26 is a hanger arm 27. Pivotally supported on this hanger arm by means of pivots 28 is a hinge means 30 to which is attached an intermediate cover or frame 31 by means of screws 32. Small angular arms 33 are punched out of the frame 31 at various points about its periphery and a dish-shaped sheet metal outer cover 34 is supported on the outside of the frame 31 by welding at the points 35 to the arms 33. The outer cover 34 therefore is adapted to swing integrally with the frame 31, and is normally biased by gravity to repose in shielding relation to the outer surface of the panel 22.

The lowermost screw 24 which is provided to secure the clamping means 23 in place is provided with a rounded head 50 which engages spring clips 51 riveted to the lower edge of the frame 31 as shown at 52. This serves as a convenient latching means to prevent the cover from swinging loosely when it is not desired to observe the interior of the furnace, and also serves as a means for supporting the lower edge of the cover in spaced relation to the furnace wall and the supporting frame 16. It will be observed that the hanger arm 27 serves to support the upper edge of the cover in spaced relation to the furnace wall and hence a space is provided between the cover and the supporting frame which serves for the upward passage of a current of cooling air induced by natural draft caused by the heating of the supporting frame 16, and thus transfer of heat to the frame 31 and outer cover 34 is prevented to an appreciable extent.

Near the upper edge of the frame 31 is mounted a ring 36 to which is attached one end of a chain 37, the other end of which is attached to a lever arm 40 which is fixedly mounted upon the outer end of a rotatable pivot pin 41 passing through the supporting frame 16 near its outer edge and being in substantially gas-tight relation thereto. On the inner end of the pivot pin 41 is fixedly mounted a lever arm 42 which is adapted to rotate in fixed relation to the lever arm 40, and which extends inwardly from the pivot pin toward the center of the closure device. At its inner end the lever arm 42 is provided with a hole 43 in which is mounted a pin 44 which serves as a support for an inner cover or shutter 45 of opaque, heat resisting material normally biased by gravity to repose between the inner surface of the panel 22 and the furnace interior. It is to be understood that other operating means interconnecting the cover and shutter to secure simultaneous or concomitant movement thereof may be substituted for the operating means consisting of the chain, lever arms and pivot pin herein described and shown without departing from the spirit of my invention.

The shutter 45 has rounded edges 46 so that it may slide easily over the inner surface of the supporting frame 16.

Solidly mounted on the rear of the supporting frame 16 is an arm 47 having a portion which extends at right angles to the lever arm 42. This last mentioned portion of the arm 47 is provided with a triangular shaped groove 48 into which the lever arm 42 seats when the shutter 45 is in shielding relation to the transparent panel, the outer wall of said groove 48 slanting inwardly toward the frame 16 to serve as a cam means for slidably engaging the lever arm 42 to force the shutter 45 mounted on lever arm 42 into intimate engagement with the inner surface of the supporting frame 16. This insures sealing of the aperture 17 in the frame 16 and thereby protects the inner surface of the panel 22 from the detrimental action of the furnace gases when the shutter is in normal shielding relation thereto.

The outer cover 34 is provided at its lower edge with an abutment 53 which may be grasped by an attendant when it is desired to swing the cover outwardly.

The operation of my improved closure device when in its preferred embodiment is as follows: When it is desired to observe conditions on the interior of the furnace an attendant may grasp the abutment 53 and thereby swing the cover outwardly and upwardly about its pivot 30. Only a slight pull is required to disengage the spring clips 51 from the head 50 of the screw 24. As the cover 34 is swung outwardly and upwardly the free end of the lever arm 40 is caused to move upwardly by reason of the pull on the chain 37 which is connected to the frame 31 by means of the ring 36, and this forces the lever arm 40 and the pivot pin 41 to rotate in a counterclockwise direction as seen in Fig. 1. Such rotation of the pivot pin 41 causes the inner lever arm 42 to rotate in a counterclockwise direction to disengage it from the groove 48 in the arm 47 and to retract the inner shutter 45 upwardly into the space behind the solid portion of the frame 16 out of shielding relation to the transparent panel 22. It will thus be seen that clear observation may be had of the interior of the furnace while the sight opening remains sealed by the transparent panel 22.

In the preferred embodiment of my invention herein described and illustrated the outer cover is hingedly mounted to swing outwardly about an axis parallel to the plane of the transparent panel and the inner cover member is pivotally mounted to swing out of registry with said panel about an axis perpendicular to the plane of the

transparent panel but it is contemplated that various other expedients may be resorted to for movably mounting said cover members in relation to the transparent panel and that the covers may have various directions of movement with relation to each other.

The cover 34 upon being released by the attendant, is automatically returned by the action of gravity to its shielding position where it may be locked securely in place by means of the spring clips 51 engaging the screw head 50. When in its shielding position the cover 34 shields the outer surface of the transparent panel from breakage and also prevents touching of the hot surfaces of the supporting frame 16 and the transparent panel 22 by anyone in the neighborhood of the furnace. Return of the outer cover to normal shielding position releases the pull on the chain 37 and allows the inner shutter 45 to to returned by means of gravity to its protective position, the length of the chain 37 serving as a means for preventing the shutter from moving too far. When in normal position the shutter 45 shields the inner surface of the panel 22 from radiated heat and also by means of its close engagement with the supporting frame 16 seals off the inner surface of the panel from the detrimental effect of furnace gases and from sooting and clouding in the event of an explosion in the furnace. It will thus be seen that when my improved closure device is in place on the furnace wall the observation opening is at all times sealed by the transparent panel 22 whether during the observation or the non-observation periods. If at any time it is desired to gain access to the interior of the furnace, it is only necessary to remove the screws 20 and demount the closure device bodily from its position over the observation opening. This provides convenient facilities for the repair or cleaning of the interior portion of the furnace.

From the foregoing it will be observed that a simple and convenient means has been provided whereby combustion conditions of a furnace may be observed as frequently as desired without the necessity of opening the observation opening with the consequent inflow of cold air to the detriment of the efficiency of the combustion in the furnace and at the same time an observer may approach as closely as he may desire to the furnace without being subjected directly to the heat from the interior or from danger of explosion. The prevention of a flow of cold air into the furnace interior during the observation period also facilitates inspection of the interior since the cold air impairs the efficiency of the fire and is liable to cause smoking and sooting in the combustion chamber which results in obscuring of the view of the combustion conditions. Another feature of importance in my improved device is the added safety to the operator which is secured by the spacing of the outer cover from the furnace wall and supporting frame. Notwithstanding shielding of the interior of the transparent panel and the supporting frame, these elements will be subjected to some heat from the interior of the furnace and therefore may be at a temperature which would be very uncomfortable or even injurious to the touch. The spacing of the outer cover from the wall of the furnace with the resultant natural upward draft of cooling air to prevent the transfer of heat from the supporting frame and transparent panel to the cover keeps the cover at all times at a safe temperature so that there will be no danger of burning anyone in proximity to the observation opening. The outer cover also protects the transparent panel from breakage due to accidental striking thereof.

A further important feature of my improved closure is the double protective action of the inner shutter which by reason of its interposition between the transparent panel and the furnace interior shields the panel from radiated heat and by reason of its close engagement with the panel supporting frame also seals off the panel from the detrimental effects of furnace gases and obviates any danger of clouding due to explosions in the furnace.

This construction is not only safe, simple, durable and easily operated but also has the advantage of being very conveniently demountable as a whole which makes it possible quickly to get at the interior of the furnace with a minimum of trouble.

It is obvious that various modifications may be made in the preferred embodiment of my invention and these modifications I desire to include in the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent in the United States is:

1. A closure device for an observation opening provided in a substantially fluid-tight partition, including in combination a transparent panel mounted for sealing the opening, a pair of movable covers one for the protection of each side of said panel and means operative to produce movement of one of the covers simultaneously with movement of the other of the covers to permit observation through said panel.

2. In combination, means providing a substantially fluid-tight partition having an opening therethrough, means including a transparent panel immovably mounted for providing a fluid-tight seal for said opening, a pair of covers each movably mounted for operation into and out of shielding relation to one surface of said panel, and means interconnecting said covers and operative upon movement of one of said covers from shielding relation to non-shielding relation to one surface of said panel for effecting concomitant movement of the other of said covers from shielding relation to non-shielding relation to the other surface of said panel, said interconnecting means including means passing through said partition in substantially fluid-tight relation thereto.

3. The combination with a furnace having an observation opening, of means includng a transparent panel mounted for sealing said opening to prevent the escape of gases from the furnace interior, a protective shutter movably mounted for operation into and out of shielding relation to the interior surface of said panel, a protective cover movably mounted for operation into and out of shielding relation to the exterior surface of said panel, means interconnecting said shutter and said cover and operative responsively to movement of said cover out of shielding relation to the exterior surface of said panel for effecting movement of said shutter out of shielding relation to the interior surface of the panel, and means cooperating with said interconnecting means for preventing the escape of gases from the interior of the furnace.

4. The combination with a furnace having an observation opening, of means including a transparent panel immovably mounted for sealing said opening to prevent the escape of gases from the interior of the furnace, inner and outer protective covers movably mounted respectively to the rear and to the front of said panel for movement alternately into shielding and non-shielding relation

to the rear and front surfaces respectively of said panel, means operable for moving said inner cover into and out of its shielding position, means responsive to movement of said outer cover and cooperating with said operable means for effecting movement of said inner cover from its shielding to its non-shielding position upon movement of said outer cover from its shielding position to its non-shielding position, and means cooperating with said operable means for preventing the escape of gases from the interior of said furnace.

5. In combination, means providing a substantially fluid-tight partition having an observation opening therethrough, means including a transparent panel for sealing said opening to prevent the passage of fluid through the opening, inner and outer covers each movably mounted and biased into shielding relation with respect to the inner and outer surfaces respectively of said panel, said outer cover being manually operable into non-shielding position, means interconnecting said covers and including means operable for effecting movement of said inner cover out of its shielding position concomitantly with the movement of said outer cover out of its shieldng position, and means cooperating with said interconnecting means for insuring against the escape of fluid through said partition.

6. The combination with means providing a substantially fluid-tight partition having an opening therethrough, of means including a transparent observation panel for sealing the opening, a pair of movable protective covers, one for each side of said panel and biased into protective covering relation therewith, and operating means for effecting movement of one of the covers concomitantly with movement of the other of the covers to permit observation through the panel, said operating means including means passing through said partition in substantially fluid-tight relation thereto.

7. A unitary bodily removable closure for a furnace service opening including in combination a supporting frame having means for detachably mounting the frame over the opening, means including a transparent panel fixedly mounted on said frame and cooperative with the frame for sealing said opening, a cover movably mounted on the front of said frame and biased to shield the outer surface of said panel, an opaque heat resistant shutter movably mounted on the rear of said frame and biased to shield the inner surface of said panel, and means operative for effecting concomitant movement of said cover and said shutter to permit observation through said panel, said operative means including means passing through said frame in substantially gas-tight sealing relation thereto.

8. The combination with means providing an enclosure having a hollow interior and an opening through the wall of the enclosure in communication with the interior thereof, of a unitary closure structure for sealing the opening including a supporting frame having an aperture, a transparent panel mounted on said frame in sealed relation thereto for closing said aperature, protective covers movably mounted on said frame and operable to and from shielding relation with respect to the inner and outer surfaces respectively of said panel, means passing through said frame in sealing relation thereto and interconnecting said covers for effecting movement of said inner cover in response to movement of said outer cover, and securing means for detachably mounting said frame on said wall adjacent said opening so that said closure structure may be bodily removed to provide access to the interior of the enclosure.

9. A closure device for an observation opening including in combination a frame adapted to be mounted in the opening in sealing relation thereto and having an aperture, means including a transparent observation panel mounted in the frame for sealing said aperture, a pair of protective covers movably mounted on the frame, one at each side of said panel, and operating connections between the covers including means extending through the frame in fluid-tight sealing relation thereto.

10. The combination with a closure for a service opening communicating with the interior of an enclosure comprising a transparent panel, a shutter interposed between the panel and the interior of the enclosure to shield the inner surface of the panel and shiftable from shielding to non-shielding position, of cam means cooperating with said shutter when in its shielding position to force said shutter into intimate relation with said inner panel surface to protect it from injury from the interior of the enclosure.

11. A closure for a furnace inspection opening, comprising a frame having a transparent panel in alinement with the opening, a cover movably mounted on said frame in shielding relation to the outer surface of said panel and spaced from said panel to provide for the passage of cooling air between said cover and said panel to prevent transfer of heat to the cover, an opaque heat resisting shutter movably mounted on said frame in shielding relation to the inner surface of said panel, operating means interconnecting said cover and shutter to cause movement of said shutter to non-shielding position in response to movement of said cover to non-shielding position, and cam means cooperating with said shutter when in its shielding position to force the shutter into intimate engagement with said frame to protect the panel surface from furnace gases.

12. A closure device for a service opening comprising a transparent observation panel mounted to close the opening, a cover movably mounted to protect one surface of the panel and arranged to swing away therefrom about an axis perpendicular to the plane of the panel, a second cover movably mounted to protect the other surface of the panel and arranged to swing away therefrom about an axis parallel to the plane of the panel, and operating connections between the covers for causing one of said covers to swing away from the panel in response to swinging of the other cover away from the panel to permit observation through the panel.

13. A closure device for a service opening comprising a frame having a transparent panel therein, means for mounting the frame and the panel to close the opening, a pair of covers, one of the covers being movably mounted in a position to protect each surface of the panel, arranged to swing away therefrom about axes substantially perpendicular to each other to permit observation through the panel, operating means connected to the covers and including a member passing through the frame in substantially sealed relation to the frame, and means cooperating with the operating means for insuring swinging of one of the covers from its protective position simultaneously with the swinging of the other of the covers from its protective position.

14. A closure device for a service opening comprising a transparent panel mounted to close the

opening, a movably mounted cover biased to a position to protect one surface of the panel, a movably mounted shutter biased to a position to protect the other surface of the panel, and operating means interconnecting the cover and the shutter for causing the shutter to move out of its protective position in a plane substantially parallel to the plane of the panel when the cover is moved from its protective position to permit observation through the panel.

15. In combination with a furnace having an observation opening communicating with the heated interior thereof, a transparent panel, means for fixedly mounting said panel so as to seal the opening, an opaque heat resisting shutter for shielding the inner surface of said panel from heat, means for shiftably mounting the shutter, a cover for protecting the outer surface of said panel, means for shiftably mounting the cover, means cooperating with said shutter and cover for shifting the shutter into non-shielding position when the cover is shifted into non-shielding position to permit observation of the furnace through said transparent panel sealing the said observation opening, and means cooperating with said shutter when in its shielding position for forcing the shutter into intimate engagement with said panel to protect the inner surface thereof from furnace gases.

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