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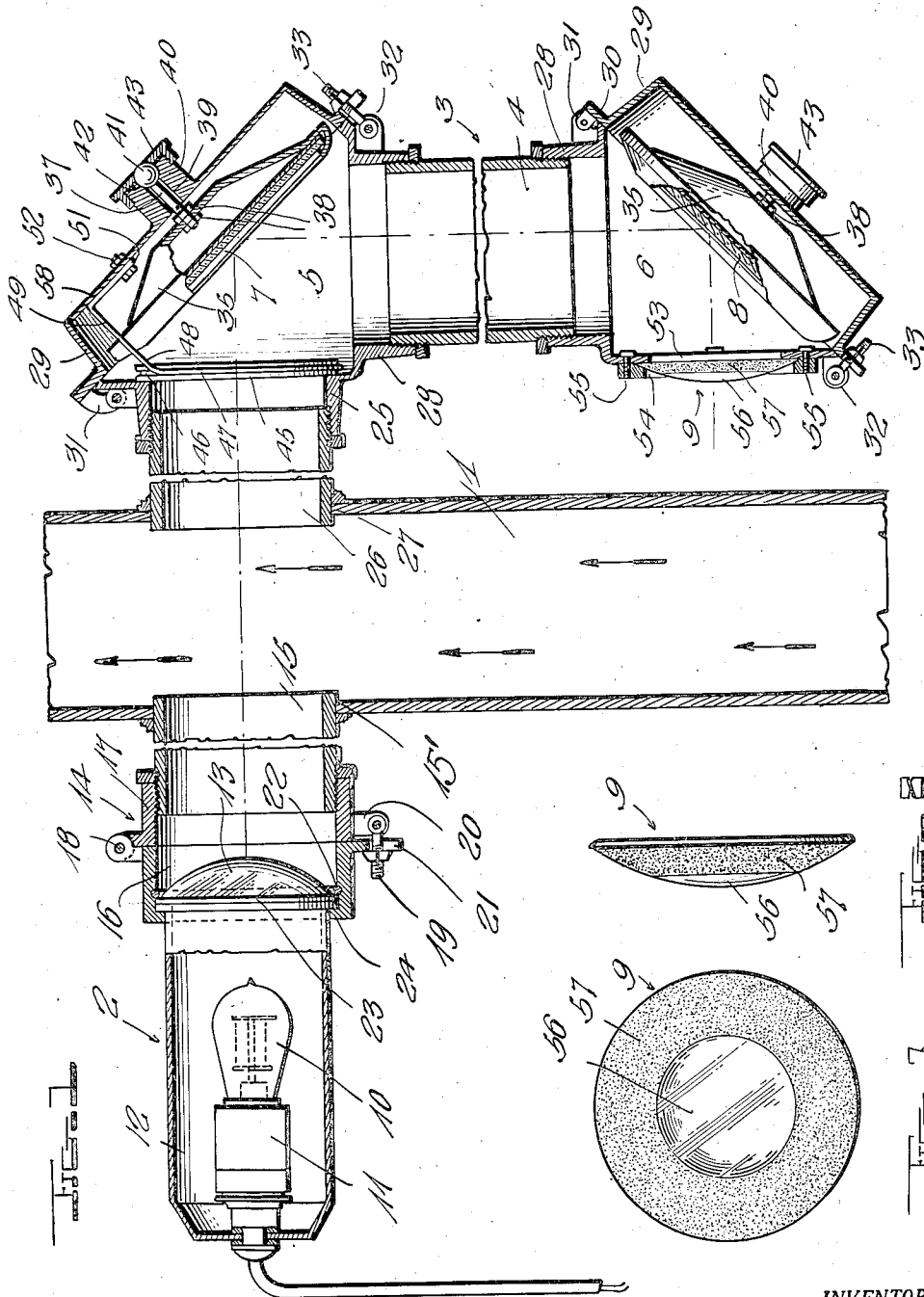
C. C. SHEPPARD

2,288,143

SMOKE DETECTOR

Filed March 20, 1941

3 Sheets-Sheet 1



INVENTOR.  
Creedy C. Sheppard,  
BY  
Russ J. Woodward.  
ATTORNEY

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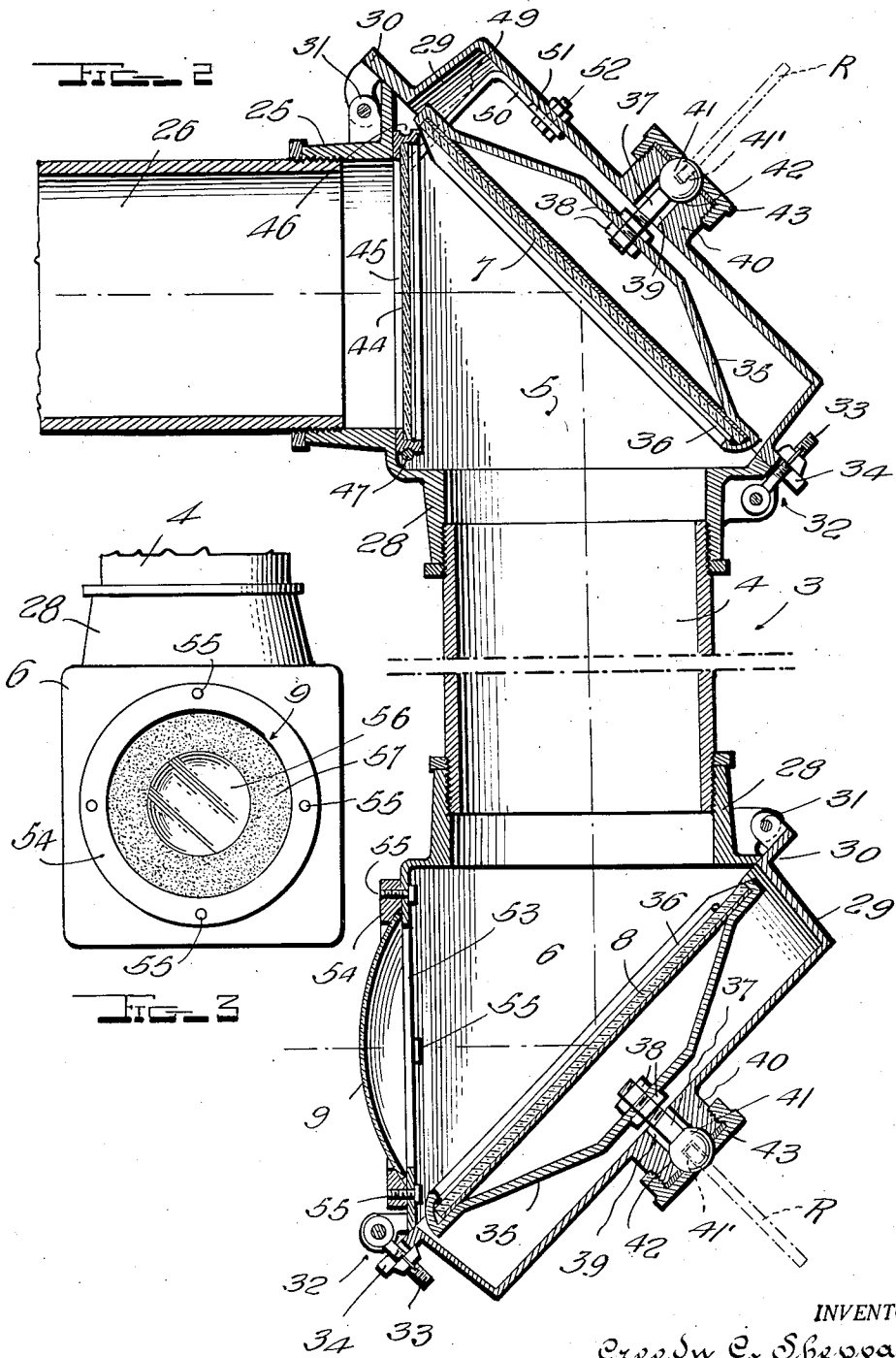
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3 Sheets-Sheet 2



INVENTOR.  
Cecily C. Sheppard,  
BY  
*Russell J. Woodward*  
ATTORNEY

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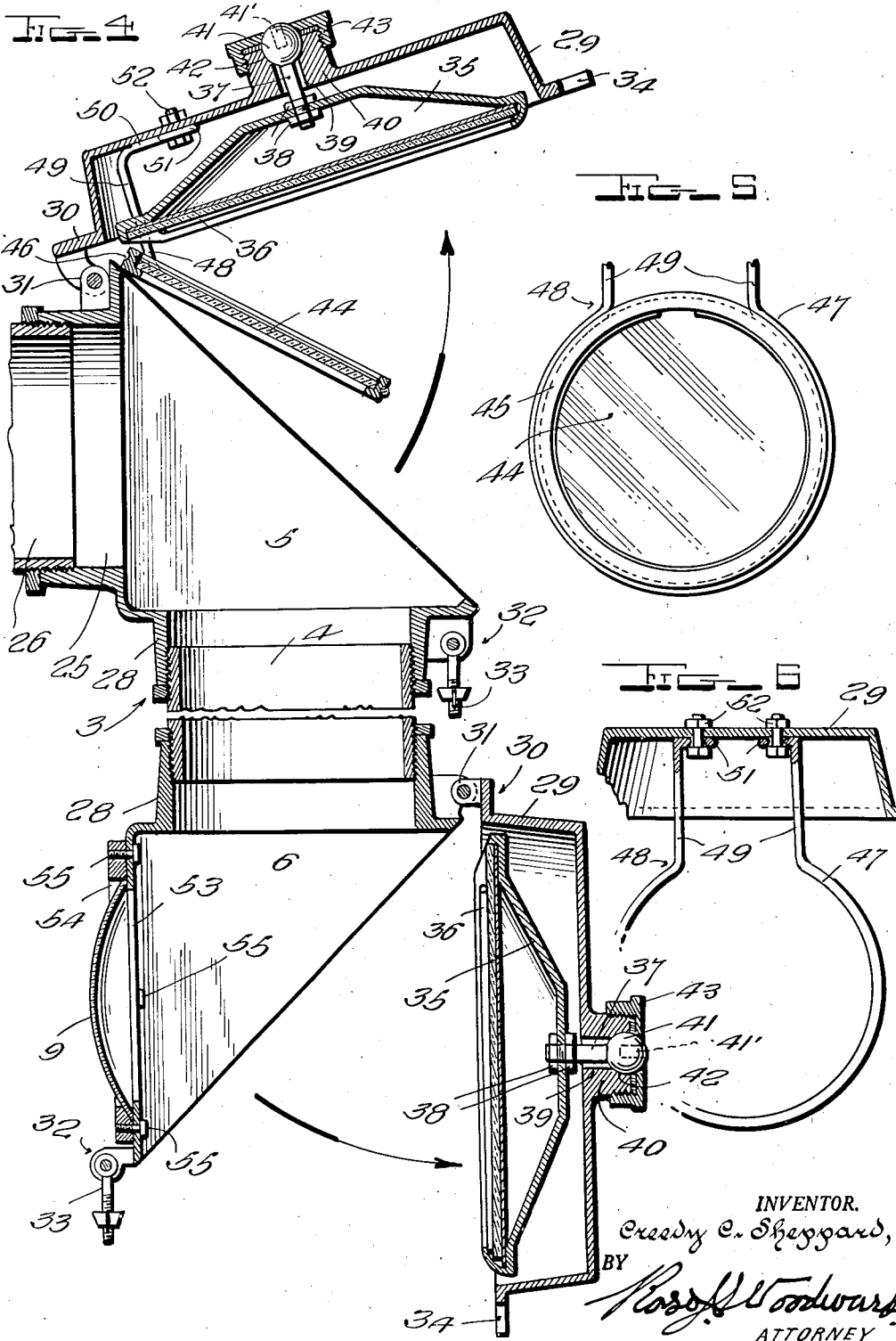
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3 Sheets-Sheet 3



INVENTOR.  
Cresdy C. Sheppard,  
BY  
*Roscoe Woodward*  
ATTORNEY

# UNITED STATES PATENT OFFICE

2,288,143

## SMOKE DETECTOR

Creedy C. Sheppard, New York, N. Y.

Application March 20, 1941, Serial No. 384,417

9 Claims. (Cl. 88-14)

This invention relates to a smoke detector and it is one object of the invention to provide a device of this character which is adapted to be mounted in cooperating relation to a smoke passage, such as a chimney flue, or a smoke pipe leading thereto, and serve very effectively to permit the fireman or other attendant in charge of a furnace, to observe the smoke contents of the products of combustion passing from a furnace through the smoke passage.

Another object of the invention is to provide an apparatus of this character wherein a source of light is provided at one side of the smoke passage and observation means at the other side thereof in substantially the form of a periscope extending to a point at which the fireman may easily look into the periscope while tending a fire and determine whether adjustments are necessary to eliminate excessive smoke flowing through the smoke passage.

Another object of the invention is to provide a smoke detector wherein the periscope portion thereof has mirrors mounted in an upper reflector box, and a lower vision head or box, in a special manner to enable them to be readily adjusted while covers carrying the mirrors are closed.

Another object of the invention is to provide the boxes with covers carrying the mirrors and so mounted that they may be released and moved to open positions, in which positions the mirrors may be easily cleaned when necessary.

Another object of the invention is to provide the upper reflector box with a soot glass or shield serving as a transparent guard which will exclude smoke from this box and, to a large extent, prevent soot from entering the upper end of the periscope and gathering upon the mirrors.

Another object of the invention is to so mount the soot glass that when the cover of the reflector box is moved to open position, the soot glass will move to a position in which it may be easily cleaned or removed from its carrier for thorough cleaning or repairs and then replaced, or another soot glass substituted.

A further object of the invention is to provide the lower vision head or box with a special form of vision glass having a clear portion surrounded by a frosted or other translucent portion, the clear portion of the vision glass being used for observing heavy smoke and the translucent portion being used when observing light smoke. It will thus be seen that when observing light smoke, the fireman or other attendant looking through the vision glass or lens will not be

blinded by the glare of a bright light and that a light of sufficient intensity to be seen through heavy smoke when looking through the clear portion of the vision glass, may be employed.

Another object of the invention is to provide an apparatus of this character which is simple in construction, easy to install, and very efficient in operation.

The invention is illustrated in the accompanying drawings, wherein:

Fig. 1 is a vertical sectional view showing the improved smoke detector operatively associated with a pipe or equivalent smoke passage.

Fig. 2 is a sectional view on an enlarged scale, showing the periscope with the covers of the reflector box and vision head closed.

Fig. 3 is a view showing the lower vision head or box in front elevation.

Fig. 4 is a view similar to Fig. 2, showing the covers of the reflector box and vision head or box open.

Fig. 5 is a view in elevation, of the smoke glass and its carrier.

Fig. 6 is a view showing the smoke glass carrier mounted on the cover of the reflector box, the cover being in section and the carrier in elevation.

Fig. 7 is a view looking at the outer face of the glass of the vision box.

Fig. 8 is a side view of the glass shown in Fig. 7.

The improved smoke detector constituting the subject matter of this invention is to be mounted in cooperating relation to a smoke passage 1, which may be a stove pipe, chimney flue, or the like, and consists briefly of a source of light 2 and a periscope 3 having a tubular body 4 of desired length and diameter and threaded at its ends for engagement with an upper reflector box 5 and a lower vision head or box 6. Mirrors 7 and 8 are mounted in the boxes 5 and 6, and by looking into the vision box 6 through the glass 9, a fireman, or other person in charge of a furnace, may observe a reflection of the products of combustion passing through the smoke passage and determine whether too much smoke is being given off by the furnace.

The source of light consists of a bulb 10 carried by a socket 11 which is mounted in a casing 12 provided with a lens 13 at its front end. A coupling 14 of box-like formation connects the casing 12 with a tube or pipe 15 having one end mounted through an opening 15' at one side of the flue or smoke passage 1, so that when the smoke detector is in operation, light from the

bulb will pass transversely through the smoke passage. The coupling 14 consists of companion sections 16 and 17 which are hinged to each other, as shown at 18, and releasably held closed by a clamp or bolt 19 which is pivoted to ears 20 of the section 17 and passes through the slotted ear 21 of the section 16. When this bolt is tightened, the section 16 will be held closed, but when the bolt is loosened and swung out of the slotted ear, the section may be swung away from the section 17 to open position, and access had to its interior for inserting the light bulb or cleaning the lens 13. A ring 22 holds the collar 23 at the front end of the lamp casing 12 against the flange 24 of the coupler section 16, it being understood that other means for removably holding the lamp in place may be employed, if desired.

The periscope 3 is mounted at the opposite side of the smoke passage or flue 1 and its upper reflector box 5 is formed with a threaded neck 25 to receive the threaded outer end of a tube or pipe 26 which has its inner end mounted through an opening 27 formed in the flue 1 in diametrically opposed relation to the opening 16. Therefore, the tubes 15 and 26 will be in alignment and light from the bulb may pass through the tube 26 and into the upper reflector box. The upper and lower boxes 5 and 6 are of substantially duplicate construction and each has a neck 28, ends of the tubular body 4 being screwed into these necks. The door or cover 29 of each box is cup-shaped and formed with an outstanding flange 30 carrying a hinge ear 31, the ear of one cover being pivoted to the neck 25 of the upper box and the ear of the other cover being pivoted to the neck 28 of the lower box so that the covers may be swung from the closed position of Fig. 2 to the open position of Fig. 4. A clamp 32 is employed to hold each cover closed and consists of a pivoted bolt 33 which is passed through a slot 34 of the flange 30 and tightened to securely but releasably hold the cover closed.

The covers are of cup-shaped formation in order to receive the mirrors 7 and 8, each of which is mounted in a frame or carrier 35 which is of concavo-convex formation, the mirror being held in the frame by a retainer 36. A stem 37 which is secured to the carrier, centrally thereof, by nuts 38, extends rearwardly from the carrier 35 through the bore 39 of a neck 40 projecting outwardly from the cover 29 and terminates in a ball or spherical head 41. The head 41 rests in a seat 42 at the outer end of the bore 39 and when the cap 43 is tightened, frictional binding will prevent movement of the ball in its seat. Therefore, the mirror may be held in angularly adjusted position and a person looking into the vision box 6 through the glass 9, may see a reflection of smoke passing upwardly through the flue 1. When the bolt 33 is loosened and the cover swung to open position, the mirror may be readily cleaned. Each of the balls 41 is formed with a sock 41' leading from its exposed outer portion to receive an adjusting rod R which is thrust into place when adjustment is necessary, as indicated by dotted lines in Fig. 2. Therefore, the mirrors may be tilted to adjusted position when the covers are closed and an accurate adjustment easily accomplished.

In addition to carrying the mirror 7, the cover of the reflector box 5 also carries a soot glass 44. This glass is clear and is provided with a frame 45 having a circumferentially extending groove 46 to receive the open ring 47 of a carrier 48. 75

This carrier is formed of resilient wire and has its end portions bent to form arms 49 which are further bent to form fingers 50 terminating in eyes 51 through which bolts 52 pass to secure the carrier to the inner surface of the cover. When the cover is closed, the soot glass first engages the inner end of the neck 25 of the reflector box and as the cover is fully closed and secured by the clamp 32, the resilient carrier will be tensioned to firmly hold the soot glass in covering relation to the inner end of the neck 25. It will thus be seen that soot which may enter the neck will be excluded from the reflector box 5 and dimming of the mirrors by soot accumulated thereon will be eliminated. When the soot glass becomes clouded, the cover of the reflector box is released and swung to its open position, when the soot glass will then be disposed as shown in Fig. 4 of the drawings and may be easily cleaned.

The vision glass 9 is of special formation. This glass is illustrated in Figs. 7 and 8, and shown in position in Figs. 1, 2, and 4 of the drawings. Referring to these figures, it will be seen that the vision glass is of concavo-convex formation and is held in place in closing relation to the front opening 53 of the vision box 6 by a ring 54 which overlaps margins of the glass and is secured to the wall of the box by screws 55. The central portion 56 of the glass 9 is clear and surrounding by a circumferentially extending band 57 which is preferably frosted but may be treated in any manner which will prevent a person's sight being interfered with by glare when looking through this portion of the glass. When thick smoke is passing through the flue passage, the fireman or other person having charge of the furnace, looks through the clear central portion of the sight glass 9 and a good view of the smoke may be obtained, as glare from the light rays will be dimmed by the smoke. When light smoke is passing through the flue, the light from the lamp will be only slightly dimmed, if at all, and a person looking through the clear portion of the sight glass would be blinded by the glare, the same as if he were looking directly at the bulb 10. Under these conditions, the attendant looks through the frosted portion of the glass and since glare from the light rays will be dimmed, he will be able to see the soot in the light smoke. The frosted portion of the glass is not used when heavy or dark smoke is passing through the flue, as the light will be dimmed sufficiently by the smoke so that he can readily see the soot in the smoke. It will be obvious that additional bends could be provided in the periscope and boxes carrying mirrors provided at each bend. It will also be understood that the periscope may extend vertically or at any other angle desired and that the boxes may be angularly adjusted to suit the convenience of the person having charge of the furnace.

Having thus described the invention, what is claimed is:

1. In a smoke detector, a light source mounted at one side of a smoke stack, a reflector box at the opposite side of the stack having an inlet and an outlet at right angles to each other and an opening between the same, a hinged cover for the opening of the reflector box, a reflecting mirror carried by said cover inwardly thereof and disposed within the box diagonally of the inlet and the outlet when the cover is closed, a soot-glass and a mounting for the soot-glass carried by the cover and mounting the soot-glass inwardly of the reflector in position for closing

relation to the inlet when the cover is closed, the mounting for the soot glass being resilient to yieldably mount the soot-glass and permit yielding of the mounting and accurate seating of the soot-glass in closing relation to the inlet during closing of the cover.

2. In an observation device of the character described, a box formed with an inlet and an outlet, a cover for the box hingedly mounted opposite the inlet for movement into and out of a closed position, a mirror, a holder for the mirror adjustably connected with the cover and mounting the mirror for angular adjustment, a soot glass, and a carrier for the soot glass carried by the cover and mounting the soot-glass for movement through the box with the cover into and out of closing relation to the inlet, the carrier being formed of resilient metal to yieldably mount the soot-glass and permit accurate seating of the soot-glass and continued movement of the cover to a tightly closed position after the soot-glass is seated.

3. In a smoke detector, a box formed with an inlet and an outlet, a cover hingedly mounted opposite the inlet for movement into and out of closed position, a mirror, a holder for the mirror adjustably connected with the cover and mounting the mirror for angular adjustment, a soot glass for closing the inlet having a frame, and a carrier for the soot glass engaged with the frame and secured to said cover, said carrier mounting the soot glass for movement with the cover into and out of closing relation to the inlet and being formed of resilient material to permit yielding movement and accurate seating of the soot glass in shielding relation to the inlet during closing of the cover.

4. In a smoke detector, a box formed with an inlet and an outlet, a cover hingedly mounted opposite the inlet for movement into and out of closed position, a mirror, a holder for said mirror adjustably connected with the cover and mounting the mirror for angular movement, a soot glass for closing the inlet having a frame, and a carrier for the soot glass formed of resilient wire and having a ring like portion fitting about the frame and arms extending therefrom, the arms being secured against the inner surface of the cover and yieldably mounting the soot glass for accurate seating in blocking relation to the inlet when the cover is closed.

5. In an observation device of the character described, a housing formed with an inlet and an outlet located transversely of the inlet, an opening being formed in the housing between the inlet and the outlet and located opposite the inlet, a cover for the opening mounted for movement into and out of closed position, a mirror connected with the cover and mounted for angular adjustment within the housing, a transparent shield for closing the inlet, and a carrier for the shield secured to the cover and mounting the shield between the mirror and the inlet for movement with the cover into and out of position for closing the inlet, the carrier being formed of resilient material to permit yielding movement and accurate seating of the shield

in closing relation to the inlet during closing of the cover.

6. In an observation device of the character described, a box formed with an inlet and an outlet, an opening being formed in the box opposite the inlet, a cover for the opening hingedly mounted for movement into and out of closed position, a mirror carried by the cover and disposed diagonally of the inlet and the outlet within the box when the cover is closed, a transparent shield for closing the inlet, and a carrier for the shield formed of resilient wire and having a portion fitting about the periphery of the shield and arms extending therefrom, the arms being secured against the inner surface of the cover and yieldably mounting the shield for accurate seating in blocking relation to the inlet when the cover is closed.

7. In an observation device of the character described, a box formed with an inlet and an outlet at right angles to the inlet, the box being also formed with a diagonally extending opening opposite the inlet, a cover hingedly mounted for movement into and out of closing relation to the diagonal opening, a mirror, a holder for the mirror adjustably connected with the cover and mounting the mirror within the box for angular adjustment relative to the inlet and the outlet, a soot glass for closing the inner end of the inlet having a frame, and a carrier for the soot glass engaged with the frame and secured to the inner face of said cover and mounting the soot glass in front of the mirror in spaced relation thereto, said carrier mounting the soot glass for movement with the cover through the box into and out of closing relation to the inlet during opening and closing of the cover and being formed of resilient material to yieldably mount the soot glass and permit accurate seating of the soot glass in closing relation to the inlet and complete closing of the cover after the soot glass is seated.

8. In a periscope-type smoke detector, a vision head having a concavo-convex vision glass projecting outwardly from the head with its convex surface presented outwardly, said glass having a circular centrally located clear portion for observation of heavy smoke against a light source and a translucent portion for observation of light smoke against the light source entirely surrounding the clear portion concentric therewith between the periphery of the clear portion and the marginal edge of the vision glass, the translucent portion being of a width appreciably less than the diameter of the clear portion.

9. In a periscope-type smoke detector, a vision head having a concavo-convex vision glass, the convex surface of the vision glass being presented outwardly, the vision glass being non-magnifying and having a clear central portion concentric with the glass and entirely surrounded by a translucent portion concentric with the central portion and covering the entire area of the glass between the periphery of the central portion and the periphery of the glass.

CREEDY C. SHEPPARD.