

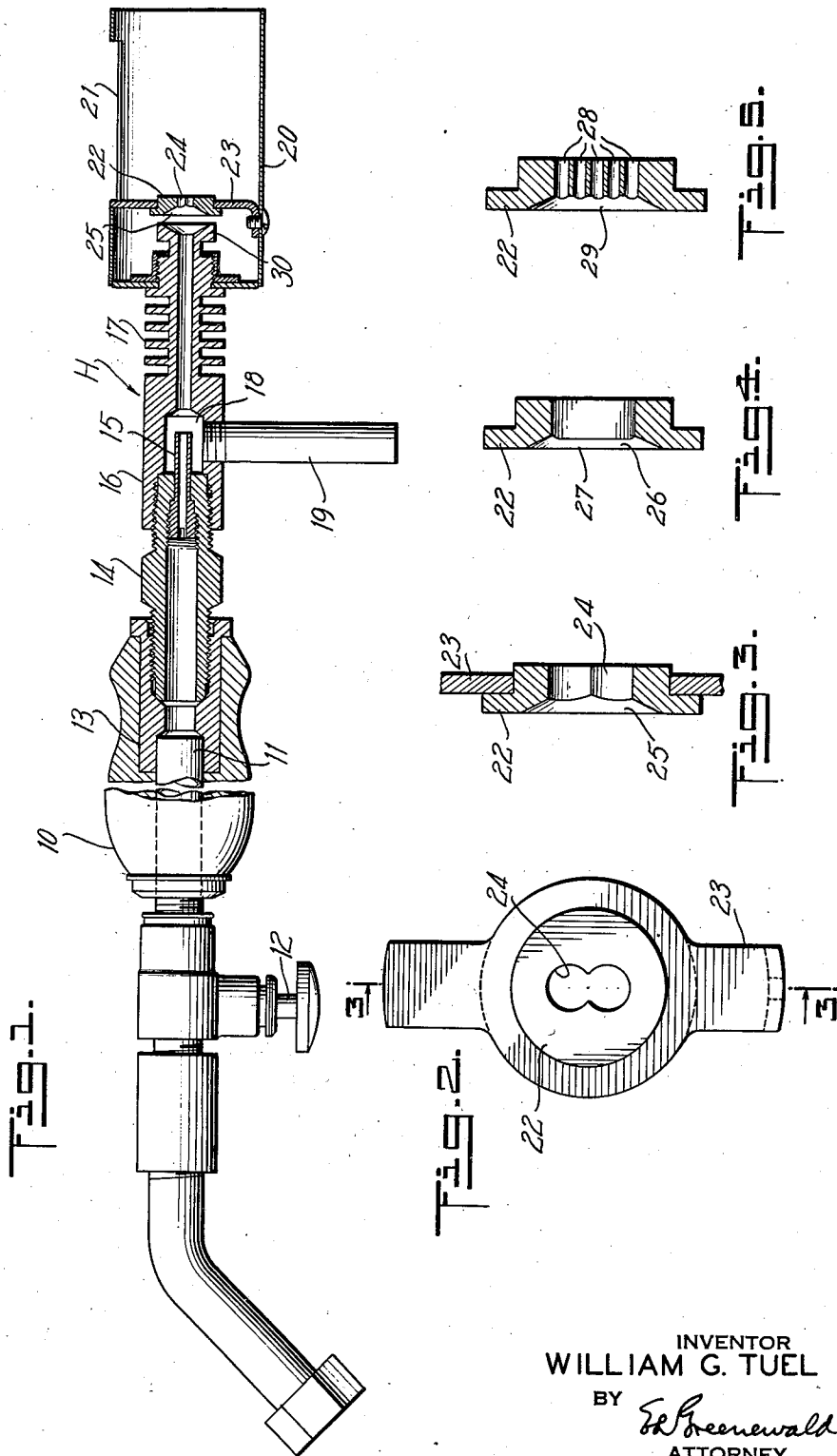
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GAS DETECTOR

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GAS DETECTOR

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The invention relates to apparatus for detecting gases and more particularly to an improved apparatus for the detection of halogen compounds in gases.

5 The use of organic halogen compounds, such as dichlorodifluoromethane and methyl and ethyl chlorides, in refrigeration apparatus has created a demand for a sensitive, reliable, and convenient device for detecting leakage of such compounds into the atmosphere. A widely used method for this purpose is a flame test in which a sample of the atmosphere to be tested is introduced into a flame and the flame impinged on a heated reactive material, such as copper or nickel, causing a characteristic reaction and a change in the color of the flame to occur if halides are present. In practice, the flame consists of a small, blue inner cone surrounded by an outer envelope ranging in color from substantially colorless to a yellowish tinge. The presence of halides causes an immediate and distinct change in the color of the outer envelope to green or blue-green.

The sensitivity of an apparatus employing the foregoing method depends largely on the operator's ability to detect a slight color change in the flame imparted by small amounts of halide gases. The sensitivity is also dependent on the temperature of the reactive material and it has been proposed to employ a larger and more intense flame to increase the temperature of such material; but the advantage obtained through the use of a larger and more intense flame is counteracted by the difficulty of detecting the presence of only a slight color change in a flame of such size and type.

35 An object of the present invention is to provide an improved apparatus including means for bringing the gas into contact with the reactive material under conditions which ensure the detection of halides in very low concentrations.

40 Another object is to provide an improved apparatus including means for ensuring a satisfactorily high operating temperature in the reactive material without increasing the difficulty of detecting very small changes in flame color.

45 These and other objects are attained in the present invention by the provision of a reactor plate of novel design which may readily be adapted for use with any apparatus employing substantially the foregoing method of halide gas detection. For convenience, the invention will be described as it may be used in one typical variety of apparatus; but that it may be used with other varieties will be apparent. In the 55 drawing:

Fig. 1 is a front sectional view of a preferred embodiment of the invention adapted for use with a halide gas detector apparatus employing acetylene as the combustible gas;

Fig. 2 is an end view of the embodiment of the invention shown in Fig. 1;

Fig. 3 is a sectional view taken on the line 3—3 of Fig. 2;

Fig. 4 is a sectional view of a second embodiment of the invention; and

Fig. 5 is a sectional view of a third embodiment of the invention.

Referring to the drawing, the apparatus shown comprises a handle or grip 10 through which a tube 11 extends longitudinally. An end of the tube 11 protrudes from the grip 10 and supports a gas valve 12 and means for connecting said valve to a source of combustible gas, in this instance, acetylene. The other end of the tube 11 is fitted into an adapter 13 which has a central longitudinal bore and which supports a burner head H.

The burner head H includes a longitudinally bored nozzle holder 14, one end of which is mounted in the adapter 13. The opposite end of the nozzle holder 14 supports a nozzle 15 which extends past the end of said holder. Also supported on the end of the nozzle holder 14 is a longitudinally bored member 16 which comprises air cooling fins 17, a gas mixing chamber 18 and a combustion tip 30. The combustible gas necessary to provide a flame is introduced into said mixing chamber through the nozzle 15, and a sample of the atmosphere to be tested is introduced through a suitable tube 19 mounted in the wall of the member 16. The gas mixture is conducted from the mixing chamber 18 through the bore of the member 16 to the combustion tip 30 enclosed within a cylindrical shield 20 which is supported by the member 16. The reactor plate holder 23 and a reactor plate 22 are mounted within the shield 20, and a window 21 is also provided in the said shield. When the combustible gas is ignited, the flame formed passes through the reactor plate 22, heats said plate during its passage, and is observed through the window 21.

The reactor plate holder 23 comprises an L-shaped member provided with a centrally located opening so that the reactor plate 22 may be supported in the path of the flame. The reactor plate 22, which may be adapted in any suitable manner to be mounted in the reactor plate holder 23, may be of copper or other material which is reactive to the gas suspected of being present in the atmosphere under test and which imparts a

- characteristic color to the flame when heated in the presence of such gas. To permit passage of the flame through the reactor plate 22, and to spread or broaden the flame into a ribbonlike or sheetlike shape as it enters the vicinity of the window 21, an elongated opening 24 is provided in said plate. Such an opening may be produced by boring two holes in the reactor plate 22, the center of each hole being at a slight distance from the center of said plate, but so located that the intersection of the two holes forms an elongated opening centrally located with respect to the passage of the flame through the reactor plate 22. It is essential that the opening, formed in the above or any other manner, impart to a flame passing therethrough a wide ribbonlike or sheetlike shape. The surface 25 of the reactor plate 22 against which the flame first impinges is preferably shaped to form a concave opening.
- 20 An alternate embodiment of the invention (Fig. 4) comprises a reactor plate 22 provided with a slot 27 which is preferably centrally located with respect to said plate. A concave surface 26 may be provided to facilitate the passage of the flame through the slots 27.
- 25 Another embodiment of the invention (Fig. 5) comprises a reactor plate 22 provided with a plurality of holes 28 which may consist of one or more rows but so positioned that a flame passing therethrough will be spread to a ribbonlike or sheet-like shape. A concave surface 29 is preferably provided to direct the entrance of the flame into said holes.

A reactor plate provided with an elongated

opening and concave surface as herein described ensures the attainment of a high temperature in said plate, thus increasing the sensitivity and reliability of the apparatus as compared with the same characteristics of a similar apparatus provided with a reactor plate having the usual circular opening. Also, the use of an elongated opening in the reactor plate tends to spread and increase the area of the flame presented to the operator's eye. This permits a more accurate observation of the color characteristics of the flame and ensures the positive detection of small amounts of the gases being detected.

I claim:

1. In an apparatus for detecting halide gas, means for introducing such gas into an unignited stream of fuel gas; means for burning such fuel gas, containing halide, as a substantially colorless flame; and an apertured reactor member so positioned within the flame that the flame impinges on the member and emerges through the aperture, said member being composed of material which when hot reacts with the halide to impart a color to the emergent flame, and said aperture being elongated transversely to the axis of the flame so that the emergent flame is in the shape of a ribbon or sheet.
2. In an apparatus as defined in claim 1, a reactor member which is provided with a concave surface on which the flame impinges, and with an elongated aperture formed by the intersection of a plurality of circular apertures.

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