Dec. 13. 1955 M. LORENZETTO 2,727,225

SIGNALING APPARATUS FOR INDICATING THE PRESENCE OF A COMBUSTIBLE GAS

Filed March 27, 1952 2 Sheets-Sheet 1

Fig. 1

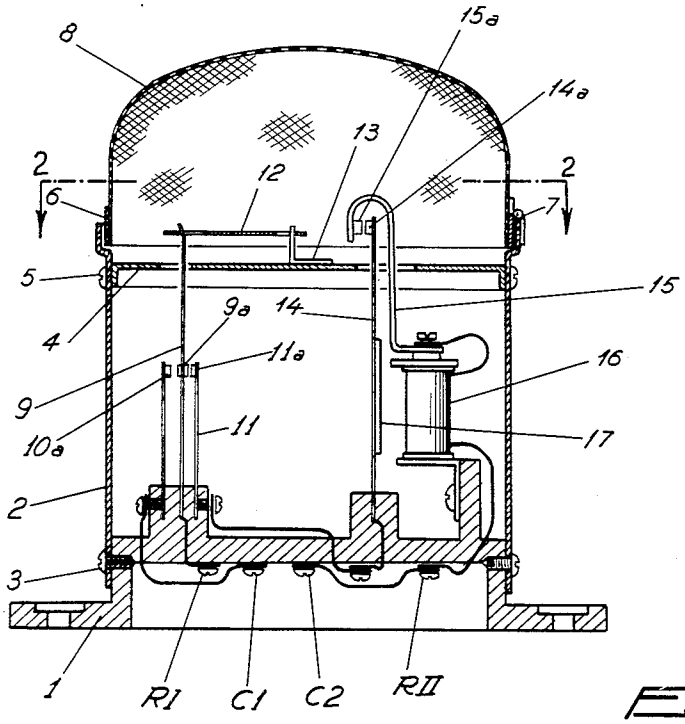


Fig. 2

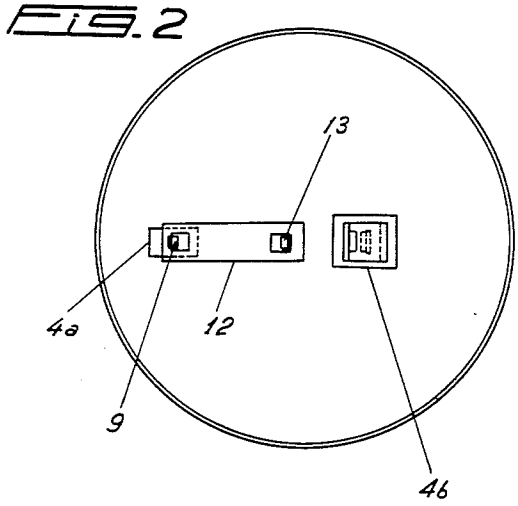
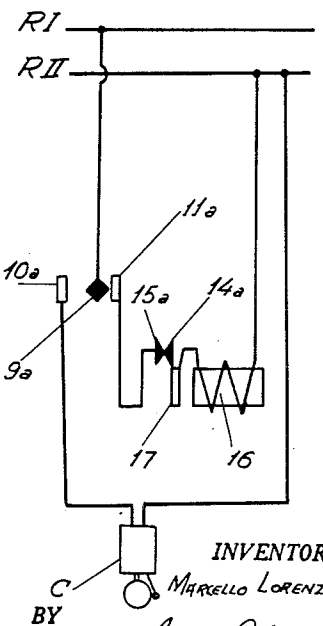


Fig. 3



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Fig. 4

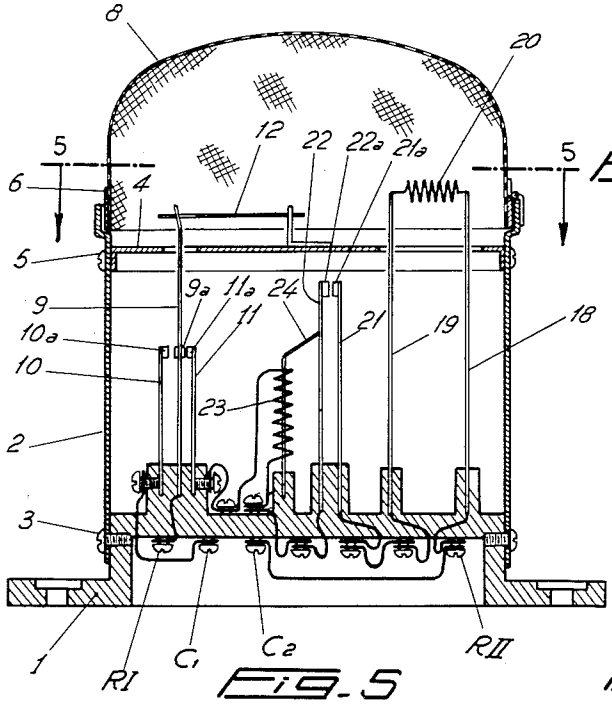


Fig. 5

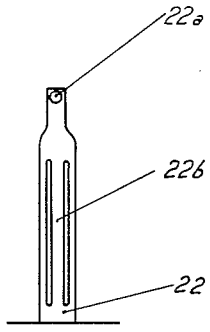


Fig. 7

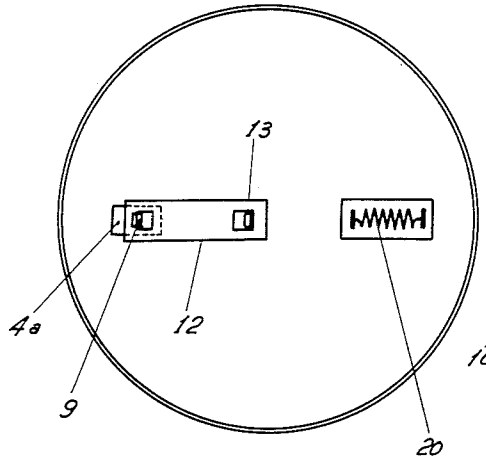
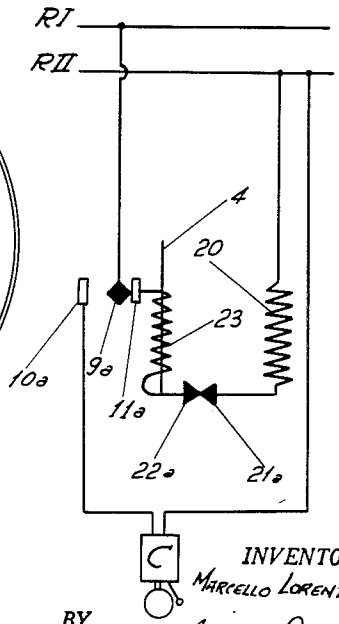


Fig. 6



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SIGNALING APPARATUS FOR INDICATING THE PRESENCE OF A COMBUSTIBLE GAS

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Application March 27, 1952, Serial No. 278,914

Claims priority, application Spain March 31, 1951

8 Claims. (Cl. 340—237)

This invention relates to signalling apparatus for indicating the presence of a combustible gas.

The presence of a combustible gas in air is a great danger in modern life. It is liable to occur, for example, from leakage of illuminating gas in apartments or laboratories, or from vaporization of volatile fuels. It also is likely to be present in mines where fire-damp or other inflammable gases escape into the tunnels.

It is difficult to prevent such disasters because of the lack of a proper device for determining the presence of the gas before it accumulates in a sufficient quantity to be explosive.

It is the principal object of the present invention to provide a device which is capable of immediately signalling the presence of small quantities of a combustible gas in the air.

It is another object of my invention to provide a device of the character described which can be used equally well to detect a combustible gas that is either heavier or lighter than air.

In the accompanying drawings, in which I have shown, by way of example, various possible embodiments of my invention,

Fig. 1 is a longitudinal sectional view through a device constructed in accordance with my invention,

Fig. 2 is a sectional view taken substantially along the line 2—2 of Fig. 1,

Fig. 3 is a circuit diagram for said device,

Fig. 4 is a view similar to Fig. 1 of a device embodying a modified form of my invention,

Fig. 5 is a sectional view taken substantially along the line 5—5 of Fig. 4,

Fig. 6 is a circuit diagram for the device of Fig. 4, and

Fig. 7 is an elevational view of one of the springs in the device of Fig. 4.

In general, I carry out my invention by providing a device which includes a combustion chamber having an opening covered with a fine screen similar to the one used in a conventional Davy lamp. An electrically energizable ignition means is located in the chamber to provide a temperature higher than the point of inflammability of the gas. Such a means may constitute, for example, a mechanism for intermittently producing a spark, or simply a hot wire resistance. Desirably, although not necessarily, the latter ignition means may only be intermittently energized in order to conserve energy. The device is energized by a source of power. A switch is included in a circuit connecting the source of power to the ignition means. Said switch has a throw member which is movable between two positions. The throw member is held in one position by a heat-destructible member located in the combustion chamber. In this position the switch connects the source of power to the ignition means. The throw member is urged to its other position by a biasing means and in its other position it connects the source of power to an electric alarm of any desired type. Thus when gas enters the combustion chamber through the screen it will be ignited by the ignition means and will

destroy the heat-destructible means to permit the throw member to be moved to its alternate position whereby to deenergize the ignition means and energize the alarm. It will be appreciated that the fine screen will prevent propagation of the flame to the ambient atmosphere.

Referring now in detail to the drawings, and more particularly to Figs. 1–3, the reference numeral 1 denotes a base of insulating material of any desired shape, e. g. circular or square. A cylindrical wall 2 is secured on the base, as by screws 3. A plate 4 is fitted over the top of the wall and is held thereto, as by screws 5. Said plate is covered with asbestos. The upper rim of the wall 2 is enlarged to receive a ring 6 which is dimensioned to be press-fitted into the rim. The ring is secured to the rim by a hinge 7 and a clip (not shown) diametrically opposed to the hinge.

Said ring carries a metallic safety net 8 which preferably is dome-shaped.

A projection on the base mounts a pair of spaced leaf springs 10, 11 on the tips of which contacts 10*a*, 11*a*, respectively, are secured. A third leaf spring 9 is mounted on the projection between the leaf springs 10, 11. Said third leaf spring extends through an opening 4*a* in the plate 4 so that its upper end is located in the combustion chamber defined by the plate 4, the ring 6 and the net 8.

A heat-destructible strip 12 is located in said combustion chamber. The strip has through openings at its opposite ends. The upper end of the leaf spring 9 is threaded through the opening at one end of the strip. The other opening receives the upstanding leg of an angle bracket secured to the plate 4. The spring 9 has contacts 9*a*; and if unrestrained it will assume a position in which said contact 9*a* engages the contact 10*a*. The strip 12 holds the spring 9 in a position in which the contact 9*a* engages the contact 11*a*.

An electromagnetic coil 16 supported on the base 1 carries a metallic arm 15 provided with a contact 15*a*. Another leaf spring 14 is supported by the base. Said last-named spring mounts an armature 17 for the coil 16. It also mounts a contact 14*a* which engages contact 15*a* when the coil is deenergized.

The under surface of the base has terminals RI and RII for connection to a source of electric power and contacts C1 and C2 for connection with an audible or visual alarm, e. g. a bell C.

The upper ends of the spring 14 and arm 15 extend through an opening 4*b* in the plate 4 so that the contacts 14*a*, 15*a* likewise are located in the combustion chamber.

The electric circuit for the device is apparent from Fig. 3 and from the following description of the operation of the device.

When ready to operate, the strip 12 holds the contact 9*a* against the contact 11*a* so that current passes from RI through spring 9, spring 11, spring 14, arm 15 and coil 16 in series to RII. This excites the coil. The armature 17 is attracted, thereby opening contacts 14*a*, 15*a* to create a spark. The coil deenergizes, reclosing contacts 14*a*, 15*a* and reexciting the coil. This produces intermittent sparking which will suffice to ignite any combusible gas which enters the combustion chamber through the net 8. In such event the ensuing flame quickly destroys the strip 12, allowing the spring 9 operating as a throw member to shift away from spring 11 and toward spring 10. This opens contacts 9*a*, 11*a* which supply current to the coil 16 and closes contacts 9*a*, 10*a* and thereupon supplies current to the bell C. The alarm circuit will remain energized until cut out by some person. To reset the device after the source of combustible gas has been discovered and remedied, a new strip 12 is inserted.

The device illustrated in Figs. 4–7 is quite similar to that described with reference to Figs. 1–3, differing there-

from only in the nature of the ignition means. Hence the coil **16**, spring **14**, arm **15** and armature **17** are omitted and another ignition means substituted therefor. The other parts are the same and are denoted by the same reference numerals.

The substitute ignition means constitutes a spiral resistance **20** located in the combustion chamber and carried by leads **18**, **19** extending from the base **1** through the plate **4**. A plate **21** carries a contact **21***a*. A second contact **22***a* is carried by a leaf spring **22**. The spring **22** biases the contact **22***a* away from the contact **21***a*. The plate **21** and spring **22** are supported on the base **1**. Said base also supports a bimetallic strip **24** around which a heating coil **23** is wound. The tip of the strip **24** rests against the middle **22***b* of the spring **22** and when the strip is cold causes the contacts **21***a*, **22***a* to engage. Heating the strip **24** warps it in a direction for its tip to flex away from the spring **22** permitting contacts **21***a*, **22***a* to disengage.

In the operation of the device shown in Figs. 4–7, the contacts **21***a*, **22***a* are normally closed so that current passes from terminal RI through series-connected spring **9**, spring **11**, heating coil **23**, spring **22**, contacts **22***a*, **21***a*, plate **21**, lead **19**, hotwire resistance coil **20** and lead **13** to terminal RII. Coil **23**, bimetallic strip **24**, spring **22**, plate **21** and contacts **21***a*, **22***a* constitute a self-opening thermal switch so that after a period of time the contacts **21***a*, **22***a* will open upon the bimetallic srtip being warmed sufficiently by the heating coil **23**. In the interim the coil **20** is heated to incandescence and will ignite any combustible gas that may be present in the combustion chamber. When the contacts **21***a*, **22***a* open they will deenergize the heating coil **23** permitting the bimetallic strip to flex back and reclose said contacts. This action repeats cyclically, thus intermittently energizing the ignition means.

I claim:

1. A device for automatically indicating the presence of a combustible gas comprising walls defining a chamber, an opening in one wall, a relatively fine mesh screen covering said opening, a fixed contact disposed within said chamber, a movable contact, resilient means for normally urging said movable contact into engagement with said fixed contact, an electromagnet for moving said movable contact out of engagement with said fixed contact, a switch disposed in said chamber comprising a movable contact and two fixed contacts, resilient means for urging said last named movable contact into engagement with one of said fixed switch contacts, a heat-destructible member normally maintaining said last named movable contact in engagement with the second of said fixed switch contacts, said last named movable contact being connected to a source of power, said second fixed switch contact being connected to said first movable contact, said first fixed contact being connected in series with said electromagnet and said source of power and an alarm connected to said first fixed switch contact and said source of power whereby, said first movable contact will periodically engage and disengage said first fixed contact to provide an intermittent spark, said spark serving to ignite a gas entering said chamber through said screen, said burning gas destroying said heat-destructible member to permit movement of said movable switch contact into engagement with said first fixed swtich contact thereby energizing said alarm and deenergizing said electromagnet.

2. A device for automatically indicating the presence of a combustible gas comprising walls defining a chamber, an opening in one wall, a relatively fine mesh screen covering said opening, a fixed contact disposed within said chamber, a movable contact, means for normally urging said movable contact into engagement with said fixed contact, an electromagnet for moving said movable contact out of engagement with said fixed contact, a switch disposed in said chamber comprising a movable contact and two fixed contacts, means for urging said last named movable contact into engagement with one of said fixed switch contacts, a heat-destructible member normally maintaining said last named movable contact in engagement with the second of said fixed switch contacts, said last named movable contact being connected to a source of power, said second fixed switch contact being connected to said first movable contact, said first fixed contact being connected in series with said electromagnet and said source of power and an alarm connected to said first fixed switch contact and said source of power whereby said first movable contact will periodically engage and disengage said first fixed contact to provide an intermittent spark, said spark serving to ignite a gas entering said chamber through said screen, said burning gas destroying said heat-destructible member to permit movement of said movable switch contact into engagement with said first fixed switch contact thereby energizing said alarm and deenergizing said electromagnet.

3. A device for automatically indicating the presence of a combustible gas comprising walls defining a chamber, an opening in one wall, a relatively fine mesh screen covering said opening, a fixed contact disposed within said chamber, a movable contact, means for normally urging said movable contact into engagement with said fixed contact, an electromagnet for moving said movable contact out of engagement with said fixed contact, a switch disposed in said chamber comprising a movable contact and two fixed contacts, means for urging said last named movable contact into engagement with one of said fixed switch contacts, a fusible member normally maintaining said last named movable contact in engagement with the second of said fixed switch contacts, said last named movable contact being connected to a source of power said second fixed switch contact being connected to said first movable contact, said first fixed contact being connected in series with said electromagnet and said source of power and an alarm connected to said first fixed switch contact and said source of power whereby said first movable contact will periodically engage and disengage said first fixed contact to provide an intermittent spark, said spark serving to ignite a gas entering said chamber through said screen, said burning gas melting said fusible member to permit movement of said movable switch contact into engagement with said first fixed switch contact thereby energizing said alarm and deenergizing said electromagnet.

4. A device for automatically indicating the presence of a combustible gas comprising walls defining a chamber, an opening in one wall, a relatively fine mesh screen covering said opening, a fixed contact disposed in said chamber, an ignition coil connetced to said fixed contact and a source of power, a movable contact for engaging said fixed contact and carried by a bimetallic strip, a heating element operatively associated with said strip, a switch disposed in said chamber comprising a movable contact and two fixed contacts, resilient means for urging said last named movable contact into engagement with one of said fixed switch contacts, a heat-destructible member normally maintaining said last named movable contact in engagement with the second of said fixed switch contacts, said last named movable contact being connected to said source of power, said second fixed switch contact being connected in series with said heating element and said first movable contact and an alarm connected to said first fixed switch contact and said source of power whereby said first movable contact will periodically engage and disengage said first fixed contact to intermittently heat said ignition coil, said heated coil serving to ignite a gas entering said chamber through said screen, said burning gas destroying said heat-destructible member to permit movement of said movable switch contact into engagement with said first fixed switch contact thereby energizing said alarm and opening the circuit to said heating element.

5. A device for automatically indicating the presence of a combustible gas comprising walls defining a chamber, an opening in one wall, a relatively fine mesh screen covering said opening, a fixed contact disposed in said chamber, an ignition means connected to said fixed contact and a source of power, a movable contact for engaging said fixed contact and carried by a bimetallic strip, a heating element operatively associated with said strip, a switch disposed in said chamber comprising a movable contact and two fixed contacts, means for urging said last named movable contact into engagement with one of said fixed switch contacts, a heat-destructible member normally maintaining said last named movable contact in engagement with the second of said first switch contacts, said last named movable contact being connected to said source of power, said second fixed switch contact being connected in series with said heating element and said first movable contact and an alarm connected to said first fixed switch contact and said source of power whereby said first movable contact will periodically engage and disengage said first fixed contact to intermittently energize said ignition means, said ignition means serving to ignite a gas entering said chamber through said screen, said burning gas destroying said heat-destructible member to permit movement of said movable switch contact into engagement with said first fixed switch contact thereby energizing said alarm and opening the circuit to said heating element.

6. A device for automatically indicating the presence of a combustible gas comprising walls defining a chamber, an opening in one wall, a relatively fine mesh screen covering said opening, a fixed contact disposed in said chamber, an ignition means connected to said fixed contact and a source of power, a movable contact for engaging said fixed contact and carried by a bimetallic strip, a heating element operatively associated with said strip, a switch disposed in said chamber comprising a movable contact and two fixed contacts, means for urging said last named movable contact into engagement with one of said fixed switch contacts, a fusible member normally maintaining said last named movable contact in engagement with the second of said fixed switch contacts, said last named movable contact being connected to said source of power, said second fixed switch contact being connected in series with said heating element and said first movable contact and an alarm connected to said first fixed switch contact and said source of power whereby said first movable contact will periodically engage and disengage said first fixed contact to intermittently energize said ignition means, said ignition means serving to ignite a gas entering said chamber through said screen, said burning gas melting said fusible member to permit movement of said movable switch contact into engagement with said first fixed switch contact thereby energizing said alarm and opening the circuit to said heating element.

7. A device for automatically indicating the presence of a combustible gas, said device comprising walls defining a chamber having an opening in a wall, a relatively fine screen covering said opening, a pair of contacts, electrically energizable ignition means in said chamber, a source of power, circuit means connecting said ignition means to said source of power through said contacts, means to open and close said contacts repetitiously to intermittently energize and deenergize said ignition means, an electric switch in said circuit means, said switch including a throw member movable between two positions, a heat-destructible member disposed in said chamber and normally maintaining said throw member in one position which permits intermittent energization of said ignition means, an electric alarm, circuit means connecting said alarm to said source of power when the throw member is in its second position, and means biasing the throw member to its second position, whereby gas entering said chamber through said screen will be ignited by said ignition means, said burning gas destroying said heat-destructible means to permit the throw member to be moved to its second position to energize the alarm and deenergize the ignition means.

8. A device for automatically indicating the presence of a combustible gas, said device comprising walls defining a chamber having an opening in a wall, a relatively fine screen covering said opening, electrically energizable ignition means in said chamber, a source of power, an electric switch including a throw member movable between two positions, a heat-destructible member disposed in said chamber and normally maintaining said throw member in one position, circuit means connecting said ignition means to said source of power through said switch when the throw member is in its said one position, an electric alarm, circuit means connecting said alarm to said source of power when the throw member is in its second position, and means biasing the throw member to its second position, whereby gas entering said chamber through said screen will be ignited by said ignition means, said burning gas destroying said heat-destructible means to permit the throw member to be moved to its second position to energize the alarm and deenergize the ignition means.

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