May 28, 1968 B. R. KING 3,385,285

BOILER VIEWING ASSEMBLY

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FIG. 1.

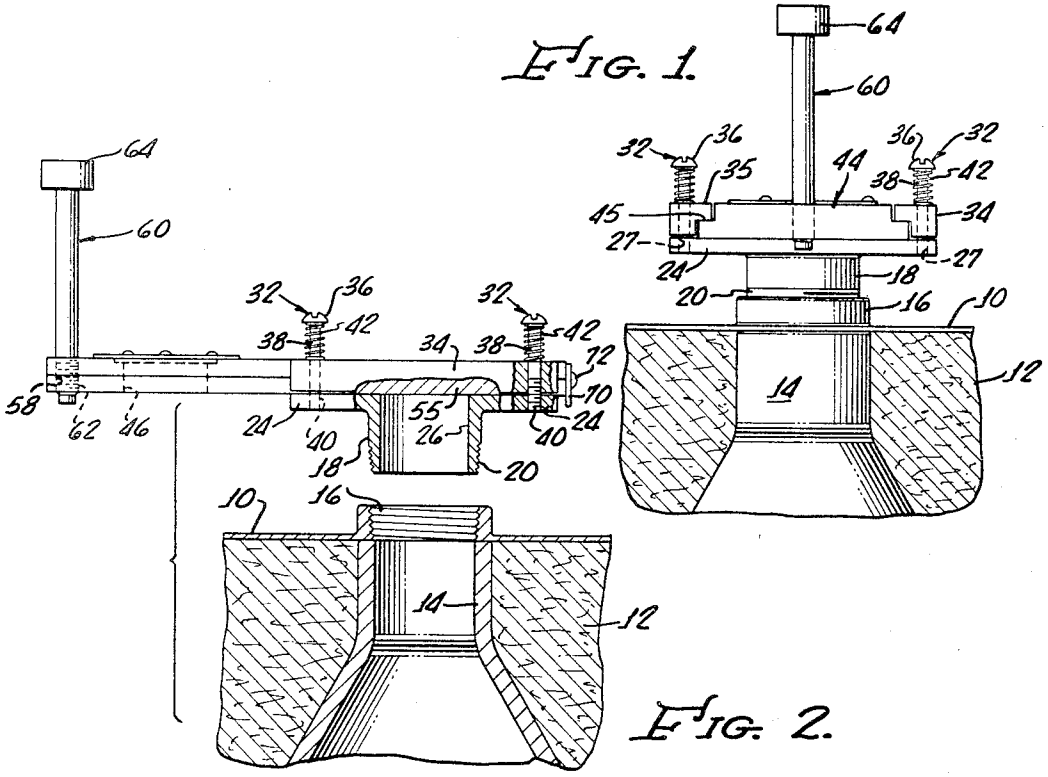


FIG. 2.

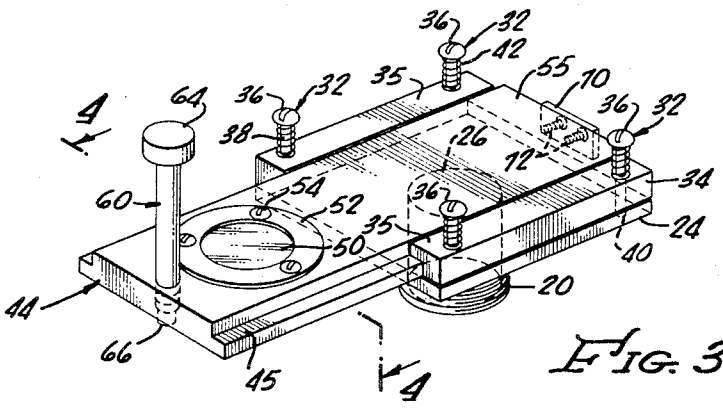
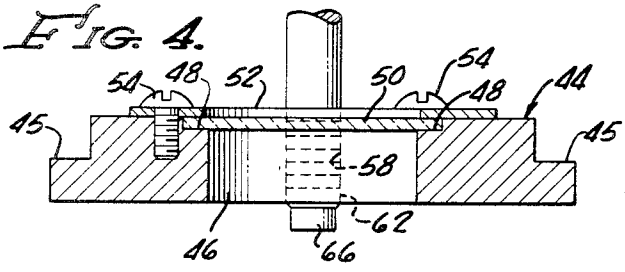


FIG. 3.

FIG. 4.



INVENTOR.
BILLY R. KING

BY Donald W Canady

ATTORNEY.

United States Patent Office

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BOILER VIEWING ASSEMBLY

Billy R. King, Bakersfield, Calif., assignor to Atlantic Richfield Company, Philadelphia, Pa., a corporation of Pennsylvania

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ABSTRACT OF THE DISCLOSURE

A viewing door for a boiler which includes a support plate rigidly mounted on the distal end of a hollow cylindrical spacer and having a port aperture in registration with the interior of the spacer communicating with the interior of the boiler, a rigid slide plate having a blank portion at one end and a lens mounted in an aperture in the other end resiliently slidably mounted on the port plate for reciprocal motion for permitting the lens to be selectively placed in registration with the port or removed in spaced relation therefrom for cleaning and including stops at each end of the slide plate, one of the stops comprising a removable actuator member is disclosed.

This invention is directed to an apparatus for viewing the interior of a furnace or boiler, and more specifically, is directed to a sliding viewing door for an oil fired steam injection boiler.

Visual inspection of flame patterns in furnaces and oil fired steam injection boiler interiors is often desirable and many viewing doors have been developed for this purpose. Since combustion within furnaces and oil fired steam injection boilers, however, is only partially complete, severe sooting of the viewing lenses obstructs vision and often renders them useless. Cleaning the lenses has required either complete removal of the viewing assembly or removal of the lenses from the assembly. Such removal vents to atmospheric pressure the boiler observation ports as they are either totally open or the pressure seals are broken. Complete shutdown of the boiler may be required to replace the lenses since flames and gases often shoot out from the open observation ports by several feet. This is dangerous to personnel working near the boilers and an inefficient operation of the boilers. While the problem of visual inspection of internal flame patterns is particularly important in oil fired steam injection boilers, it is common to all high capacity heating vessels such as oil and coal furnaces and the like.

Previous attempts to overcome the problem of sooting by construction of viewing assemblies with movable parts have been plagued with problems caused by severe temperature variations which the assemblies must withstand. Differential expansion and contraction of the movable parts has caused binding and warping of these assemblies rendering them almost totally ineffective. For example, the flame temperature in oil fired steam injection boilers is about 2000° F. and the temperature at the observation port entrance may be 700 to 800° F. whereas the insulated boiler plates and remote portions of the assembly are usually approximately the outdoor temperatures of the boiler site.

Accordingly, it is an object of this invention to provide a novel assembly for visual inspection of the interior of boilers, furnaces and the like.

Another object of this invention is to provide an assembly for viewing the interior of a boiler wherein the assembly viewing lens is easily cleanable in situ.

Still another object of this invention is to provide an assembly for viewing a boiler interior wherein the viewing lens is adjustably spaced from the furnace side wall.

Another object is to provide a boiler sliding viewing door assembly having a slidably mounted lens which is only subjected to sooting during brief periods when the boiler flame pattern is being viewed.

Yet another object of this invention is to provide an assembly for viewing the interior of heating vessels, wherein said assembly has a plurality of moving parts including means for compensating for unequal thermal expansion of the parts.

Another object is to provide a sliding viewing door for boilers which can be slid into and out of viewing position even though severe soot buildup has occurred.

Still another object of this invention is to provide an economical assembly for viewing the interior of a boiler wherein the assembly viewing lens can be easily cleaned without removal from the assembly or the boiler and without opening the side wall observation ports to atmospheric pressure.

Another object of this invention is to provide a sliding glass viewing door which is spacedly mounted on a boiler side wall and which can be readily cleaned in situ.

Yet another object of this invention is to provide a sliding glass viewing door which is spacedly mounted from the boiler side wall in registration with an observation port wherein a constant pressure is evenly applied to the viewing door and wherein the viewing door is slidably movable out of registration with the observation port.

Another object of this invention is to provide a sliding viewing door for observing a boiler interior wherein a substantially constant pressure is applied on the viewing door at all times.

Another object of this invention is to provide a sliding viewing door having a handle and stop member for limiting door movement and which can be partially withdrawn from the assembly for easy removal of the assembly slide plate.

These and other objects of this invention will become more readily apparent from the following detailed discussion and the appended claims when taken in conjunction with the drawings, wherein:

FIG. 1 is a partially sectioned end view of one embodiment of the sliding viewing door assembly of this invention mounted on a furnace side wall observation port;

FIG. 2 is a side view of the sliding viewing door assembly of this invention in spaced relation from a partial cross section of a furnace side wall and observation port;

FIG. 3 is a perspective view of the sliding viewing door assembly of this invention; and

FIG. 4 is a sectional view of the slide plate taken through the viewing lens substantially along line 4—4 of FIG. 3.

Briefly, this invention is directed to a sliding door viewing assembly wherein the viewing lens is mounted on a slide plate for sliding into and out of registration with a boiler observation port and the mounting assembly is so constructed that the port is always sealed, the lens can be cleaned in situ without danger of burn injury when out of the viewing position, and the slide plate can be moved easily into and out of viewing position in spite of differential expansion and contraction of the assembly parts.

Referring now to the drawings in more detail, FIG. 1 shows a boiler portion comprising a side wall plate 10, a refractory lining 12 and an internally flared observation port 14. An internally threaded annular sleeve 16 is attached to side wall plate 10 to extend longitudinally of observation port 14 from the side plate. Sleeve 16 may be welded or otherwise fixedly mounted on side plate 10 and is internally threaded for receiving the sliding observation door assembly of this invention. Conventionally, oil fired steam injection boilers are provided with three

observation ports, such as port **14**, for viewing the flame patterns of the boiler interior. Any number of such ports may be used, however.

The door assembly of this invention as shown in FIG. 1 is provided with a hollow cylindrical mating spacer member **18** which carries external threads **20** at its lower end portion for fitting into sleeve **16**. A standard 2 inch threaded pipe has been found to be suitable for the spacer member. Spacer member **18** is rigidly mounted, preferably by welding, to a substantially planar slide support base **24**.

Support base **24**, as best shown in FIGS. 2 and 3, is provided with an annular through bore **26** of substantially the same diameter as the internal diameter of spacer member **18**. The slide support base is rigidly mounted to cylindrical spacer **18** so that through bore **26** is fixed in registration with the internal bore of member **18**. Support **24** is also provided with four threaded apertures **27** for receiving spring-loaded clamping screws **32** which resiliently mount a pair of side guide track rails **34** in position as shown in FIGS. 1 and 3. Rails **34** are each provided with a longitudinally extending upper pressing flange **35** for a reason to be discussed.

Clamping screws **32** comprise a flat head **36**, a shank **38** and a threaded lower end portion **40**. A coil spring **42** is mounted about shank **38** to apply resilient pressure between clamping screw heads **36** and track members **34**. By adjustment of screws **32**, substantially constant downward pressure can be maintained by track members **34** along the length of support base **24**.

As best shown in FIGS. 3 and 4, a rectangular slide plate **44** having lower guide track following side flanges **45** for mounting subjacent flanges **35** on track members **34** is slidably positioned on the assembly base **24**. Springs **42** maintain pressing flanges **35** snugly in contact with follower flanges **45** at all times. Even though temperature variations cause expansion and contraction of plate **44** and rails **34** by different degrees due to the difference in distance from the boiler flame, springs **42** always permit relatively free and easy sliding of plate **44**. The pressure of springs **42** is easily regulated by adjustment of screws **32** and is preferably maintained slightly higher than the maximum boiler pressure. This prevents loss of pressure through port **14** and, since the normal boiler pressure is about 4 inches of water, still permits plate **44** to be slid easily into blanking or viewing position.

Slide plate **44** is also provided at one end with an annular through bore **46** of substantially the same diameter as bore **26** in support base **24**. As shown in FIG. 4, bore **46** is provided along its upper edge with an annular inset **48** for receiving a circular transparent viewing lens **50**. Viewing lens **50** is held in place by an annular clamping ring **52** with metal set screws **54** as best shown in FIGS. 3 and 4. The viewing lens is preferably constructed from high temperature, tinted borosilicate glass, such as Pyrex, but any transparent, thermally resistant material can be used.

The opposite end of plate **44** forms a sealing blank portion **55** which is in sealing relation with bore **26** when viewing lens **50** is slid out of its viewing position. Pressing flanges **35** and following flanges **45** firmly maintain blank portion **55** in contact along its length with support base **24**.

Slide member **44** is also provided with an internally threaded smaller diameter through passage **58** (see FIG. 4) adjacent one end for receiving a cylindrical combination handle and stop bolt **60**. Bolt **60** is provided with a threaded portion **62** adjacent one end for mounting it in threaded passage **58** of slide member **44**. Bolt **60** may also be provided with a knob **64** at its one end for a handle grip and a tapered reduced diameter abutment portion **66** at its opposite end for a slide limiting stop. An abutment stop plate **70** is also mounted at the opposite end of slide member **44** by means of metal set screws **72** as best shown in FIG. 3.

Bolt **60** serves the dual purpose of a slide actuator and a limit stop to prevent inadvertent advancement of slide member **44** off of base **24**. It is usually necessary, however, to periodically remove slide plate **44** from the support base to allow the flame to blow out carbon buildup on the internal surface of sleeve **16**, spacer **18**, and bore **26** at port **14**. For this purpose, bolt **60** is so designed that it can be unscrewed sufficiently to clear stop member **66** of base **24** so that the slide plate can be easily removed by grasping the bolt and sliding plate **44** off the right end of base **24** of FIGS. 2 and 3. This can usually be accomplished without using wrenches or other tools since bolts **60** can normally be backed off by hand. Handle knob **64** may be hexagonal or of any other suitable shape to permit grasping surfaces for ease in unscrewing the bolt, however, in case sticking should occur.

Slide plate **44** is slidable between the limit positions defined by stops **60** and **70** so that viewing lens **50** is alternatively in registration with bore **26** of support base **24** when plate **44** is slid to the extreme right position of FIG. 2 and in spaced relationship away from the boiler side wall when slid to the extreme left as shown in FIG. 2. When viewing lens **50** is out of registration with spacer mount **18** and port **14**, to the extreme left as shown in FIG. 2, it can be easily cleaned on both sides without danger of burn injury. The cleaning can be accomplished in situ since cylindrical spacer **18** maintains the viewing assembly a distance of at least 2 inches from the boiler side plate **10**. The space can be increased to any distance desired by varying the length of spacer **10** or by the use of an adapter section or collar (not shown). This space enables simple manual cleaning of the viewing window when it is in the extreme left limit position as shown in FIG. 2. Additionally, the entire assembly may be adjusted in distance from side wall plates **10** by rotation of the assembly in a counterclockwise direction which threadably withdraws spacer member **18** from sleeve **16**.

Spring loaded screws **32** allow track members **34** to be resiliently moved away from support base **24** to provide greater clearance for slide plate **44** when carbon deposits build up on the blank portion **55** of the slide plate **44**. As explained previously, the spring pressure should be maintained slightly higher than the maximum internal boiler pressure. The compression of springs **42** is desirably maintained at a level sufficiently high to prevent boiler pressure loss by movement of plate **44** away from base **24**. Track members **34** evenly maintain this constant pressure along the entire length of slide plate **44** preventing loss of pressure through observation ports **14** of the boiler. In this manner, the boiler observation port is constantly sealed whether lens **50** is in registration with the port or out of registration therewith. Facing of the slide plate has been found to be unnecessary since soot buildup on the plate undersurface quickly seals any leaks.

Referring now to FIG. 4 which is a cross section through the slide plate of FIG. 3 substantially along line **4—4**, it can be seen that viewing lens **50** is firmly held in position between annular ring clamp **52** and the base of inset **48** on slide plate **44** to allow visual inspection of the furnace interior when in registration with port **14**. This manner of mounting lens **50** prevents scratching of the lens by means of rubbing against base support **24** during sliding of plate **44** and also reduces overheating of the lens since it is spaced substantially the distance of the length of spacer member **18**, the thickness of base support **24** and the thickness of slide plate **44** from the boiler interior. The clamping ring **52** and all other members of the assembly are most conveniently machined from cold-rolled, low carbon steel, although any similar suitably strong, heat-resistant, and machinable metals may be used.

With continued reference to FIG. 4, removal of the

lens for replacement due to breakage, excessive wear or other reasons may be accomplished simply by removing screws 54 and metal ring clamp 52 and pushing the window away from slide 44. The assembly of this invention facilitates lens removal without opening of the observation port since the operator's hand or other instrument can easily be inserted behind slide plate 44 to push the window out of inset 48 once clamping ring 52 has been removed. The arrangement of the viewing assembly of this invention eliminates the need for using a sharp instrument to pry the viewing lens from its mount which often results in damaging of the mount.

Many modifications and variations of the invention, as hereinbefore set forth, may be made without departing from the spirit and scope thereof and therefore only such limitations should be imposed as are indicated in the appended claims.

I claim:

1. A viewing door assembly for boilers and the like having an observation port on one of its walls comprising:
- a rigid slide member having a lens portion and a blank portion;
- means for mounting said slide member in substantially fluid tight relation with said observation port and in spaced relation with said one wall so that said lens portion and said blank portion are alternatively slidable into registration with said observation port, said spacing being sufficient to permit in situ cleaning of said lens when said blank portion is in registration with said port;
- means for compensating for expansion and contraction of said assembly to maintain said slide member in substantially fluid tight relation with said port while permitting manual sliding of said slide member; and
- stop means for limiting the sliding movement of said slide member.

2. A viewing door assembly as defined in claim 1 wherein said mounting means comprises a hollow cylindrical spacer member fixedly attached to a substantially planar slide support base, said support base having an annular through bore mounted in registration with the bore of said spacer member.

3. A viewing door assembly as defined in claim 2 wherein said compensating means comprises a pair of guide rails resiliently mounted on said support base for guiding sliding movement of said slide member.

4. A viewing door assembly as defined in claim 3 wherein said guide rails are resiliently mounted by means of spring loaded screws.

5. A viewing door assembly for viewing boiler and the like interiors through an observation port comprising:
- a cylindrical, hollow spacer member mounted in registration with said observation port;
- a slide support plate rigidly mounted on said spacer member;
- a pair of slide guide rails resiliently mounted along opposite edges of said support plate and having flanges extending inwardly therefrom; and
- a slide plate having a blank portion and a lens portion, said plate being mounted in sealed relation with said observation port under said flanges for sliding movement between blanking and viewing positions so that when said slide plate is in said blanking position said viewing portion is spaced from the boiler and can be cleaned in situ.

6. A viewing door assembly as defined in claim 5 wherein said guide rails are biased toward said support plate by spring loaded screws which exert a pressure sufficiently great to prevent movement of said slide plate by the internal pressure in said observation port.

7. A viewing door assembly for observation ports of boilers and the like comprising:
- means for mounting said viewing door in a spaced relationship with a wall through which said observation port extends and in viewing relation with said observation port;
- platform means fixedly mounted on said mounting means and having a through passage in viewing relation with said port;
- guide tracks mounted on said platform means; and
- a slidably mounted rigid viewing member comprising:
  - means for following said tracks; and
  - lens means for moving into and out of registration with said port including means for permitting in situ cleaning of said lens and for maintaining said port sealed to the atmosphere when said lens means is moved out of registration with said port.

8. A viewing door assembly as defined in claim 7 wherein said rigid slidable viewing member further comprises a planar slide plate having a blank portion and a viewing portion, said lens means being mounted in said viewing portion and said portions being alternatively slidable into and out of registration with said port.

9. A sliding viewing door assembly as defined in claim 8 wherein said slidable viewing member is constructed so that when said blank portion is in registration with said port said viewing portion extends beyond said port in spaced relation from said wall so that said viewing member is easily cleanable without removal from said assembly.

10. A sliding viewing door assembly as defined in claim 7 further including means for biasing said guide tracks toward said platform means to maintain said slidable viewing member in substantially fluid tight relationship with the through passage of said platform means.

11. A sliding viewing door as defined in claim 10 wherein said biasing means are manually adjustable.

12. A sliding viewing door as defined in claim 7 wherein said slidable viewing member includes a stop member at one end thereof and an adjustably mounted combination slide actuator and stop member at the opposite end thereof.

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KENNETH W. SPRAGUE, *Primary Examiner.*