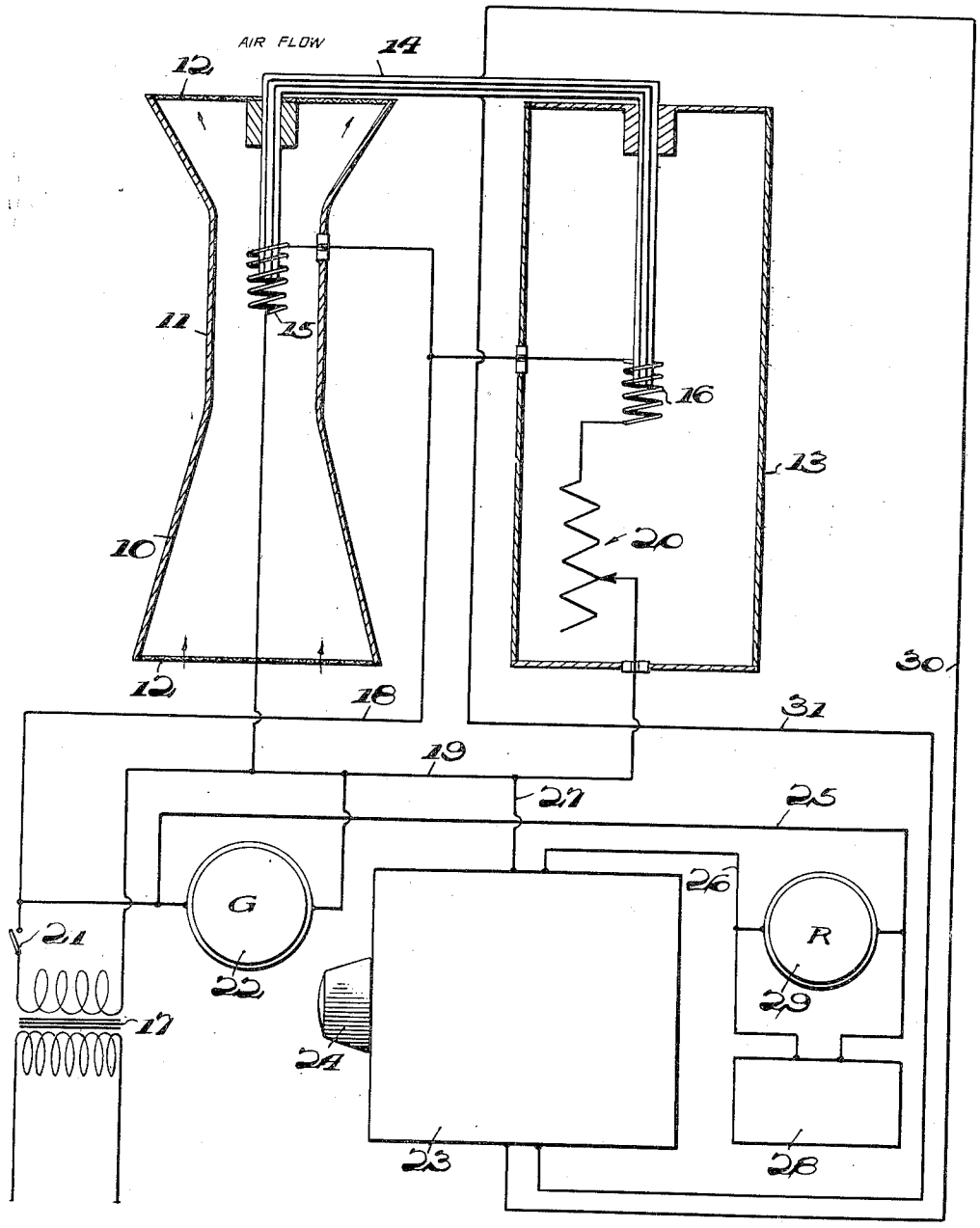
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COMBUSTIBLE GAS DETECTOR

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COMBUSTIBLE GAS DETECTOR

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1 Claim. (Cl. 23—255)

This invention relates to an improved combustible gas alarm of the type employing a thermocouple in conjunction with companion, heated catalyst coils housed by suitable chambers therefor.

As a salient objective, the invention is especially directed to the provision of a reliable device of low cost and simplicity of construction and operation, and adapted for use in mines, shops, and miscellaneous commercial establishments as well as homes and garages for indicating the presence of combustible gases in air-gas mixtures below a lower explosive limit, or warning of the presence of the highly toxic and combustible gas carbon monoxide.

Heretofore, in certain devices of the type indicated, the catalyst coil has been housed in a combustion chamber through which the air-gas mixture to be sampled is caused to flow. Difficulty, with varying results, has been experienced, however, through the fact that when the ratio of combustible gas in the air-gas mixture exceeds a certain percentage, or is high, the catalyst coil becomes devitalized and temporarily ceases to function accurately, or is subject even to permanent failure.

To obviate the difficulty noted, it has been proposed, in some instances, to employ intermittent surges of heating current through the coil for revitalizing the coil. In other instances, it has been proposed to dilute the sampled air-gas mixture with an excess of air, so as to maintain the ratio of combustible gas in the mixture at a low level. In still other instances, additional air has been forced through the combustion chamber, but this procedure is subject to its own difficulty in that the air-gas content of the mixture in contact with the catalyst coil is not uniform. In still other instances, advantage has been taken of the draft induced through the combustion chamber by the heated coil therein for accelerating the flow of the mixture through said chamber.

It has been discovered, however, that if the velocity of the mixture flowing through the combustion chamber is increased immediately at the zone of the catalyst coil therein, while at the same time the normal pressure of the mixture in said zone is lowered, the so-called poisoning or contamination of the coil is greatly discouraged, or retarded, while, also, the character of the mixture remains uniform.

It is therefore a further object of the invention to provide a device wherein the velocity of flow of the air-gas mixture through the combustion chamber of the device will be accelerated immediately at the zone of the catalyst coil therein, while, also, the normal pressure of the mixture in said zone will be concurrently decreased, whereby the dependability of the device will be greatly enhanced.

Other and incidental objects will appear as the description of the invention proceeds.

The figure of the drawings is a diagrammatic view of my improved alarm, parts being shown in section.

In carrying the invention into effect, I employ a combustion chamber **10** flared at its ends and provided with an elongated throat **11** of uniform diameter, said chamber being in the form of a venturi tube. Overlying the ends

of the chamber are flame arresters **12**. A suitable screen of 40 mesh with about 35% free opening will suffice for each. In conjunction with the chamber **10**, I further provide a cylindrical reference chamber **13** closed at its ends. This chamber contains plain air.

Extending at its ends into the chambers **10** and **13** is a thermocouple unit **14**, and surrounding the ends of said unit are identical catalytic coils **15** and **16** respectively of bare platinum ribbon. The thermocouple unit preferably includes a plurality of suitable series-connected thermocouple junctions positioned within each coil.

Power is supplied from a suitable source through an appropriate transformer **17**, and connecting the coils **15** and **16** in parallel in a heating circuit are wires **18** and **19**. Interposed in the heating circuit is a balancing rheostat **20** for the coils, and, preferably, a main switch **21** is provided for rendering the device inoperative when so desired. Connected across the heating circuit is a green pilot light **22** adapted to indicate the presence of supply power when the main switch is closed.

A relay of appropriate character is indicated at **23**. This relay includes a knob **24** by means of which the relay may be manually reset, and connecting the relay across the heating circuit to provide a relay circuit are wires **25**, **26**, and **27**. Interposed in the relay circuit is a suitable alarm buzzer **28**, and connected across said circuit is a red alarm light **29**. Connecting the thermocouple unit **14** with the relay **23** are wires **30** and **31** providing a thermocouple circuit.

In an alarm of the present character, the ability to indicate potential explosive hazards well below a lower explosive limit is important, so that, in the event of an accumulation of gas or vapor, sufficient time will remain to take corrective measures. Thus, sensitivity of the device becomes of prime consideration. This qualification may be accomplished through the use of a maximum number of series thermocouples that can be inserted within the two catalyst coils **15** and **16** to provide a correspondingly strong potential in the thermocouple circuit for triggering the relay **23**.

Normally, the coils **15** and **16** will be at temperature levels of from 1200° F. to 1400° F., and, initially, the balancing rheostat **20** is actuated to produce equal coil temperatures under nil conditions, as registered by the thermocouple circuit and relay **23**. Under such conditions, the voltage produced by the thermocouples will be zero.

Subsequent to adjustment, the presence of combustible gases in the combustion chamber **10** will cause direct burning to occur on the heated surface of the coil **15**, thereby augmenting the surface temperature of the coil, while the coil **16** in the reference chamber **13** will remain unaffected. As will be appreciated, this thermal unbalance will result in a thermocouple voltage directly proportional to the quantity of the combustible gas present, and at given or arbitrarily set low limit of gas concentration, the relay **23** will be triggered, with the result that the alarm buzzer **28** will be caused to sound while the red alarm light **29** will be simultaneously energized.

It is now to be noted that the catalytic coil **15** is located in the throat **11** of the chamber **10**, and, of course, the heat generated by the coil will produce an upward draft through the chamber of the air-gas mixture being sampled. Due to the shape of the chamber, however, the velocity of the rising current of the mixture will be increased at said throat while the normal pressure of the mixture will be decreased immediately at the zone of the coil **15**. As a result, any tendency of the coil to become devitalized when subjected to high gas ratio of the air-gas mixture will be retarded without diluting the mixture with additional air. The device will thus be rendered correspondingly more accurate and dependable in practical use.

Having thus described my invention, I claim:

In an apparatus for analyzing air for the presence of a combustible gas therein, the combination of a closed reference chamber, a separate tubular combustion chamber arranged in spaced relation adjacent said reference chamber and disposed for the flow therethrough of a current of air to be analyzed, a thermocouple unit extending between said chambers and having angularly disposed end portions projecting into corresponding ends of said chambers, the angular end portions of said unit each comprising a plurality of series-connected thermocouple junctions, a companion catalyst coils encircling the angular end portions of said unit about said junctions, and a heating circuit connecting said coils parallel, said combustion chamber having flared ends connected by an elongated throat at the zone of the coil in said combustion chamber for accelerating the velocity of said current of air through said zone and simultaneously reducing the normal pressure of the air in said zone about the coil therein.

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