June 5, 1934. P. HAUSMEISTER 1,962,074

MEANS FOR PROTECTING CONDUITS FOR EXPLOSIVE GAS MIXTURES

Filed Feb. 24, 1932

FIG. 1.

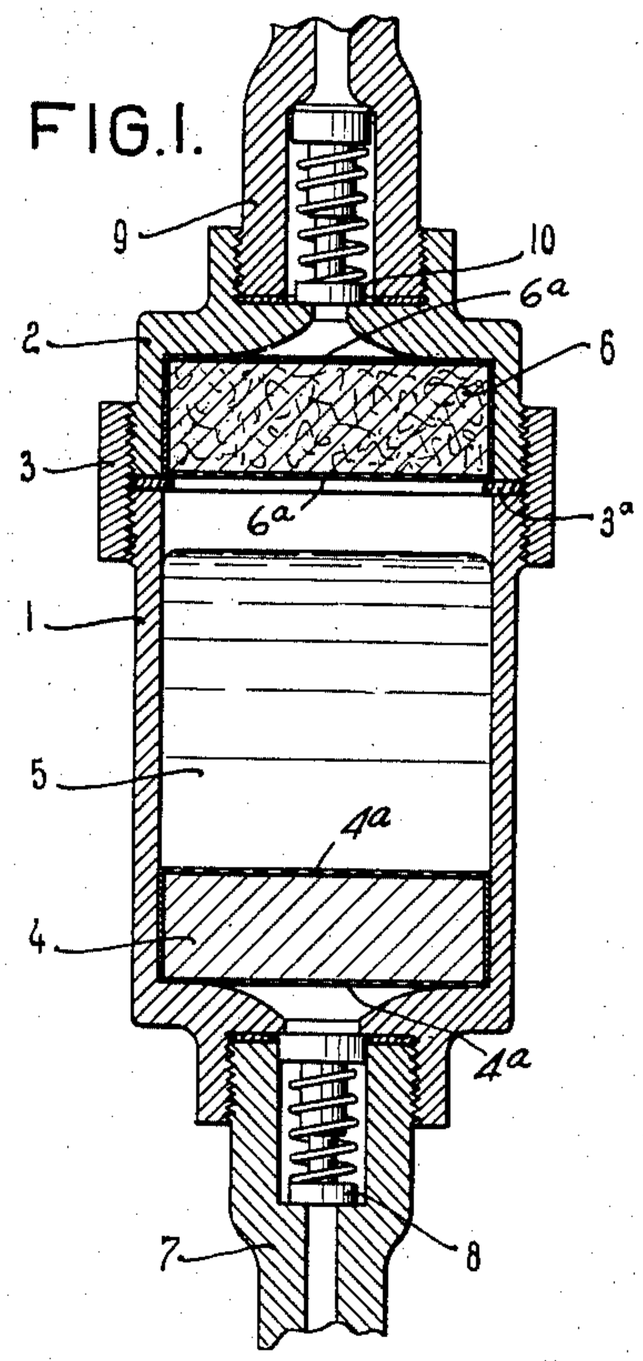


FIG. 2.

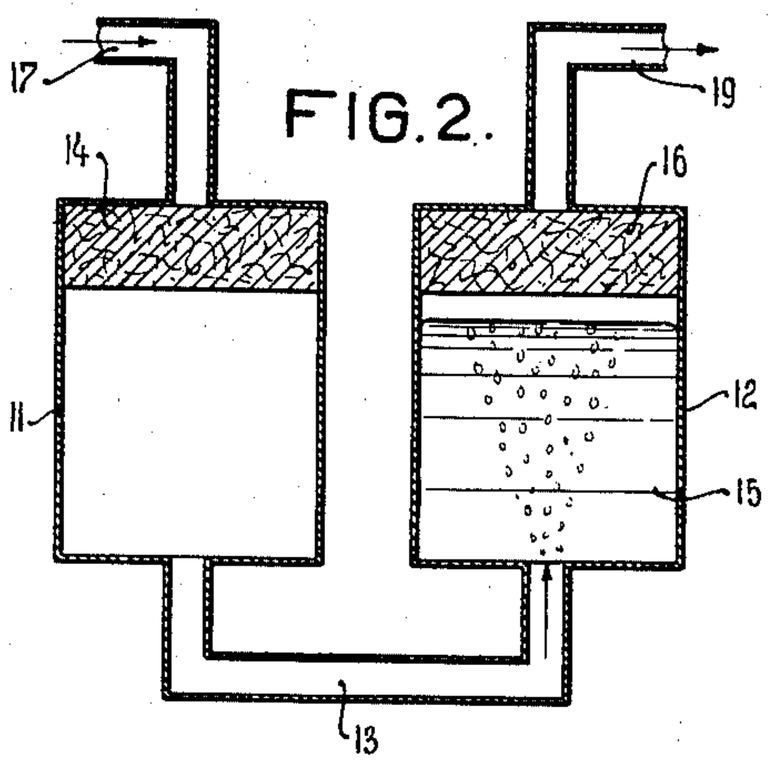


FIG. 3.

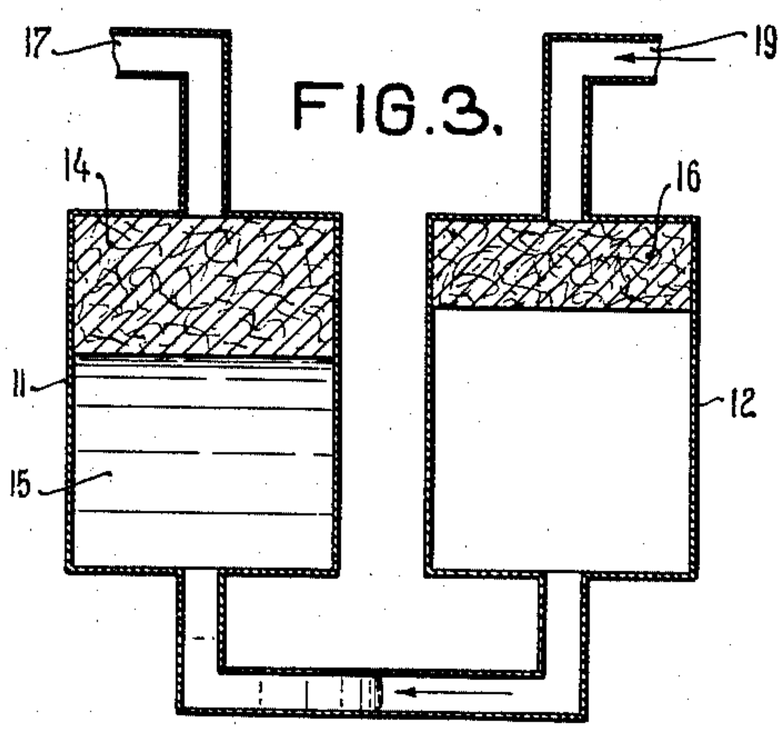


FIG. 5.

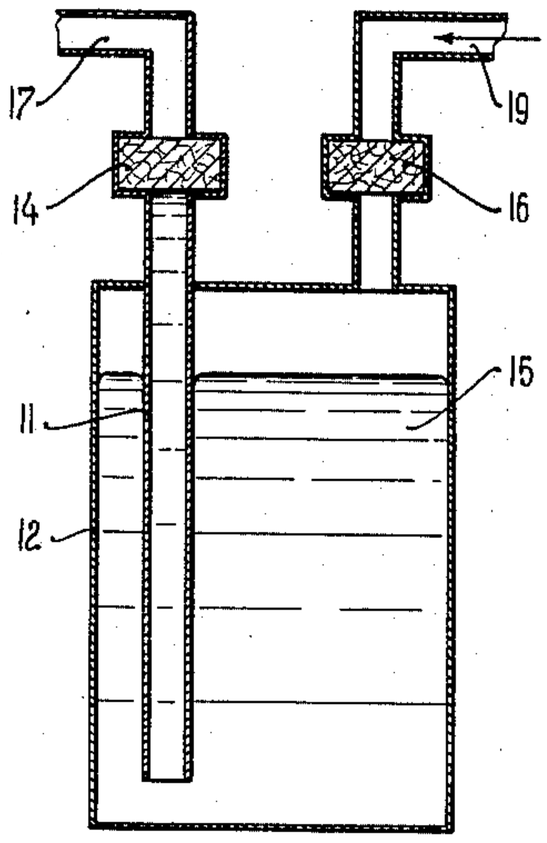
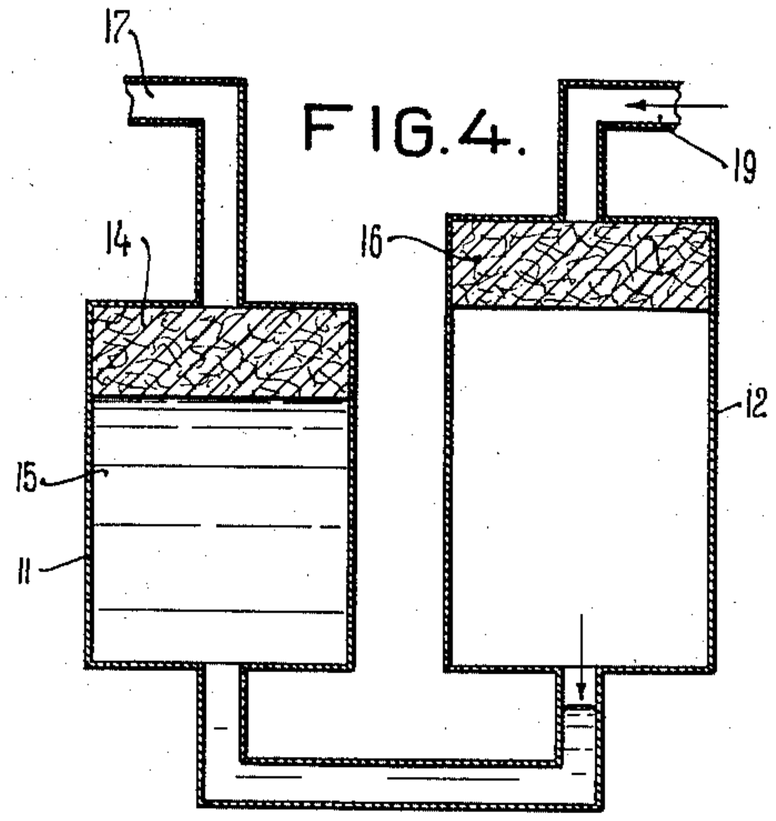


FIG. 4.



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MEANS FOR PROTECTING CONDUITS FOR EXPLOSIVE GAS MIXTURES

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16 Claims. (Cl. 48—192)

When a flame is burning on the mouth of a conduit for an explosive gas mixture, back fire is liable to occur, unless a suitable safety device is used. It has already been proposed to provide for a porous body or check placed inside the conduit so as to fill up the whole cross-sectional area thereof, and also for a column of liquid on said body, so that back fire, if any, is positively prevented from reaching the check and heating it to incandescence. As a rule, the liquid used for this purpose is water, although the use of other liquids has been suggested.

I have now found that water and similar liquids such as oil or glycerol are not very suitable for protecting the check against direct contact with the flame, in the first place because they readily pass through the porous material, and in the second place because small drops of said liquids, or vapour thereof, are likely to be taken along with the explosive gas, especially at high velocities of flow, so as to be evaporated or burnt in the flame. The first said drawback can be met by the provisioin of a trap in the conduit before the check, so that liquid passing through the porous material, on reduction of the gas pressure, is trapped and again forced into the space above said check when the gas pressure is restored. The second drawback, however, cannot be avoided, the result being that the combustion of the gas is unfavourably affected and that the amount of liquid gradually decreases, so that the device no longer affords the required safety.

With the object to overcome said difficulties, I now suggest to provide for a column of mercury, instead of water or the like. Mercury vapour is carried along with the explosive gas in exceedingly small quantities only. If the check is made of suitable material, mercury will not permeate it.

Moreover, mercury has the valuable property of dividing the gas into very small bubbles, so that it is not possible for the gas to burn in the form of a steady flame on the surface of said liquid.

In order to prevent any mercury from being carried along with the gas, I may also provide for a porous check above the level of the mercury. In order to prevent this check from being damaged by the return shock that may be caused by back fire, a check valve may be fitted in the conduit beyond the same. Alternatively, I may provide for a perforated metal, for instance steel plate to reinforce said check, or I may enclose it in a metal box having perforated top and bottom. The said check valve not only protects the porous body, or bodies, against damage, but also prevents the mercury from being squeezed through the porous material of the check on the side of the gas inlet. If desired, a second non-return valve may be provided before the check on the inlet side, although this will not be necessary if the safety device is suitably constructed.

The drawing illustrates some embodiments of my invention. On this drawing:

Fig. 1 is a longitudinal sectional elevation of a safety device in accordance with my invention.

Figs. 2–5 are diagrammatic sections of four other embodiments.

In Fig. 1, the device comprises a casing consisting of two superposed coaxial parts 1 and 2 with an interposed gasket 3*a*, said parts being pressed on one another by a threaded ring 3. The bottom of part 1 supports a porous body 4, for instance of burnt fireclay, which completely fills up the cross-sectional area of the casing and which itself supports a column of mercury 5. The upper part 2 encloses a similar porous body 6.

Threaded in a bottom opening of part 1 is the supply pipe 7 for an explosive gas mixture, and threaded in the top of part 2 is the outlet pipe 9, non-return valves 8 and 10 being provided in pipes 7 and 9, respectively.

If, with the construction just described, back fire causes a heavy return shock in the conduit, the mercury may be squeezed to a certain depth into the porous body 4. After restoration of normal conditions, the relatively low pressure of the gas supplied may not be able to force the mercury out of the pores, whereby the free passage of the gas is interfered with. This can be avoided by a construction in which the mercury chamber assumes substantially the form of of a U, so that both porous bodies are situated above the level of the mercury. In this case, however, it is desirable for both compartments of the mercury chamber to have different holding capacities, and to employ an amount of mercury such that during the normal flow of the gas the mercury can wholly or for by far the greater part be taken up by the one compartment, but that on an explosion occurring in the conduit the mercury cannot be fully accommodated in the second compartment.

In Figs. 2 and 3, the compartments 11 and 12 are connected by a relatively narrow pipe 13 opening into their bottoms. They contain a certain amount of mercury 15 and, in their upper

portions, porous bodies 14 and 16, respectively, above which the supply pipe 17 and the discharge pipe 19 are connected. During normal operation, the gas flows from pipe 17, through check 14, connection pipe 13 and check 16 to pipe 19, thereby forcing the whole amount of mercury into compartment 12. As will be understood, the gas has to bubble through the mercury 15 in order to reach pipe 19. If back fire occurs, the mercury is forced from compartment 12 into compartment 11 and the normal flow of gas is interrupted, see Fig. 3.

In order that the flame may then not "puncture" the mercury, it is necessary for the apparatus to contain a sufficient amount of said liquid. However, said amount should preferably be insufficient to completely fill the compartment 12 during normal operation. It is therefore preferred for compartment 11 to be smaller than compartment 12, see Fig. 4. In accordance with Fig. 5, compartment 11 is formed by increasing the length of the pipe 17, which dips into compartment 12.

It will be understood that a safety device in accordance with my invention may be interposed between a plurality of discharge pipes and a common supply pipe, or vice versa.

What I claim is:—

1. Means for protecting conduits for explosive gas mixtures, including in combination a tubular member having an inlet and an outlet, a mass of mercury within said member intermediate between the inlet and the outlet thereof, and a porous check having minute interstices in said member intermediate between the inlet and the mass of mercury.

2. Means for protecting conduits for explosive gas mixtures, including in combination a tubular member having an inlet and an outlet, a mass of mercury within said member intermediate between the inlet and the outlet thereof, a porous check having minute interstices in said member intermediate between the inlet and the said mass of mercury, and a second porous check having minute interstices in said member intermediate between the said mass of mercury and the outlet.

3. Means for protecting conduits for explosive gas mixtures including in combination a tubular member having an inlet and an outlet, a mass of mercury within said member intermediate between the inlet and the outlet thereof, a porous check having minute interstices in said member intermediate between the inlet and the mass of mercury, and a perforated metal plate reinforcing the said check.

4. Means for protecting conduits for explosive gas mixtures, including in combination a tubular member having an inlet and an outlet, a mass of mercury within said member intermediate between the inlet and the outlet thereof, a porous check having minute interstices in said member intermediate between the inlet and the said mass of mercury, a second porous check having minute interstices in said member intermediate between the said mass of mercury and the outlet, and perforated metal plates reinforcing said checks.

5. Means for protecting conduits for explosive gas mixtures, including in combination a tubular member having an inlet and an outlet, a mass of mercury within said member intermediate between the inlet and the outlet thereof, a porous check having minute interstices in said member intermediate between the inlet and the mass of mercury, and a check valve in said member intermediate between the check and the inlet.

6. Means for protecting conduits for explosive gas mixtures, including in combination a tubular member having an inlet and an outlet, a mass of mercury within said member intermediate between the inlet and the outlet thereof, a porous check having minute interstices in said member intermediate between the inlet and the said mass of mercury, a second porous check having minute interstices in said member intermediate between the said mass of mercury and the outlet, and a check valve in said member intermediate between the first said check and the inlet.

7. Means for protecting conduits for explosive gas mixtures, including in combination a tubular member having an inlet and an outlet, a mass of mercury within said member intermediate between the inlet and the outlet thereof, a porous check having minute interstices in said member intermediate between the inlet and the said mass of mercury, a second porous check having minute interstices in said member intermediate between the said mass of mercury and the outlet, a check valve in said member intermediate between the first said check and the inlet, and a second check valve in said member intermediate between the second check and the outlet.

8. Means for protecting conduits for explosive gas mixtures, including in combination a tubular member having an inlet and an outlet, a mass of mercury within said member intermediate between the inlet and the outlet thereof, a porous check having minute interstices in said member intermediate between the inlet and the mass of mercury, a check valve in said member intermediate between the check and the inlet, and a perforated metal plate reinforcing said check.

9. Means for protecting conduits for explosive gas mixtures, including in combination a tubular member having an inlet and an outlet, a mass of mercury within said member intermediate between the inlet and the outlet thereof, a porous check having minute interstices in said member intermediate between the inlet and the said mass of mercury, a second porous check having minute interstices in said member intermediate between the said mass of mercury and the outlet, a check valve in said member intermediate between the first said check and the inlet, and a perforated metal plate reinforcing said check.

10. Means for protecting conduits for explosive gas mixtures, including in combination a tubular member having an inlet and an outlet, a mass of mercury within said member intermediate between the inlet and the outlet thereof, a porous check in said member intermediate between the inlet and the said mass of mercury, a second porous check in said member intermediate between the said mass of mercury and the outlet, a check valve in said member intermediate between the second check and the outlet, and perforated metal plates reinforcing said checks.

11. Means for protecting conduits for explosive gas mixtures, including in combination a tubular member composed of two chambers communicating with one another near their bottoms and having an inlet and an outlet, respectively, in their upper portions, a porous check in said member intermediate between the

inlet and the first chamber, a second porous check in said member intermediate between the outlet and the second chamber, and a mass of mercury within said member intermediate between said checks.

12. Means for protecting conduits for explosive gas mixtures, including in combination a tubular member composed of two chambers of unequal holding capacities communicating with one another near their bottoms and having an inlet and an outlet, respectively, in their upper portions, a porous check in said member intermediate between the inlet and the smaller chamber, a second porous check in said member intermediate between the outlet and the larger chamber, and a mass of mercury within said member intermediate between said checks, the volume of said mass exceeding the volume of the smaller chamber.

13. Means for protecting conduits for explosive gas mixtures, including in combination a tubular member composed of two chambers of unequal holding capacities communicating with one another near their bottoms and having an inlet and an outlet, respectively, in their upper portions, a porous check in said member intermediate between the inlet and the smaller chamber, a second porous check in said member intermediate between the outlet and the larger chamber, and a mass of mercury within said member intermediate between said checks, the volume of said mass exceeding the volume of the smaller chamber but being smaller than that of the larger chamber.

14. Means for protecting conduits for explosive gas mixtures, including in combination a tubular member composed of two chambers connected with one another near their bottoms and having an inlet and an outlet, respectively, in their upper portions, the first chamber communicating with the second chamber, a porous check in said member intermediate between the inlet and the inner chamber, a second porous check in said member intermediate between the outlet and the outer chamber, and a mass of mercury within said member intermediate between said checks.

15. Means for protecting conduits for explosive gas mixtures, including in combination a chamber containing a mass of mercury, a dip pipe provided within said chamber and having a gas inlet, a gas outlet pipe opening into said chamber near the top thereof, and porous checks in both said dip pipe and said outlet pipe.

16. Apparatus for protecting conduits for explosive gas mixtures, including a cylindrical member forming a first compartment, an elongated conduit extending partly into said first compartment and forming a second compartment, and opening at its bottom into said first compartment, the said cylindrical member having an outlet and the said conduit forming an inlet in their upper portions, a porous check in said conduit between its inlet portion and its compartment portion, a second porous check between said outlet and said cylindrical member, and a mass of mercury within said cylindrical member and said conduit between said checks.

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