

March 14, 1933.

E. H. VEDDER ET AL

1,901,570

SMOKE INDICATOR

Filed Nov. 9, 1928

3 Sheets-Sheet 1

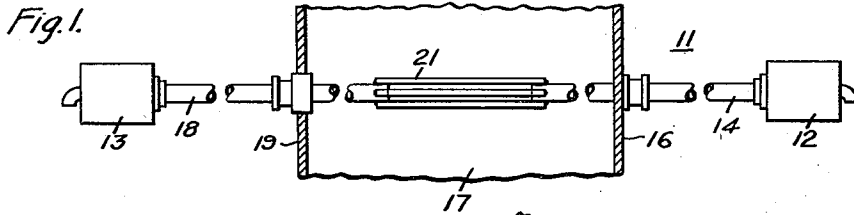


*Fig. 2.*

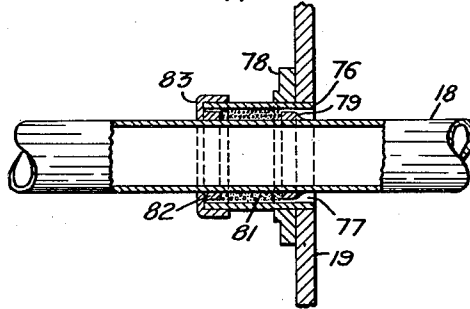


*Fig. 3.*

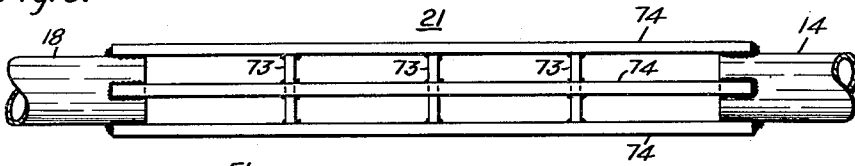
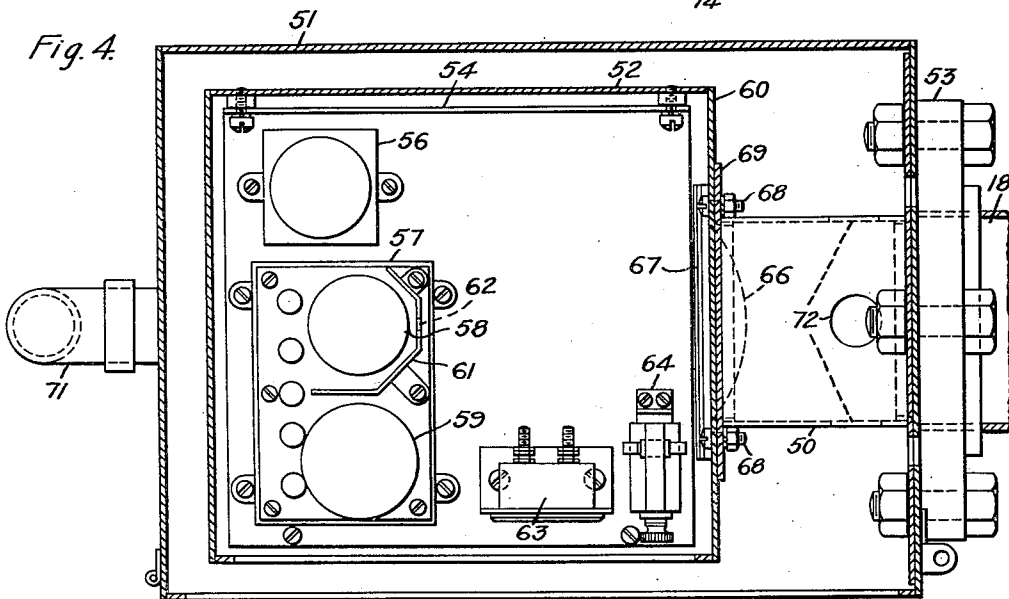


*Fig. 4.*



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INVENTORS.  
Edwin H. Vedder &  
Ellis O. Erickson.

BY  
*Wesley H. Barr*  
ATTORNEY

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Fig. 5.

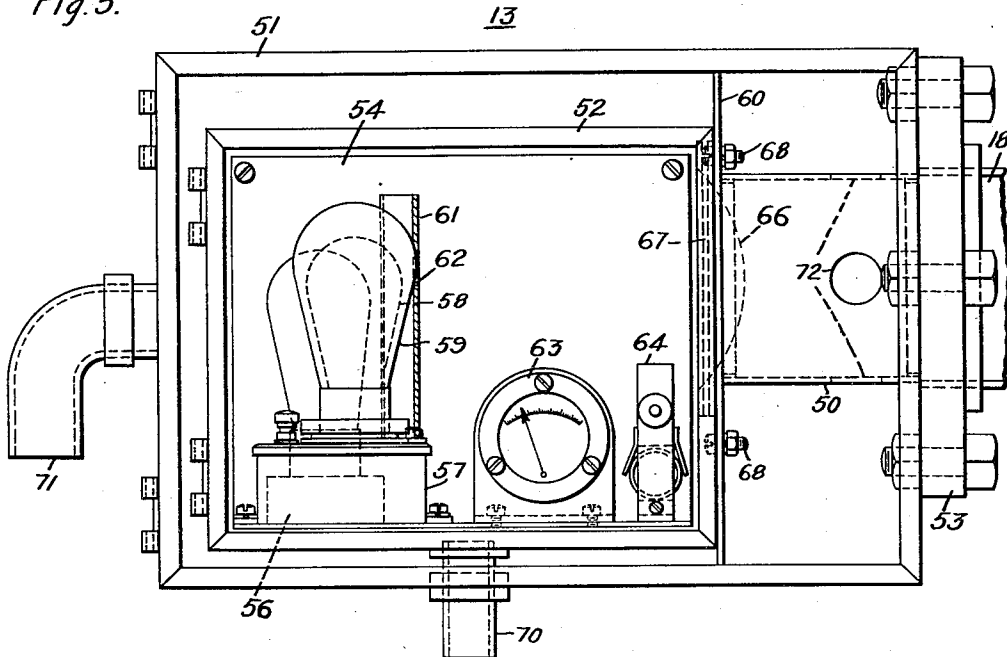
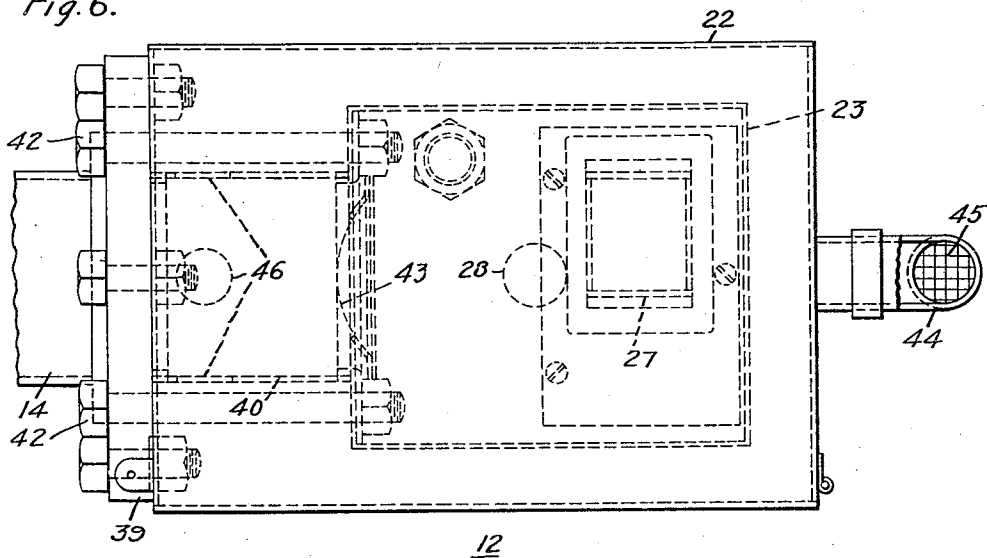


Fig. 6.



INVENTORS.

Edwin H. Vedder &  
Ellis O. Erickson.

BY

Wesley G. Barr  
ATTORNEY

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Fig. 7.

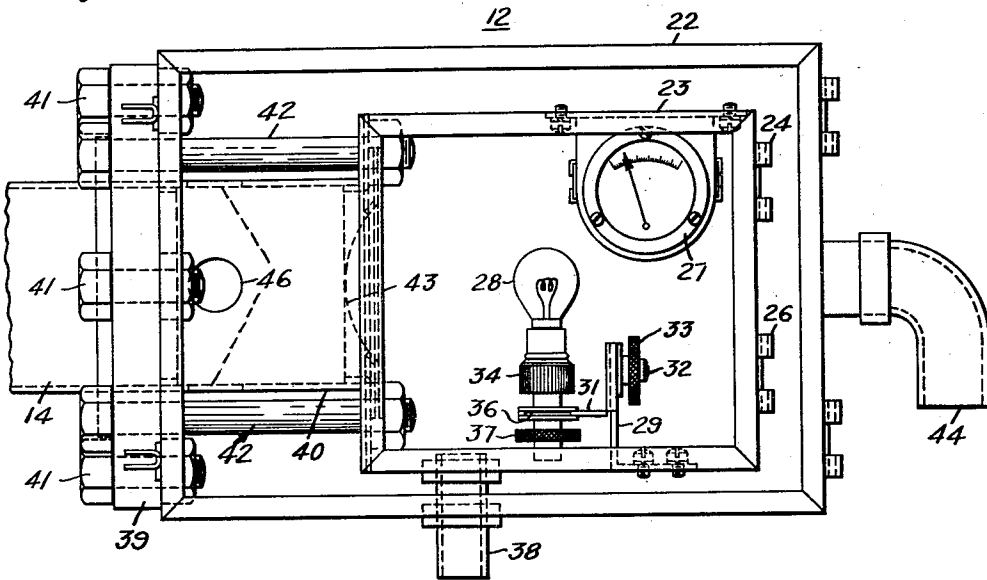
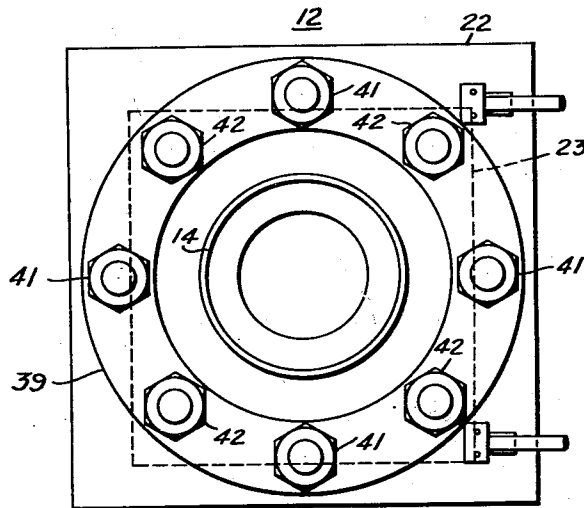


Fig. 8.



INVENTORS.  
Edwin H. Vedder &  
Ellis O. Erickson.

BY  
*Wesley H. Carr*  
ATTORNEY

# UNITED STATES PATENT OFFICE

EDWIN H. VEDDER AND ELLIS O. ERICKSON, OF WILKINSBURG, PENNSYLVANIA, ASSIGNORS TO WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA

## SMOKE INDICATOR

Application filed November 9, 1928. Serial No. 318,297.

Our invention relates to smoke indicators and recorders and more particularly to the mechanical details of construction of such devices.

5 An object of our invention is to provide a relatively simple and highly efficient mechanical structure for a smoke-indicating or recording device.

10 Another object of our invention is to provide an assembled structure of this kind, the parts of which shall be so aligned relatively to each other that the initial alignment thereof will be maintained throughout the use of the device.

15 Another object of our invention is to provide a structure of this kind that shall be easily adapted to be mounted in operative relation to, and supported by, a conduit traversed by smoke.

20 Another object of our invention is to provide means in a smoke indicator or recorder that shall prevent the accumulation of dust or soot in or on the enclosed parts of the apparatus.

25 Another object of our invention is to provide a structure that shall be weatherproof and that shall embody means for cooling parts thereof by incoming air.

30 In practicing our invention, we provide two spaced boxes, one of these enclosing or surrounding a light unit casing, the other box enclosing a light-sensitive cell, tubular members secured to the respective boxes and casings and located in coaxially aligned positions. A skeleton metal frame is rigidly secured to the adjacent opposing ends of the tubular members to maintain them in the initial coaxial alignment. Means is provided for securely clamping the light source casing against the end of one of the tubular members to permit of maintaining the initial alignment, irrespective of small movements of the smoke conduit supporting the assembled structure.

Referring to the drawings,

Figure 1 is a view, mainly in side elevation, but partially in section, of an assembly embodying our invention;

50 Fig. 2 is a view, partially in vertical sec-

tion and partially in side elevation, of a part of the device embodying our invention.

Fig. 3 is a view of a skeleton metal frame and the ends of two tubular members shown in their proper operative positions.

Fig. 4 is a view, in horizontal section, through a light-sensitive unit;

Fig. 5 is a view, in front elevation, of the light-sensitive unit;

Fig. 6 is a top plan view of a light source unit;

Fig. 7 is a view, in front elevation of a light source unit with the doors to the box and the casing removed, and

Fig. 8 is a view, in end elevation, of the light source unit.

Referring more particularly to Fig. 1 of the drawings, we have there shown a smoke-indicating or recording assembly designated generally by the numeral 11 and comprising a light source unit 12, a light-sensitive unit 13, a tubular member 14 having one end thereof operatively associated with the unit 12 and extending through one wall 16 of a smoke conduit 17. The light-sensitive unit 13 has associated therewith and extending therefrom a tubular member 18 which extends through another wall 19 of the smoke conduit. The assembly includes further a skeleton metal frame 21.

The light source unit 12 (see Figs. 6, 7 and 8) comprises an outer box 22 and an inner casing 23 supported therein in a manner to be set forth in detail. The box 22 is made substantially rectangular in shape and is made of metal and provided with a door which is not shown in particular detail in the drawings. The construction of this box is preferably such that it will not permit the entrance of water and dirt.

The casing 23 is somewhat smaller in dimensions than the box 22 and is located therewithin. This casing must be moisture and dust proof and any suitable or desirable construction for such purpose may be employed. A door (not shown in particular detail) is provided with hinges 24 and 26, shown particularly in Fig. 7 of the drawings.

An ammeter 27 is supported within the

casing 23, as well as a source of radiant energy 28, which is preferably a relatively small incandescent lamp with a concentrated filament of the kind usually used in motor vehicle lighting.

The lamp 28 is adjustably supported within the casing 23 and supporting bracket 29 of substantially L-shape having one leg thereof secured against the bottom wall of the casing 23. A second bracket 31 also of L-shape is adjustably supported on the other leg of the bracket 29 by a clamping screw 32 and a knurled nut 33. A socket 34 for the lamp 28 is supported in the other leg of the bracket 31, which leg is provided with a circular opening 36 therethrough to permit of moving the socket 34 and the lamp 28 in a plane at right angles to the plane of one of the legs of the bracket 31, a clamping nut 37 being provided to clamp the base in a definite or predetermined position after adjustment of the coiled filament of the lamp has been made.

A short tubular member 38 is supported by the casing 23 and extends relatively loosely through the adjacent bottom wall of the box 22 to permit of having the supply circuit conductors for the lamp 28 extend into the casing 23.

It is highly desirable, and, in fact, necessary, that a predetermined initial focused position of the filament of the lamp 28 be maintained once it has been effected or obtained, and for this purpose, the tubular member 14, which is preferably made of metal and which may have a diameter of from three to four inches, is provided with a relatively heavy metal flange 39 either screwed or welded on the conduit or pipe member 14 adjacent to one end thereof. A plurality of bolts 41 extend through the flange 39 and through the one side wall of the box 22 in order to hold the box tightly against the outer surface of the flange 39.

A plurality of bolts 42 are located in staggered relation relatively to the bolts 41 and extend through the flange 39 and through one of the side walls of the casing 23 in order that the casing 23 may be tightly clamped against the outer end of a short conduit 40, coaxial with the conduit 14, substantially as shown in Fig. 7 of the drawings. It is understood, of course, that the face of the outer end of the conduit 40 where it engages the outer face of the side wall of the casing 23, has been so machined as to be in substantially parallel alignment with the face of the flange 39 and that these two faces are substantially at right angles to the axis of the tubular conduits 14 and 40.

The flange 39 thus constitutes a supporting member for mounting thereagainst the box and the casing independently of each other.

A lens 43 is located in, and supported by,

any suitable supporting structure in the end of the conduit 40 a suitable opening being, of course, provided in the wall of the casing 23 engaged by the end of the conduit 40.

Means for providing for the ingress of fresh air comprises a conduit 44 of substantially L-shape secured to the outer side wall of the box 22 and a plurality of openings 46 in the conduit 40, these openings being located within the box 22. A screen 45 (see Fig. 6) is located in the outer end of the conduit 44.

It is to be understood that the casing 23 provides a substantially dust proof housing for the light source and for the ammeter 27 located within the casing 23, which is securely clamped against the end of the conduit 40, and that the box 22 is supported substantially independently of the casing 23 by being bolted against the flange 39. A door (not shown) is provided for the box 22, and may be of any desired construction.

The light-sensitive unit is of substantially similar construction as hereinbefore set forth for the light source unit and will now be described. An outer box 51 has located therein an inner casing 52. The box 51 is supported by one end of the tubular conduit 18 as by means of a flange 53 mounted on the conduit, which flange is bolted against the end wall of the box 51. A short conduit 50, coaxially aligned with the conduit 18, abuts against the inner side of the end wall of the box 51 and extends therefrom to the casing 52.

The casing 52 is substantially dust and light-tight, made of metal, and has located therein a supporting plate 54 on which are mounted a base 56 for a rectifier of the bulb type, a base 57 for supporting a light-sensitive cell whose socket is indicated by the numeral 58 and a thermionic tube amplifier whose location is indicated by the socket 59. A shield 61 is provided for the light-sensitive cell which may, and preferably is, made of tube shape, the shield being provided with a relatively small opening 62 through which light emitted by the filament of lamp 28 may reach the light-sensitive cell. The main use of the shield is to prevent external light from reaching the cell where the box and casing are opened to make adjustments.

An ammeter 63 is mounted on the plate 54 and an initial current adjuster 64 is also mounted thereon. A lens 66 is mounted in a suitable supporting structure 67 adjacent to, and preferably fitting into, the end of the conduit 18. The casing 52 is bolted against a supporting plate 60 by a plurality of short machine screws 68 extending through one of the side walls of the casing 52. A plate 69 having an opening therein, has inturned rim portions fitting into the conduit 50 and

is traversed by the bolts 68 to hold the conduit 50 in its proper operative position.

A conduit of substantially L-shape extends into the outer side wall of the box 51 and a plurality of openings 72 are provided in the tubular conduit 50. A short conduit 70 extends through the box 51 into the casing 52 to permit the entrance of electric conductors (not shown).

The smoke indicator thus far described is adapted to be mounted in operative relation to any type of smoke conduit, shown or indicated generally in Fig. 1 by 17 or the indicator may be located in a smoke stack or in a suitable part of the breeching between the furnace and the chimney proper. In accordance with this, the lengths of the tubular conduits 14 and 18 are made such that the inner adjacent ends thereof are separated about three feet in order that the space therebetween may be traversed by smoke. It is to be noted, however, that the device may be used in other places and for other applications, such as in places where a fire and smoke therefrom may occur at rare intervals.

The skeleton metal frame 21 comprises a plurality of spaced rings 73 and a plurality of spaced metal bars or rods 74 welded around the outer peripheral surface of the rings 73, and having their respective ends welded or tightly secured against the ends of the conduits 14 and 18, substantially as shown in Fig. 3 of the drawings. It is necessary that the skeleton metal frame be relatively stiff and that the ends of the rods 74 be tightly secured to the conduits, preferably by welding as set forth above, in order that any predetermined alignment of the tubular conduits 14 and 18 may be preserved throughout the use of the assembled apparatus.

In order that the tubular conduits and the light-sensitive unit and the light source unit supported thereby may maintain their initial alignment, irrespective of slight movements of the component parts of the smoke conduit which may be necessitated by variations in temperature, I prefer to mount or support the tubular conduits resiliently within the openings through the walls 16 and 19. A short tubular member 76 may be fitted within an opening 77 in the wall 19, an auxiliary flange member 78 being provided which may have screw-threaded engagement with the member 76 and be bolted against the wall 19, or which may be suitably welded to these two members. The tubular conduit 18 may be provided with an annular flange 79 welded thereto and a mass 81 of material, such as asbestos, may be located between the conduit 18 and the tubular member 76, to constitute a packing therebetween. The packing 81 may be compressed, as by means of a second ring 82 and

a cover or cap member 83 which may have screw-threaded engagement with the outer end of the tubular member 76. This construction permits the conduits 14 and 18 to maintain their alignment, irrespective of slight changes in the relative positions of the walls 16 and 19.

While I have hereinbefore referred to the device embodying my invention as a smoke indicator and have shown two ammeters mounted in the respective boxes, it is to be understood that the assembly embodying my invention may be used as a smoke-density recorder merely by providing a pair of conductors connected to the ammeters which are connected to a suitable recording device of any kind well known in the art and used for such purposes. It may also be used as a smoke detecting device, not only in operative relation to a smoke conduit, but also for use in indicating, detecting or recording the occurrence of smoke or other abnormal conditions in a predetermined space.

It is obvious that it is necessary to maintain a predetermined initial alignment of the filament of the light source 28 once the proper alignment has been obtained, this alignment being such that a beam of radiant energy is provided by the effect of the lens 43, which beam is coaxial with the tubular conduit 14.

To maintain this initial alignment, the casing 23 is made of relatively stiff and heavy material and is tightly bolted against the end of the tubular conduit 14 in a manner already set forth. Even if the box 22 should be accidentally jarred or bumped, it will not mean a consequent movement or disalignment of the casing 23, as this casing is supported by the conduit 14, as is also the housing 22, but independent thereof.

It is also obvious that slight movements of the casing 52 within the box 51 will not result in incorrect readings of the apparatus for the reason that the spacial extent of the light-sensitive cell is much larger than the opening 62 through the screen 61 and slight disalignment of the light-sensitive cell or of the opening will not seriously affect the readings.

If no means were provided for ventilating the respective boxes or units, it is obvious that that surface of the lenses away from the respective casings might have soot settle thereon, and in order to prevent this, the two conduits 44 and 71 and the openings 46 and 72 are provided in the respective boxes and tubular conduits. The draft in the chimney will cause an inflow of air through the conduits 44 and 71 around the respective casings 23 and 52 through the openings 46 and 72 into the conduits 14 and 18 and from there into the smoke conduit 17. It is obvious that the amount of fresh

air thus introduced is not enough to affect the density of the smoke and it is also obvious that any accumulation of the smoke in the tubular members and in the boxes will be effectively prevented. The incoming air will effectively cool the respective boxes and casings, so that even if they are so located as to be subjected to relatively high temperature, they will not become overheated.

The openings 46 and 72 are located at some distance from the lenses in the respective casings so that particles of dirt carried by the incoming air may not be deposited on the outer face of the respective lenses.

The device embodying our invention thus provides a relatively simple and rigid assembly which may be mounted in any smoke-traversed conduit, be supported by the walls thereof in such manner as to permit the maintenance of the initial alignment and that accumulation of dust or smoke in or on certain of the parts will be prevented.

Various modifications may be made in the device embodying our invention without departing from the spirit and scope thereof, and we desire, therefore, that only such limitations shall be placed thereon as are imposed by the prior art or are set forth in the appended claims.

We claim as our invention:

1. In a smoke indicating device, in combination, a light-unit box, a tubular member secured thereto, a light-receiving-unit box, a tubular member secured thereto and coaxially aligned with said first named tubular member, the two opposing ends of the tubes being spaced apart, and means for maintaining the alignment of said tubular members while permitting smoke to pass freely between the exposed ends of the tubes, said means comprising a skeleton frame operatively rigidly engaging the opposing ends of the two tubular members.

2. In a smoke indicating device, in combination, a pair of boxes, a source of radiant energy in one of said boxes, a cell sensitive to radiant energy in the other box, a pair of tubular members extending toward each other in coaxially aligned relation, one end of each tube engaging one of said boxes, and the other ends of the tubes being spaced apart, and a skeleton frame having its ends operatively engaging the opposing ends of the tubes to maintain the initial alignment thereof.

3. A smoke indicating device comprising a tubular member adapted to be traversed by light rays and having a flange therearound at its outer end, an outer protecting box secured to the flange, an inner light-unit casing, and means extending through a wall of the casing and the flange for securing the

casing against the end of the tubular member independently of the outer box.

4. In a smoke indicating device including a light-unit casing, a light-sensitive cell casing, a protecting box around each of said casings, and a tubular member communicating with each of said casings, extending into the respective boxes and into a smoke conduit, the tubular members being coaxially aligned and their inner ends spaced apart, means controlled by the draft in said smoke conduit for preventing accumulation of soot in the tubular members and on the boxes, said means comprising an opening into each protecting box and a lateral opening into each of said tubular members inside of a box but outside of a casing to permit a draft of air from the outside into a box around a casing, into the tubular member and into the smoke conduit.

5. In a smoke indicating device of the type including a pair of coaxially aligned tubular members, each extending through a wall of a smoke conduit and having their inner ends spaced apart, a casing secured to the outer end of one of said tubular members, a casing secured to the outer end of the other tubular member, and a skeleton metal frame secured to the adjacent inner ends of the tubular members, resilient bushing means, supported by the walls of the smoke conduit and encircling the respective tubular members, coacting with said metal frame to maintain the initial alignment of the tubular members, skeleton frame and casings irrespective of relative movements of the walls of the smoke conduit.

In testimony whereof, we have hereunto subscribed our names this 6th day of November, 1928.

EDWIN H. VEDDER.  
ELLIS O. ERICKSON.