Aug. 20, 1935. W. O. HEBLER 2,012,231

GAS ANALYSIS APPARATUS

Filed Jan. 2, 1934 2 Sheets-Sheet 1

Fig. 1

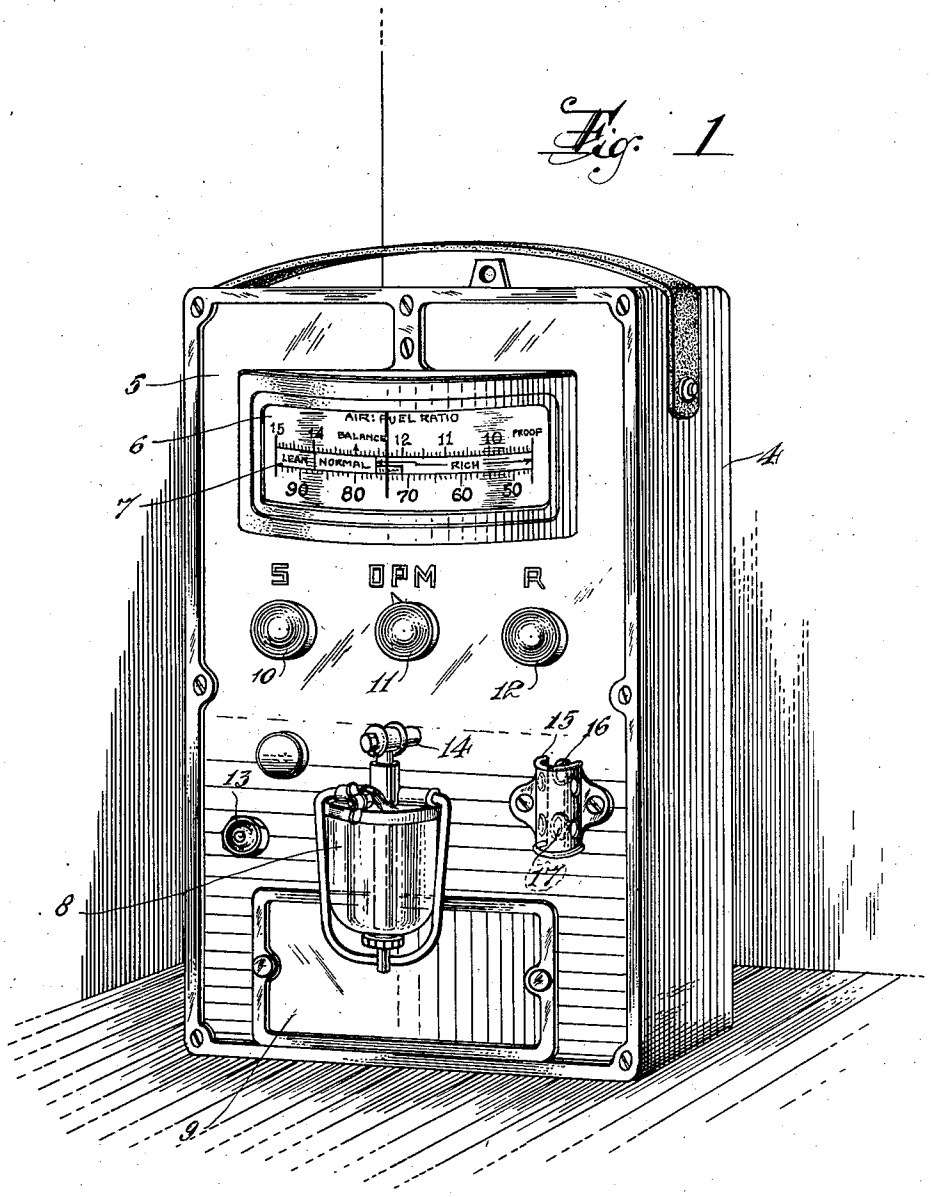

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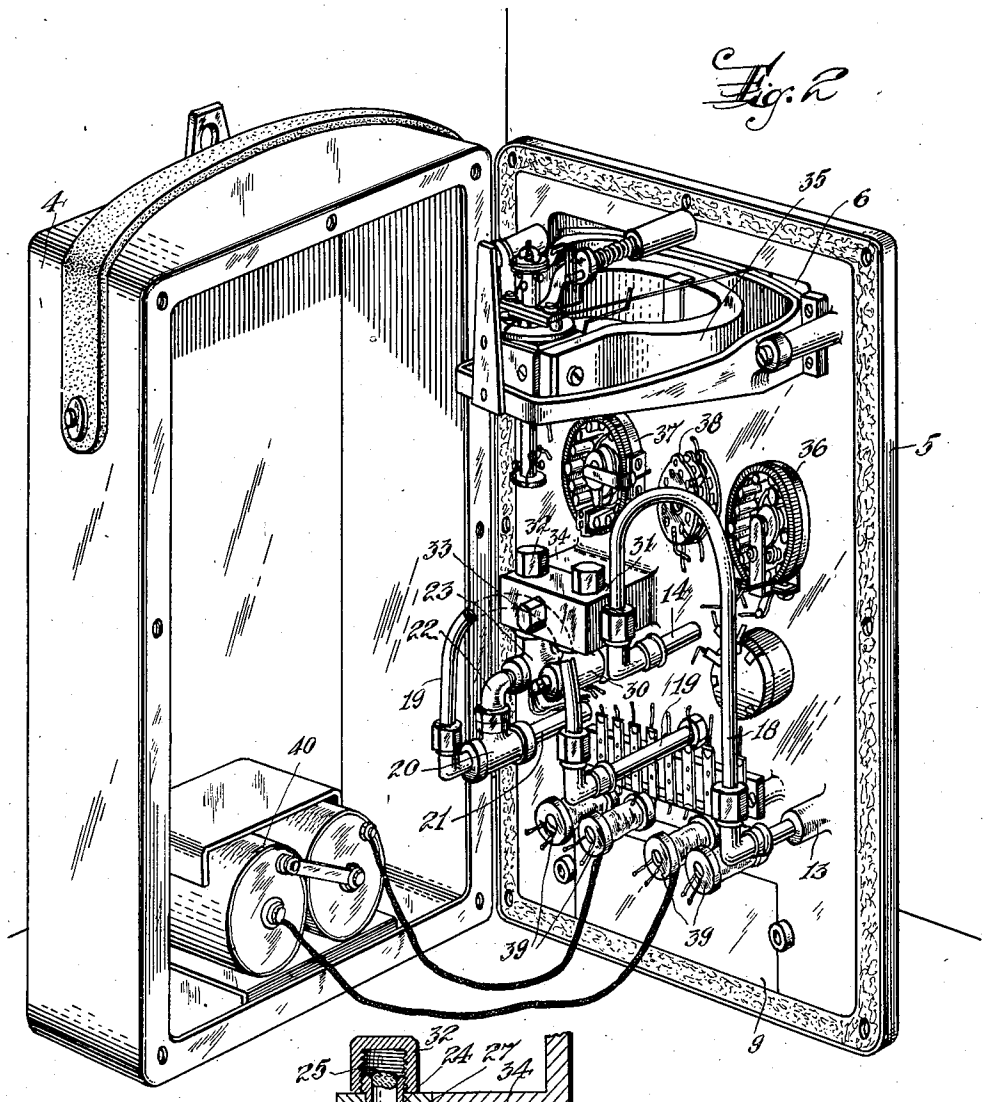
Fig. 2



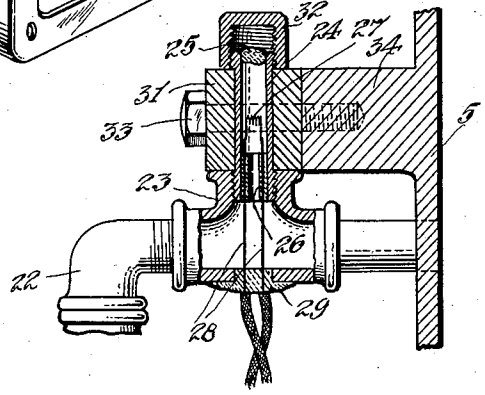


Fig. 3

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GAS ANALYSIS APPARATUS

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Application January 2, 1934, Serial No. 704,913

2 Claims. (Cl. 73—51)

This invention relates to gas analysis apparatus of the thermal conductivity type, and more particularly to a novel arrangement and mounting of such apparatus.

Heretofore, thermal conductivity gas analysis apparatus has comprised a number of units which have been generally mounted in a more or less cumbersome manner, occupying an appreciable amount of space, and accordingly requiring that the installation of the apparatus be practically permanent.

The usual gas analysis apparatus includes a unit for scrubbing the gas to be analyzed, a standard thermal conductivity cell and a comparison cell, a galvanometer and various control devices. It has been customary to position the scrubbing device somewhat remotely from the conductivity cell and the gas being analyzed was by-passed through the comparison cell, flowing directly over the resistance element carried by the comparison cell. When the various units were mounted in a casing, such mounting was permanent and the casing could be opened only with considerable inconvenience to replace the dry cells used in connection with the Wheatstone bridge, and in the event of the necessity of adjusting the various units, considerable labor was necessary.

It is an object of this invention to provide a portable gas analysis apparatus of the thermal conductivity type in which the entire apparatus is mounted upon a vertical panel, the various units of the apparatus being arranged in a novel manner on one face of the panel, and the controls for the units being arranged on the obverse face of the panel, the panel being attached to a casing to protect the units from dust and disarrangement by accidental blows or the like.

A further object is the provision of a novel manner of arranging thermal conductivity gas analysis apparatus upon a vertical panel so that each unit of the apparatus may be conveniently adjusted without interfering with or affecting the adjustment and operation of the other units of the apparatus.

A further object is the provision of a novel and inexpensive manner of mounting thermal conductivity cells on a vertical panel.

A further object is the provision of a novel and efficient structure for a thermal conductivity gas analysis cell, which can be manufactured at a considerably less cost than heretofore has been the case, and which can be readily assembled and mounted upon a panel without requiring unusual skill.

A further object is the provision of a thermal conductivity gas analysis apparatus mounted in a novel manner upon a panel and enclosed in a casing having means therein for housing dry cells necessary for the operation of the apparatus, said panel having a readily removable plate to enable access to the interior of the casing for the purpose of renewing the dry cells without necessitating the entire removal of the panel or in any way affecting the other units of the apparatus.

These and other advantageous objects, which will later appear, are accomplished by the simple and practical construction and arrangement of parts hereinafter described and exhibited in the accompanying drawings, forming part hereof, and in which:

Fig. 1 is a perspective view of the casing and panel showing the control side of the panel upon which the gas analysis apparatus is mounted,

Fig. 2 is a perspective view showing the casing open and the obverse side of the panel upon which the units of the gas analysis apparatus are arranged in a compact position, and

Fig. 3 is a sectional view of a gas analysis cell, showing in detail the structure thereof and the manner in which it is mounted upon the panel.

Referring to Fig. 1, the gas analysis apparatus is housed within a casing 4 having a covering panel 5 which is provided with a window 6, through which is visible an indicating scale 7. Mounted upon the outside face of the panel is a flow indicator 8 consisting of a transparent glass vessel which is partially filled with water.

Panel 5, near the lower edge thereof, is provided with a removable plate 9 which enables access to the interior of the casing 4 without necessitating removal of the panel 5.

Mounted in a row beneath the window 6 are control knobs 10, 11, 12; and also mounted on the panel is a pipe connection 13 through which the gas to be analyzed is introduced, and on the opposite side of the panel is mounted a guard 15 which covers apertures 16 and 17 for the exhaust of the gas after it has been analyzed.

Referring to Fig. 2, in which is shown the inside face of the panel 5, it will be noted that pipe connection 13 is connected to a tube 18 which in turn is connected to the pipe connection 14 as shown in Fig. 1, which leads to the flow indicator 8.

From the flow indicator the gas is conducted by tubing 19 to a T-shaped pipe connection 20, which enables the main portion of the gas to be directly exhausted through pipe 21 and the aperture 17, while a portion of the gas is by-passed through

pipe 22 into a pipe T 23 which communicates with the exhaust opening 16 in the panel 5.

Mounted within the vertical part of the pipe T 23 is a metal tube 24, (see Fig. 3) which has its upper end threaded and closed by means of a sealing compound 25 which may be a wax or a hydrocarbon compound.

Positioned in the tube 24 is a small porcelain tube 26 which supports a resistance element 27, which is connected to a Wheatstone bridge circuit by lead-in wires 28 passing through a seal 29 in the bottom of the pipe T 23.

It will be seen that the pipe T 23 and the tube 24 constitute a comparison cell of a thermal conductivity gas analysis apparatus, the gas being analyzed coming into contact with the resistance element 27 by diffusion. The gas does not flow directly over the resistance element and consequently the analysis indications are not affected by the rate of flow of gas. Adjacent the pipe T 23 is another pipe T 30 which is sealed throughout and contains a similar resistance element; the pipe T 30 with its resistance element constitutes what is called the "standard" or "comparison" cell of the thermal conductivity gas analysis apparatus, the resistance element in the pipe T 30 being connected to the Wheatstone bridge circuit as is common and well known to persons familiar with thermal conductivity gas analysis apparatus.

Tube 24 which is threaded into pipe T 23 and a similar tube, not shown, which is connected with the pipe T 30, pass through passages in a metal block 31 and are secured thereto by nuts 32 which engage the upper threaded end of the tube 24, as shown in Fig. 3. The block 31 in turn is secured by means of a bolt 33 to a boss 34 integral with and projecting from the inside surface of the panel 5.

Also mounted on the inside surface of the panel 5 is a galvanometer generally indicated by the numeral 35, and control rheostats 36, 37, respectively, connected to the knobs 10 and 12, and a switch 38 connected to the knob 11. The galvanometer, rheostats and thermal-conductivity cells are connected to a Wheatstone bridge circuit, which includes a plurality of resistance coils 39, mounted on the inside surface of panel 5. Current is supplied to the Wheatstone bridge and other apparatus by means of dry cells 40 positioned in the casing 4.

From the above description and drawings, it will be seen that the entire gas analysis apparatus is mounted in a readily accessible manner on the inside face of the panel 5, while the controls for the apparatus are all mounted on the outside surface of the panel 5, thus making it unnecessary, for the purpose of operating the apparatus, to remove the panel 5 or come into contact with various elements of the apparatus which are mounted on the inside face of the panel. Should it be necessary to add water to the flow indicator, obviously it is not necessary to remove this panel. In making a gas analysis, it is only necessary to introduce the gas being analyzed through the pipe connections 13, and then adjust the switch 11 and control rheostats 10 and 12 in a certain manner to obtain a reading on the scale 7, which indicates the quality of the gas. At no time during the analyzing of the gas is it necessary to remove the panel 5 or to have access to the interior of the casing 4.

When the batteries 40 become worn out and too weak for the purpose intended, they may be readily replaced with new dry cells by removing the plate 9 in the lower part of panel 5.

It will be seen that I have provided an unusually compact arrangement of the elements of a thermal conductivity gas analysis apparatus which enables them to be conveniently and effectively mounted upon a vertical panel.

It will also be noted that I have provided an unusually simple and economical mounting for a thermal conductivity cell as shown in detail in Fig. 3. The thermal conductivity cell essentially consists of the pipe T 23, a tube 24 having its upper end threaded and sealed by means of sealing compound 25, and the resistance element 27 mounted in the tube 24. This conductivity cell is very simply mounted upon a panel by passing the tube 24 through an aperture in a metal block 31 and clamping the cell in such a position by means of the nut threadedly engaging the threaded portion of tube 24. The block 31 may then be readily mounted on a panel by means of a bolt 33 or any similar means. Obviously, the structure of the thermal conductivity cell and the mounting thereof as herein disclosed presents a decided improvement over the thermal conductivity cells as heretofore have been known and used. The parts of the conductivity cell may be made from standard pipe T's, standard tubing, and it is not necessary to plate the wall of the tube 24 with gold, the tube 24 forming a gas chamber, as heretofore has been the case with thermal conductivity cells, at the same time the structure enabling one or more cells to be conveniently and economically mounted in a rigid manner upon a panel or the like.

The foregoing disclosure is to be regarded as descriptive and illustrative only and not as restrictive or limitative of the invention, of which obviously an embodiment may be constructed including many modifications, without departing from the general scope herein indicated and denoted in the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. In a gas analyzing apparatus of the thermal conductivity type, an analysis cell comprising a pipe T, a metal tube threaded into the vertical portion of the T, said tube having its upper end threaded and closed by means of a sealing compound, a resistance element mounted in the tube, the gases being analyzed coming in contact with said element by diffusion only, a metal block having an aperture therein, said tube being passed through the aperture in the block, a nut threaded onto the tube and engaging the block to clamp the block between the nut and the vertical portion of the pipe T, a panel having a boss, and means for securing the block to the boss.

2. In a gas analysis apparatus of the thermal conductivity type, an analysis cell comprising a pipe T, a tube mounted in the vertical portion of the T and having its upper end threaded and closed by means of a sealing compound, a resistance element mounted in the tube and connected to lead-in wires passing through the horizontal portion of the pipe T, a metal block having an aperture through which the tube passes, said block resting upon the vertical portion of the pipe T, and a nut threaded on to the tube and engaging the block to clamp the block between the nut and the pipe T.

WILLIAM O. HEBLER.