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APPARATUS WITH REFLECTOR AND ILLUMINATING MEANS FOR VIEWING FURNACE INTERIORS

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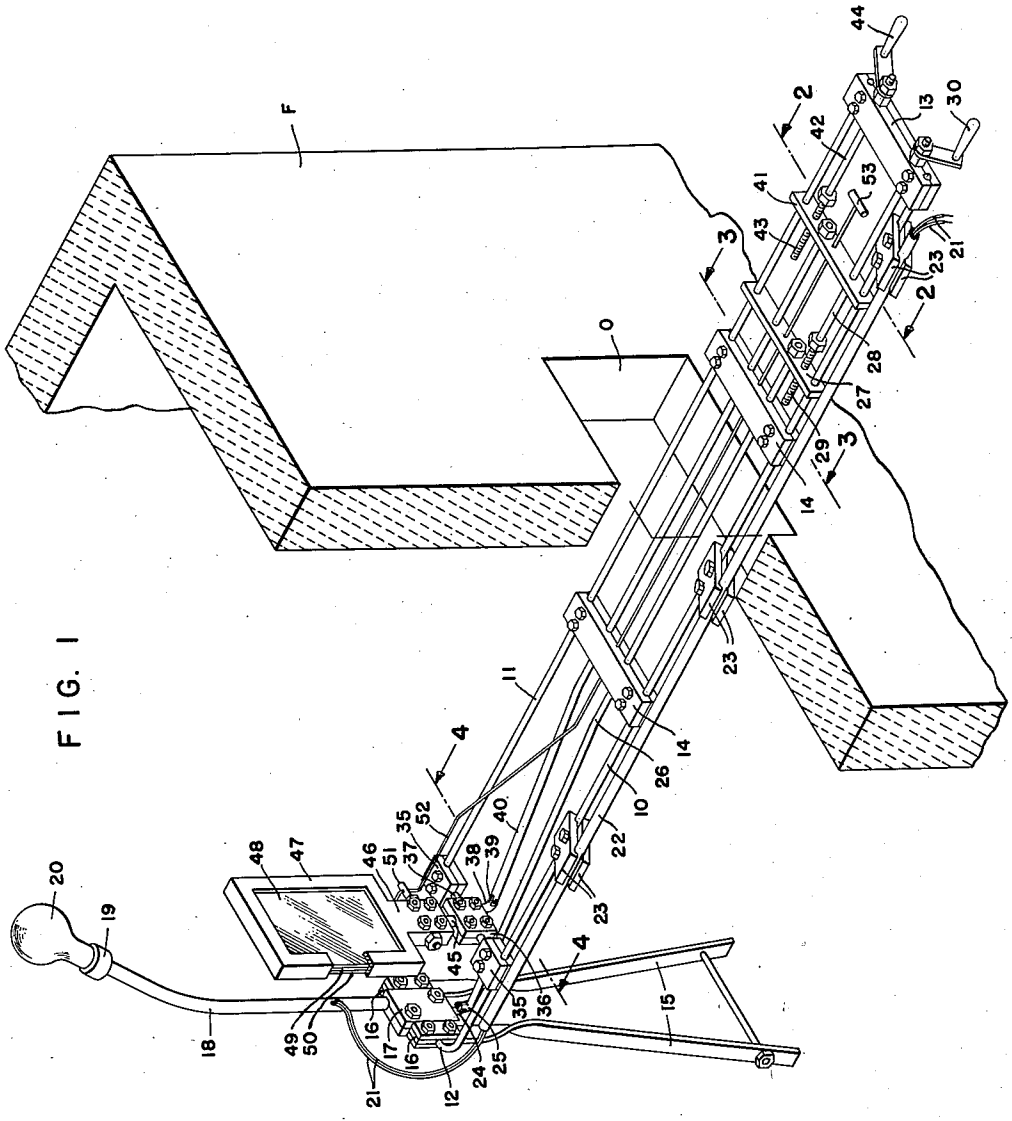


FIG. 1

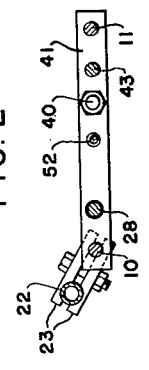


FIG. 2

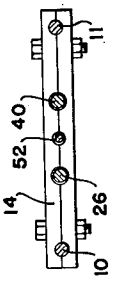


FIG. 3

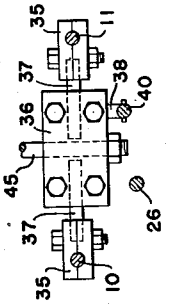


FIG. 4

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APPARATUS WITH REFLECTOR AND ILLUMINATING MEANS FOR VIEWING FURNACE INTERIORS

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2 Claims. (Cl. 88—74)

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This invention relates to apparatus for viewing the interiors of furnaces of steam generators and the like, and more particularly to portable apparatus which may be inserted through an opening in a furnace wall, while the furnace is in a highly heated condition, for viewing the refractory walls and linings and portions of the steam generating or other tubes exposed to view in the furnace chamber.

It is the principal object of the present invention to provide apparatus of the character aforesaid which may be readily handled by the user, and with which a wide variety of adjustments is possible for purposes of inspection.

It is a further object of the present invention to provide apparatus of the character aforesaid which includes a light source and a mirror adjustable to a wide variety of positions for viewing the furnace interior.

It is a further object of the present invention to provide apparatus of the character aforesaid capable of insertion through an opening in a furnace wall and with adequate provisions for support upon insertion to permit of inspection of a large portion of the furnace interior.

Other objects and advantageous features of the invention will be apparent from the specification and claims.

The nature and characteristic features of the invention will be more readily understood from the following description, taken in connection with the accompanying drawings forming part hereof, in which:

Figure 1 is a view in perspective of apparatus in accordance with the present invention in place in a furnace interior;

Fig. 2 is a vertical sectional view, enlarged, taken approximately on the line 2—2 of Fig. 1;

Fig. 3 is a vertical sectional view, enlarged, taken approximately on the line 3—3 of Fig. 1; and

Fig. 4 is a vertical sectional view, enlarged, taken approximately on the line 4—4 of Fig. 1.

It should, of course, be understood that the description and drawings herein are illustrative merely, and that various modifications and changes may be made in the structure disclosed without departing from the spirit of the invention.

Like numerals refer to like parts throughout the several views.

Referring now more particularly to the drawings, in which a preferred embodiment of the invention is illustrated, the viewing apparatus in accordance with the present invention preferably

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includes a frame comprising horizontal spaced bar or rod members 10 and 11 connected at the rear or inner ends by a horizontal cross bar 12 preferably formed integral therewith. The front or outer ends of the bars 10 and 11 are secured in a block 13 and a plurality of spacer blocks 14 are interposed between the front and rear ends of the bars 10 and 11 for holding the bars 10 and 11 in spaced relation, and for other purposes hereinafter explained.

The cross bar 12 at the rear end preferably has pivotally secured thereto a pair of spaced legs 15, the legs 15 being pivotally mounted on the cross bar by means of spaced leg blocks 16.

Pivotally mounted on the cross bar 12, in the space between the blocks 16 a lamp mounting block 17 is provided having a pipe 18 secured thereto, the upper or free end of the pipe 18 being provided with a lamp socket 19 for the reception of an electric incandescent lamp 20.

The lamp supporting pipe 18 preferably has electric conductors 21 for the lamp 20, and insulated with asbestos covering, disposed therein and extending to and along the interior of a conduit pipe 22 secured by blocks 23 to one of the side bars, such as the side bar 10.

The mounting block 17 has an arm 24 extending therefrom and connected by a link 25 to an actuating rod 26 which is guided in suitable openings in the spacer blocks 14, and is secured to a cross-head 27 slidable on the side bars 10 and 11. A rod 28 having a threaded end 29 is provided in engagement with a complementally threaded opening in the cross-head 27 and is mounted in the block 13 for rotary movement. A crank 30 is provided at the outer or front end of the rod 28 for rotating the rod 28 thereby to move the cross-head 27 and the rod 26 to position the lamp supporting pipe 18 and the lamp 20 at the desired position of upward adjustment.

Spaced forwardly from the cross bar 14, a pair of pivot blocks 35 are provided on the side bars 10 and 11 in which a mirror supporting block 36 is pivotally mounted by horizontal pivot pins 37.

The mirror supporting block 36 preferably has connected thereto an arm 38 which is connected by a link 39 to an actuating rod 40. The rod 40 extends through the spacer bars 14, and through the cross-head 27 to a cross-head 41 slidably mounted on the side bars 10 and 11, which it is secured.

A rod 42, having a threaded end 43, is provided in engagement in a complementally threaded opening in the cross-head 41, and is mounted in the block 13 for rotary movement. The rod 42 is

provided at its outer or front end with a crank 44 for adjustment of the angle of elevation of the mirror supporting block 36.

The mirror supporting block has pivotally mounted therein a vertical mirror supporting spindle 45 which is also mounted in a downward extension 46 of a mirror frame 47. The mirror frame 47 is preferably provided with a mirror 48 which may be protected from the heat of the furnace by an asbestos lining 49 held in position by a back metallic cover plate 50.

The frame extension 46 is provided with a transversely extending arm 51 pivotally mounted therein to which an adjusting rod 52 is connected. The adjusting rod 52 preferably extends forwardly through the spacer blocks 14 and through the cross-heads 27 and 41, and is provided at the forward end thereof with an operating handle 53 for swinging the mirror about the vertical pivotal axis provided by the spindle 45.

The apparatus is shown in a viewing position in a furnace F after its insertion through a suitable viewing or access opening O.

The mode of operation will now be pointed out.

The apparatus is initially in a collapsed position with the legs 15 disposed forwardly and in flat substantially horizontal condition along and immediately below the bars 10 and 11, with the mirror frame 47 disposed forwardly and in flat substantially horizontal condition along and immediately above the bars 10 and 11, and with the lamp supporting pipe 18 also forwardly disposed in substantially horizontal condition. The apparatus may thus be stored in substantially flat collapsed condition and may when desired be inserted through the opening O. When it is desired to inspect the furnace interior and within a few minutes after the fuel or the draft or both have been shut off, and while the interior of the furnace is still in highly heated condition the access plate (not shown) at the opening O in the wall of the furnace F is removed.

The inner or rear end of the frame, in collapsed position, is then inserted through the opening O in the furnace wall. Upon insertion the legs 15 will tend to swing downwardly to a position to provide a support for the inner end of the frame. The frame may be inserted to the extent desired to obtain the best or desired views.

The lamp supporting pipe 18 is then swung upwardly by rotation of the crank 30, preferably to a position with the pipe 18 disposed substantially vertically, although if some other desired position of adjustment is desired, such position may be readily attained.

The mirror 48 is then swung upwardly to a position for observation through the furnace wall opening by actuation of the crank 44, and by movement of the handle 53 may be swung about its vertical pivotal axis 45 to obtain the desired angular position of adjustment.

By selective operation of the crank 44 and of the handle 53, the entire furnace wall may be inspected while still in a highly heated condition, and the furnace structure above the furnace wall or floor, as well as the furnace wall or floor may also be inspected. When the inspection has been completed, and it is desired to withdraw the viewing apparatus from the furnace, the mirror 48 is moved downwardly to a position substantially in alinement with the frame and the lamp 20 is preferably also returned to a position substantially in alinement with the frame. The frame may then be withdrawn from the furnace, and the legs 15 will swing upwardly and in alinement with the frame, and beyond the end thereof for the purpose of withdrawal.

I claim:

1. In apparatus for insertion into a furnace for viewing the interior, an elongated frame comprising spaced bars adapted to be inserted through an opening in the furnace wall, supporting legs for the inner end of the frame pivotally mounted on a horizontal axis on the inner end of the frame and swingable from a position for insertion aligned with said frame to supporting position with the ends of said legs spaced downwardly from the frame, a source of light, a supporting arm for said light source pivotally mounted on the inner end of said frame on a horizontal pivotal axis and movable from a position for insertion aligned with said frame to an upwardly extending position for illuminating said furnace interior, a reflector, a pivotal reflector mounting on said reflector having a predetermined pivotal axis, an additional pivotal reflector mounting interposed between said first reflector mounting and the inner end of the frame, said additional pivotal mounting having its pivotal axis normal to the pivotal axis of the first reflector mounting, operating connections from said reflector mountings and said supporting arm to the outer end of the frame, and manual operating members for each of said operating connections.

2. In apparatus for insertion into a furnace for viewing the interior, an elongated frame comprising spaced bars adapted to be inserted through an opening in the furnace wall, supporting legs for the inner end of the frame pivotally mounted on the inner end of frame and swingable from a position for insertion aligned with said frame to supporting position with the ends of the legs spaced downwardly from said frame, a source of light, a supporting arm for said light source pivotally mounted on said frame and movable from a position for insertion aligned with said frame to an upwardly extending position for illuminating a furnace interior, a reflector, mounting means for said reflector including a first pivotal mounting on the inner end of said frame and a second pivotal mounting for shifting said reflector with respect to said first pivotal mounting, a pair of spaced cross heads slidably mounted on said bars, operating connections between one of said cross heads and said supporting arm and between the other of said cross heads and one of said pivotal mountings, manual operating members at the outer end of the frame for respectively positioning said cross heads, and an operating connection between the other of said pivotal reflector mountings and the outer end of the frame.

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