April 17, 1956 K. SCHULTZE 2,741,912

APPARATUS FOR DETECTING GASES OR VAPORS

Filed Dec. 10, 1952

Fig. 1

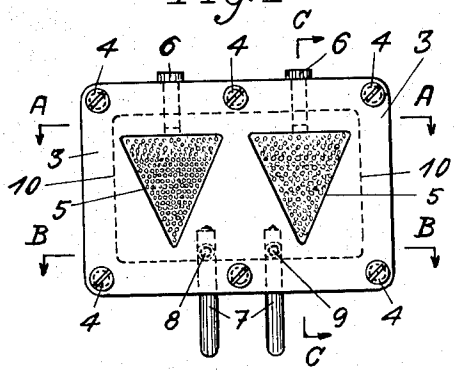


Fig. 5

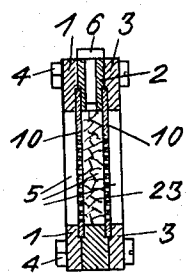


Fig. 3

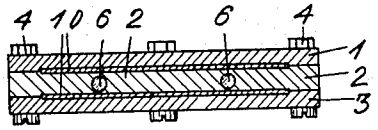


Fig. 2

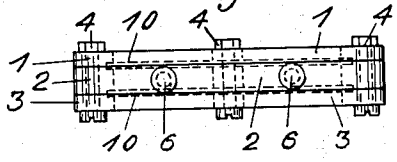


Fig. 4

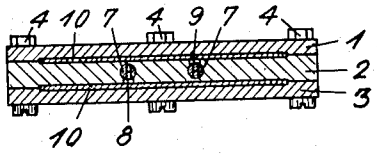


Fig. 6

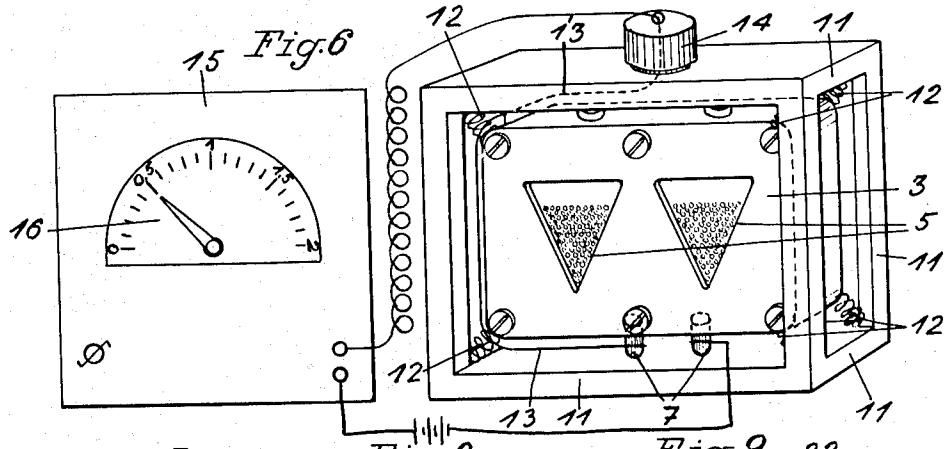


Fig. 7

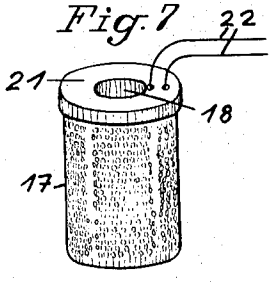


Fig. 8

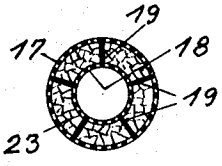
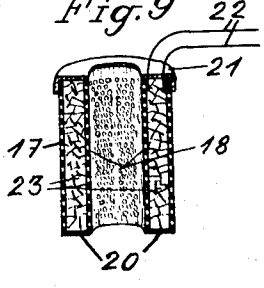


Fig. 9



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2,741,912

APPARATUS FOR DETECTING GASES OR VAPORS

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Application December 10, 1952, Serial No. 325,177

Claims priority, application Germany December 19, 1951

21 Claims. (Cl. 73—23)

The present invention relates to an apparatus for detecting gases or vapors in the air.

More particularly, the present invention relates to an apparatus for detecting in the air gases which are harmful to human beings or which are explosive in too great concentrations and for warning of an increase of such gases in the air.

Certain devices has already been provided for detecting vapors of gases such as gasoline or benzene gases or vapors, carbon tetrachloride, ether, carbon bisulfide, etc. These known devices are either too insensitive or they are only sensitive to a particular gas. Usually these known detecting devices are of such small sensitivity that the gas to be detected must be enriched in some way which requires additional structures which cause the air to be moved through a reaction device so that the indication can be obtained only through manual or mechanical methods of enriching the gas. Also, the reaction means of these known structures must be renewed from time to time so that an automatic registration or indication of the presence of certain gases is not possible.

However, it is quite important to solve this problem of providing such automatic detecting devices because the danger to human beings and equipment resulting from possible toxic effects, ignition, or explosion of certain gases is great. In most cases the time when the danger increases is unknown. The above-mentioned type of gases are likely to cause explosions when they are present in the air in a concentration of between approximately 2 and 6% by volume, and their capability of harmfully affecting human beings is present at considerably lower concentrations.

One of the objects of the present invention is to solve the above-discussed problem by providing a very simple apparatus capable of automatically detecting small concentrations of harmful gases in the air.

A further object of the present invention is to provide an apparatus capable of automatically detecting these gases when they are present in the air in a concentration of approximately 0.1% by volume.

An additional object of the present invention is to provide a detecting apparatus capable of automatically and repeatedly detecting harmful gases without requiring renewal of the materials of the apparatus.

A still further object of the present invention is to provide an apparatus capable of detecting the presence of many different types of harmful gases in the air.

Yet another object of the present invention is to provide an electrically operable detecting apparatus.

Still another object of the present invention is to provide an exceedingly simple detecting apparatus which is small in size and capable of being inconspicuously hung up at a predetermined part of a room or the like to detect the presence of harmful gases or vapors in the air of the room.

With the above objects in view, the present invention mainly consists of an apparatus for detecting gases or vapors in the air, this apparatus including a quantity of granulated carbon supported in contact with the surrounding atmosphere, and an electrical circuit formed in part by the carbon and including an indicator for indicating variations in the current passing through the carbon.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

Fig. 1 is a side, elevational view of one possible structure for carrying out the present invention;

Fig. 2 is a top plan view of the structure of Fig. 1;

Fig. 3 is a sectional view taken along line A—A of Fig. 1 in the direction of the arrows;

Fig. 4 is a sectional view taken along line B—B of Fig. 1 in the direction of the arrows;

Fig. 5 is a sectional view taken along line C—C of Fig. 1 in the direction of the arrows;

Fig. 6 is a partly diagrammatic, elevational view of an entire apparatus with which the structure of Figs. 1–5 is associated;

Fig. 7 is a perspective view of a different embodiment of the invention;

Fig. 8 is a transverse, sectional view in a horizontal plane of the structure of Fig. 7; and

Fig. 9 is a transverse, sectional view in a vertical plane of the structure of Fig. 7.

The present invention takes advantage of the fact that the electrical conductivity of activated carbon increases when air mixed with the harmful gas or vapor to be detected comes into contact with such activated carbon. It appears that such contact causes a swelling of the carbon and in this way increases the area of contact between a quantity of activated carbon particles so as to thereby increase the electrical conductivity of the carbon.

Referring now to Figs. 1–5 of the drawings, it will be seen that the apparatus includes three electrically non-conductive plates **1**, **2**, and **3** made from a plastic or the like, these plates having the same outer dimensions and being held together with the thicker plate **2** located between the plates **1** and **3** by six screw members **4**. Each of the plates **1**, **2**, and **3** is formed with a pair of sharp cornered triangular openings **5**, and these pairs of openings of the plates **1**, **2** and **3** are identical with each other and aligned with each other when the plates are assembled.

The plate **2** is formed with two bores extending inwardly from an outer side edge thereof and respectively communicating with the pair of openings **5** of the plate **2**, these bores being closed by the removable plug members **6**. As is apparent from Fig. 1, these bores which are closed by the plugs **6** extend to the center of the base of the triangular openings **5**.

Adjacent to the lower apexes of the triangular openings **5** of the center plate **2**, as viewed in Fig. 1, there are located a pair of elongated electrical contact members **7** which extend into suitable openings formed in the plate **2**, these contact members **7** extending from the side edge of plate **2** which is opposite to the plugs **6**. A pair of electrically conductive set screws **8** and **9** are respectively in contact with the members **7**, the set screws **8** extending from the left member **7** of Fig. 4 toward the plate **3** while the set screw **9** extends from the right member **7** of Fig. 4 toward the plate **1**, so that these set screws extend in opposite directions.

Between each of the outer plates **1** and **3** and the inner plate **2** there is located an electrically conductive plate

10 of copper or brass sheet, for example, and one of these plates 10 is electrically connected to one of the members 7 through the set screw 8 while the other of the plates 10 is electrically connected to the other of the members 7 through the set screw 9, these plates 10 respectively contacting the set screws 8 and 9. Those parts of the plates 10 which cover the openings 5 of the plate 2 are formed with a plurality of small openings which are located very close to each other.

Thus, the central plate 2, together with the electrically conductive plates 10 located against the opposite sides thereof, forms a pair of containers, at the openings 5 of the plate 2, each of which has opposite, electrically conductive, apertured side wall portions formed by the plates 10 which are insulated from each other. These openings 5 of the plate 2 are filled with granulated activated carbon through the bores closed by the plugs 6, or the openings 5 of the plate 2 may be filled with granulated carbon after one of the plates 1 and 3 and the plate 10 associated therewith is removed.

The above described structure thus forms a pair of electrically conductive cells of activated carbon, and these cells are located in an electrical circuit which includes an ammeter and/or an optical or aural electrical indicator. With such an arrangement the concentration of harmful gases or vapors in the air may be detected and indicated.

In Fig. 6 there is shown a frame 11 located about and spaced from a structure identical with that of Figs. 1–5 except that the top portions of the plates 10 are covered with an electrically non-conductive lacquer which extends slightly below the topmost parts of the openings 5 so that the top layer of activated carbon located in the openings 5 of plate 2 does not contact any electrical conductors. It should be noted, however, that the structure of Figs. 1–5, without any changes, could also be located in the frame 11. As is apparent from Fig. 6 the assembly is held within the frame 11 through the medium of eight coil springs 12 which respectively extend from the eight corners of the assembly of plates 1—3 to the inner eight corners of the frame 11, which is in the form of top and bottom horizontal plate portions interconnected by four vertical members extending between the corners of these plate portions, as shown in Fig. 6.

From one of the contact members 7 there extends an electrical lead 13 which passes through a bored cap member 14 to one of the contacts of the ammeter 15, and a similar lead extends from the other of the contacts of the ammeter through a battery, or a different source of current, to the other of the members 7. The ammeter 15 is provided in the usual way with a switch for cutting it into and out of the circuit. As is shown in Fig. 6, the ammeter in the particular example is provided with a face 16 having thereon a dial extending from 0 to 2.0 milliamperes.

In Figs. 7–9 there is shown a different embodiment of the structure of Figs. 1–5. In the embodiment of Figs. 7–9, there are provided a pair of electrically conductive, apertured tubes 17 and 18 which are coaxially arranged with the outer tube 17 located about the inner tube 18 to form an annular cylindrical space therewith. This annular cylindrical space is divided up by a plurality of electrically non-conductive partitions 19 which extend radially from the axis of tubes 17 and 18 and which extend along the entire length of these tubes. In the particular example illustrated, the partitions 19 divide the space between the tubes 17 and 18 into five cells each of which is filled with granulated activated carbon 23.

The bottom end of the annular space between the tubes 17 and 18 is closed by an annular ring 20 of electrically non-conductive material which is joined to the tubes 17 and 18, and the top end of this annular space is closed by a removable cover 21, as illustrated, this cover 21 also being made of an electrically non-conductive material and being formed with a pair of openings through which the leads 22 extend, these leads being respectively connected to the tubes 17 and 18 and being adapted to be located in a circuit such as that shown in Fig. 6. It will be noted that cover member 21 is annular so that the space in the interior of tube 18 is open at the top and bottom, and therefore the air may contact the activated carbon through the tube 18 as well as through the tube 17.

With the apparatus of the invention it is sufficient to obtain the current from a battery which need only have a potential of three volts. Although the grains of activated carbon may have any shape, the best results are obtained when the granulated carbon is in the form of spherical pellets having a diameter of approximately 2 mm. It has been found that when both of the cells of the structure of Figs. 1–5 are each filled with 14 to 16 pellets of this size, the ammeter may be controlled through a shunt in such a way that the full 2 milliampere stroke of the pointer is used, such an indication of 2 milliamperes corresponding to a concentration in the air of approximately 0.5% by volume of light gasoline. Through further suitable shunt arrangements, for example, according to multiples of 5, it is possible to use the apparatus with higher concentrations which correspond to the concentration values where explosions are likely to occur and which begin at a concentration approximately 1% by volume.

Through electrical connections of this type the apparatus may be used with devices for sounding alarms or giving other warnings, and the value of the voltage and milliamperes of the apparatus is kept low enough so that the device itself is protected against explosions. To further increase the safety of the device, fuses of 20 milliamperes, for example, may be connected in the circuit.

When there are no harmful gases or vapors in the air, there is, in the apparatus of Fig. 6, a continuous residual current in the carbon of approximately 0.5 milliampere. Concentrations of 0–0.5% by volume of light gasoline in the air give readings of 0.5–2.0 milliamperes, and it is therefore possible to have the scale of the ammeter read directly in concentration by volume, if desired.

At higher voltages the sensitivity of the apparatus is increased, but the movement of the ammeter needle is much more vigorous and any curves inscribed by such a moving needle or a suitable device connected thereto are extremely jagged.

The actual dimensions of the apparatus are quite small. Thus, the structure of Figs. 1–5 need be only as large as a match box, and, if desired, the structure of Figs. 7–9 may be made as small as a thimble. Instead of apertured walls to provide access of the outer air to the activated carbon, porous walls may be used. The apertures of the plates 10 are preferably of less than 1 mm. in diameter and are located so close to each other that 100 apertures, for example, are located in a square cm. Also, it is possible to provide a corresponding number of small slits instead. It is necessary that the plates 10 be quite rigid or strongly reinforced so that they are capable of withstanding the pressure of the expanding grains of carbon. Instead of a plastic material, the plate 2 may be made of a porous ceramic material or of sintered glass or the like. Also, an entire cell may be made out of a porous electrically non-conductive material and opposite inner surfaces thereof may be provided with an electrically conductive coating to contact the carbon. In such an arrangement the non-conductive walls are porous so that the conductive parts need not be porous.

It will be seen from the arrangement of Figs. 1–5 that a single plate 10 may form the electrode for a plurality of cells, and the triangular shape of the openings 5 of the plate 2 assures filling of these openings from the bottom up. The grains are preferably located in these openings of the plate 2 in such a way that they may move to a small extent upon shaking of the apparatus. The lower grains are held substantially steady by the grains

located thereover. When a vigorous movement of the structure takes place, it is possible for the topmost layer of the grains to move considerably and therefore to disturb the setting of the apparatus made upon installation thereof. To avoid this, the apparatus is yieldably supported on the springs **12** as shown in Fig. 6. Also, it is possible to locate against the top layer of carbon grains a layer of cotton wadding or the like so as to prevent such movement of the grains while not pressing appreciably against the latter. Another way of greatly reducing the effect of movement in the top layer of carbon grains is to provide the metal plates **10** with an insulating coating, as was described above in connection with Fig. 6. With this arrangement the topmost layer of the carbon is located between the non-conductive parts of the plates **10**, so that the current in following the line of least resistance does not pass through the topmost layer of the carbon and instead passes only through the lower part of the granulated carbon.

Structures of the type described above may be mounted in rooms in the same way as thermometers or thermostats, and it is unnecessary to provide any means for forcing the air through the apparatus. The electrical leads extending from the cells may be of any desired length.

If a potential of 5 volts is set up across the electrodes formed by the plates **10**, then there will be a residual current of 5–10 milliamperes passing through the carbon, and an ammeter different from that of Fig. 6 would have to be used with the apparatus. In an arrangement of this latter type, if the air has a concentration of 0.1% by volume of gasoline, the ammeter will immediately begin to indicate a rise in current, and when the concentration reaches 0.3% the ammeter will read between 50 and 60 milliamperes. These values are obtained when the cells are filled with about 60 pellets of carbon having a diameter of from 2 to 3 mm. and where the plates **10** or the tubes **17** and **18** are located at a distance of 5 mm. from each other.

When the concentration of harmful gases or vapors decreases, the current flowing through the carbon also decreases and the reading on the ammeter goes down. Without any further preparation or handling of any type, the readings of the ammeter will automatically go up when the concentration of harmful gases or vapors in the air increases. It is possible to provide electrical alarms which operate to provide continuous sounds as soon as the concentration of harmful gases or vapors exceeds a predetermined value and which ends when this concentration goes below such a value.

It has been shown that the sensitivity of the cells is increased when they are higher than they are wide, and Figs. 5 and 9 clearly show that the height of the cells is several times as great as the space between the walls **10** or the tubes **17** and **18**. As was mentioned above, pellets of carbon having a diameter of 1–2 mm. are preferred, and the reason for this is that the residual electrical current can be very accurately determined and maintain constant with grains of this type.

Instead of providing a plate **2** of non-conductive material, it is possible to make this plate of conductive material and insulate the same from the plates **10**. Also, the sensitivity of the apparatus may be increased by the use of amplifiers or the like such as are used in communication circuits.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of apparatus for detecting gases or vapors differing from the types described above.

While the invention has been illustrated and described as embodied in electrical apparatus for detecting gases or vapors, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characeristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. Apparatus for detecting gases or vapors in the air, comprising, in combination, a quantity of granulated activated carbon; container means surrounding and engaging said carbon along the depth thereof and supporting at least a part of said quantity of granulated carbon in contact with the surrounding atmosphere said container being at least partially filled by said carbon, said container means including a pair of electrically conductive wall portions spaced and insulated from each other and contacting said carbon the latter substantially bridging said electrically conductive wall portions in mass-like form, said pair of wall portions being adapted to be connected to a source of potential to form a circuit for establishing a current flow through said carbon; and electrical indicator means connected electrically to one of said wall portions and adapted to be placed in said circuit for indicating a variation in the current passing through said granulated carbon.

2. Apparatus for detecting gases or vapors in the air, comprising, in combination, a quantity of granulated activated carbon; container means surrounding and engaging said carbon along the depth thereof and supporting at least a part of said quantity of granulated carbon in contact with the surrounding atmosphere, said container being at least partially filled by said carbon, said container means including a pair of opposite, electrically conductive wall portions spaced and insulated from each other and contacting said carbon the latter substantially bridging said electrically conductive wall portion in mass-like form, said pair of wall portions being adapted to be connected to a source of potential to form a circuit for establishing a current flow through said carbon; and electrical indicator means connected electrically to one of said wall portions and adapted to be placed in said circuit for indicating a variation in the current passing through said granulated carbon.

3. Apparatus for detecting gases or vapors in the air, comprising, in combination, a container having opposite, electrically conductive, apertured side wall portions which are insulated from each other; a quantity of granulated activated carbon located in and substantially filling said container and contacting said side wall portions thereof, said side wall portions being adapted to be connected to a source of potential to form a circuit for establishing a current flow through said carbon; and electrical indicating means connected electrically to one of said wall portions and adapted to be placed in said circuit to indicate a variation in the current flowing through said carbon.

4. Apparatus for detecting gases or vapors in the air, comprising, in combination, a container having opposite, electrically conductive, apertured side wall portions which are insulated from each other and which have a height substantially greater than the space between said side wall portions; a quantity of granulated activated carbon located in and substantially filling said container and contacting said side wall portions thereof, said side wall portions being adapted to be connected to a source of potential to form a circuit for establishing a current flow through said carbon; and electrical indicating means connected electrically to one of said wall portions and adapted to be placed in said circuit to indicate a variation in the current flowing through said carbon.

5. Apparatus for detecting gases or vapors in the air,

comprising, in combination, a plate of electrically non-conductive material formed with an opening passing transversely therethrough; a pair of electrically conductive, apertured plates respectively located against opposite sides of said electrically non-conductive plate and covering said opening thereof; a quantity of granulated activated carbon located in said opening between and substantially bridging in mass-like form said pair of electrically conductive plates, said pair of plates being adapted to be connected to a source of potential to form a circuit for establishing a current flow through said carbon; and an electrical indicating means electrically connected to one of said apertured plates and adapted to be placed in said circuit to indicate a variation in the current flowing through said carbon.

6. Apparatus for detecting gases or vapors in the air, comprising, in combination, a plate of electrically non-conductive material formed with an opening passing transversely therethrough; a pair of electrically conductive apertured plates respectively located against opposite sides of said electrically non-conductive plate and covering said opening thereof; a quantity of granulated activated carbon located in said opening between and contacting said pair of electrically conductive plates and substantially filling said opening, said pair of electrically conductive, apertured plates being adapted to be connected to a source of potential to form a circuit for establishing a current flow through said carbon; and an electrical indicating means electrically connected to one of said apertured plates and adapted to be placed in said circuit to indicate a variation in the current flowing through said carbon.

7. Apparatus for detecting gases or vapors in the air, comprising, in combination, a plate of electrically non-conductive material formed with an opening passing transversely therethrough and being formed with a bore extending from an edge of said plate to said opening; a pair of electrically conductive, apertured plates respectively located against opposite sides of said electrically non-conductive plate and covering said opening thereof; a quantity of granulated activated carbon located in said opening between and substantially bridging in mass-like form said pair of electrically conductive plates, said pair of electrically conductive, apertured plates being adapted to be connected to a source of potential to form a circuit for establishing a current flow through said carbon; a cover located over said bore so that said opening may be supplied with said carbon through said bore when said cover is removed; and an electrical indicating means electrically connected to one of said apertured plates and adapted to be placed in said circuit to indicate a variation in the current flowing through said carbon.

8. Apparatus for detecting gases or vapors in the air, comprising, in combination, a plate of electrically non-conductive material formed with a triangular opening passing transversely therethrough; a pair of electrically conductive, apertured plates respectively located against opposite sides of said electrically non-conductive plate and covering said opening thereof; a quantity of granulated activated carbon located in said opening between and substantially bridging in mass-like form said pair of electrically conductive plates, said pair of electrically conductive, apertured plates being adapted to be connected to a source of potential to form a circuit for establishing a current flow through said carbon; and an electrical indicating means electrically connected to one of said apertured plates and adapted to be placed in said circuit to indicate a variation in the current flowing through said carbon.

9. Apparatus for detecting gases or vapors in the air, comprising, in combination, a plate of electrically non-conductive material formed with a triangular opening passing transversely therethrough; a pair of electrically conductive, apertured plates respectively located against opposite sides of said electrically non-conductive plate and covering said opening thereof; a quantity of granulated activated carbon located in said opening between and substantially bridging in mass-like form said pair of electrically conductive plates, said pair of electrically conductive, apertured plates being adapted to be connected to a source of potential to form a circuit for establishing a current flow through said carbon; an electrical indicating means electrically connected to one of said apertured plates and adapted to be placed in said circuit to indicate a variation in the current flowing through said carbon; and support means supporting said plates in a substantially vertical position.

10. Apparatus for detecting gases or vapors in the air, comprising, in combination, a plate of electrically non-conductive material formed with a triangular opening passing transversely therethrough; a pair of electrically conductive, apertured plates respectively located against opposite sides of said electrically non-conductive plate and covering said opening thereof; a quantity of granulated activated carbon located in said opening between and substantially bridging in mass-like form said pair of electrically conductive plates, said pair of electrically conductive, apertured plates being adapted to be connected to a source of potential to form a circuit for establishing a current flow through said carbon; an electrical indicating means electrically connected to one of said apertured plates and adapted to be placed in said circuit to indicate a variation in the current flowing through said carbon; and support means supporting said plates in a substantially vertical position with the base of said triangular opening located at the topmost part thereof.

11. Apparatus for detecting gases or vapors in the air, comprising, in combination, a plate of electrically non-conductive material formed with a triangular opening passing transversely therethrough; a pair of electrically conductive, apertured plates respectively located against opposite sides of said electrically non-conductive plate and covering said opening thereof; a quantity of granulated activated carbon located in said opening between and substantially bridging in mass-like form said pair of electrically conductive plates, said pair of electrically conductive, apertured plates being adapted to be connected to a source of potential to form a circuit for establishing a current flow through said carbon; an electrical indicating means electrically connected to one of said apertured plates and adapted to be placed in said circuit to indicate a variation in the current flowing through said carbon; and resilient support means resiliently supporting said plates in a substantially vertical position.

12. Apparatus for detecting gases or vapors in the air, comprising, in combination, a plate of electrically non-conductive material formed with a triangular opening passing transversely therethrough; a pair of electrically conductive, apertured plates respectively located against opposite sides of said electrically non-conductive plate and covering said opening thereof; a quantity of granulated activated carbon located in said opening between and substantially bridging in mass-like form said pair of electrically conductive plates, said pair of electrically conductive, apertured plates being adapted to be connected to a source of potential to form a circuit for establishing a current flow through said carbon; an electrical indicating means electrically connected to one of said apertured plates and adapted to be placed in said circuit to indicate a variation in the current flowing through said carbon; a frame located about and being spaced from said plates; and a plurality of springs carried by said frame, being connected to said plates, and yieldably supporting the latter in a substantially vertical position.

13. Apparatus for detecting gases or vapors in the air, comprising, in combination, a first plate of electrically non-conductive material formed with an opening passing transversely therethrough; a pair of second, apertured plates respectively located against opposite sides of said first plate and covering said opening thereof, said second plates having opposite electrical conductive portions located over only a part of said opening; a quantity of granulated activated carbon located in said opening be-

tween said pair of second plates substantially bridging in mass-like form said electrically conductive portions thereof, said conductive portions being adapted to be connected to a source of potential to form a circuit for establishing a current flow through said carbon; and an electrical indicating means connected electrically to one of said portions and adapted to be placed in said circuit to indicate a variation in the current flowing through said carbon.

14. Apparatus for detecting gases or vapors in the air, comprising, in combination, an elongated, apertured, electrically conductive inner tube; an elongated apertured, electrically conductive outer tube coaxial with said inner tube, located about the latter, and being spaced therefrom to define an annular cylindrical space therewith; an annular ring member of electrically non-conductive material located in said annular space between said tubes at one end of the latter to form a bottom wall for said annular space; an electrically non-conductive cover located on said tubes over said annular space at the end of said tubes distant from said bottom wall; granulated activated carbon located in and substantially filling said annular space; and a pair of electrical leads extending respectively from said inner and outer tubular members so that an electrical circuit may be completed through said carbon to determine variations in current flowing through said carbon.

15. Apparatus for detecting gases or vapors in the air, comprising, in combination, an elongated, apertured, electrically conductive inner tube; an elongated apertured, electrically conductive outer tube coaxial with said inner tube, located about the latter, and being spaced therefrom to define an annular cylindrical space therewith; an annular ring member of electrically non-conductive material located in said annular space between said tubes at one end of the latter to form a bottom wall for said annular space; an electrically non-conductive cover located on said tubes over said annular space at the end of said tubes distant from said bottom wall; granulated activated carbon located in and substantially filling said annular space; a pair of electrical leads extending respectively from said inner and outer tubular members so that an electrical circuit may be completed through said carbon to determine variations in current flowing through said carbon; and a plurality of electrically non-conductive plates extending substantially radially from the axis of said tubes and being located in said annular space and extending along the length thereof in a direction substantially parallel to said axis to divide said annular space a plurality of cells insulated from each other by said plates.

16. Apparatus for detecting gases or vapors in the air, comprising, in combination, a porous container; electrically conductive coating portions insulated from each other and located at spaced parts of said container on the interior thereof; a quantity of granulated activated carbon located in said container substantially bridging in mass-like form said coating portions, said coating portions being adapted to be connected to a source of potential to form a circuit for establishing a current flow through said carbon; and electrical indicating means connected electrically to one of said portions and adapted to be placed in said circuit to indicate a variation in the current flowing through said carbon.

17. Apparatus for detecting gases or vapors in the air, comprising, in combination, a resilient support means; an electrically non-conductive plate formed with an opening extending transversely therethrough and being carried in a substantially vertical position by said resilient support means; a pair of cover members respectively located against opposite sides of said plates over said opening thereof and having apertured, electrically conductive portions extending almost up to the top of said opening; granulated activated carbon located in and substantially filling said opening, said electrically conductive portions being adapted to be connected to a source of potential to form a circuit for establishing a current flow through said carbon; and an electrical indicating means connected electrically to one of said portions and adapted to be placed in said circiut to indicate variations in the current flowing through said carbon.

18. Apparatus for detecting gases or vapors in the air comprising, in combination, a quantity of granulated activated carbon; container and contact means surrounding and engaging said carbon along the depth thereof, supporting at least part of said quantity of granulated carbon in contact with the surrounding atmosphere, and electrically contacting said carbon at a pair of spaced portions thereof, said pair of spaced portions being adapted to be connected to a source of potential to form a circuit for establishing a current flow through said carbon; and electrical indicator means connected electrically to one of said portions through said contact means and adapted to be placed in said circuit for indicating a variation in the current passing through said granulated carbon.

19. Apparatus for detecting gases or vapors in the air comprising, in combination, a quantity of granulated activated carbon; means forming a pair of spaced electrically conductive portions engaging said carbon at spaced portions thereof, respectively, and forming a container surrounding and engaging said carbon along the depth thereof and supporting at least a part of said quantity of granulated carbon in contact with the surrounding atmosphere, said pair of electrically conductive portions being adapted to be connected to a source of potential to form a circuit for establishing a current flow through said carbon; and an electrical indicator means electrically connected to one of said portions and adapted to be placed in said circuit for indicating a variation in the current pasing through said granulated carbon.

20. Apparatus as defined in claim 19 and wherein said granulated carbon is in the form of spherical pellets.

21. Apparatus as defined in claim 19 and wherein said granulated carbon is in the form of spherical pellets having a diameter of approximately 1.5 mm.

References Cited in the file of this patent

UNITED STATES PATENTS

2,047,638	Kott	July 14, 1936
2,327,060	Pollak et al.	Aug. 17, 1943
2,589,983	Blodgett et al.	Mar. 18, 1952

FOREIGN PATENTS

25,046	Great Britain	1913
134,243	Great Britain	Nov. 6, 1919
963,759	France	July 20, 1950