June 16, 1936. S. DUNIN-MARKIEWICZ ET AL 2,044,537

SAFETY DEVICE FOR GAS CONDUITS

Filed Feb. 23, 1933

Fig. 1.

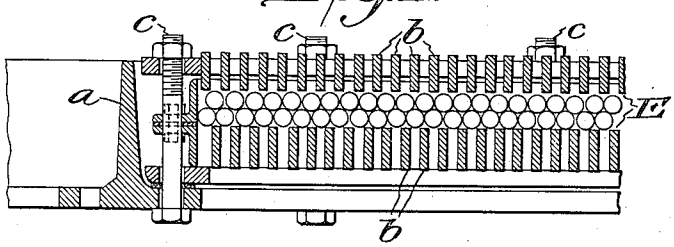


Fig. 3.

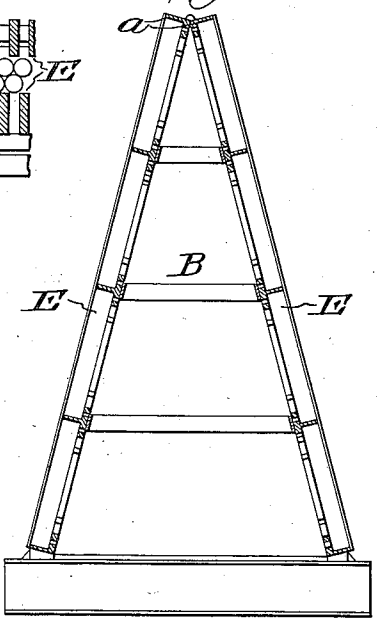


Fig. 2.

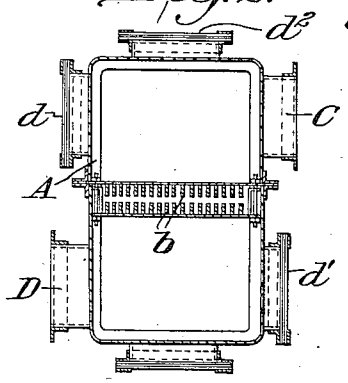


Fig. 4.

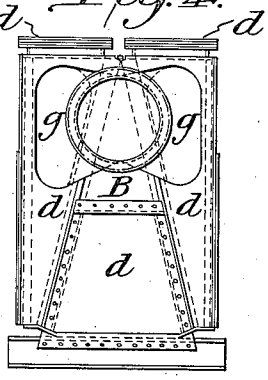


Fig. 5.

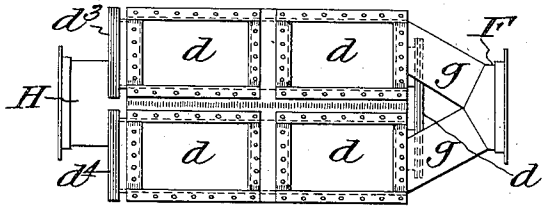


Fig. 6.

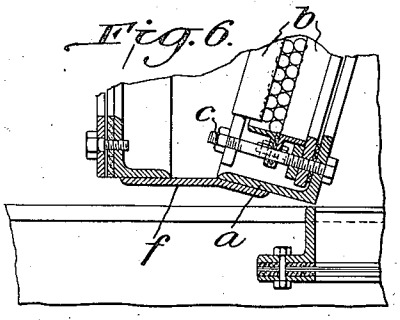
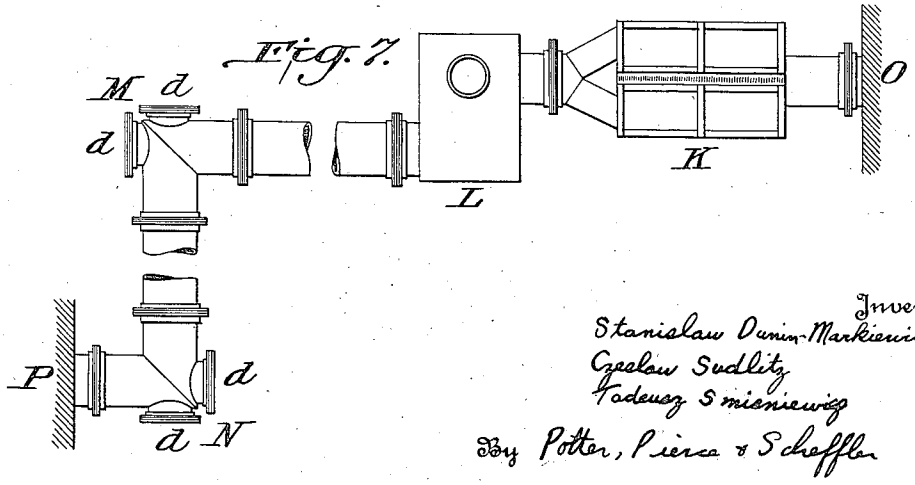


Fig. 7.



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SAFETY DEVICE FOR GAS CONDUITS

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Application February 23, 1933, Serial No. 658,258
In Poland April 12, 1932

3 Claims. (Cl. 48—192)

The already known devices for the prevention of propagation of the detonation of the wave and the flame in conduits for transmitting explosive gaseous mixtures, do not accomplish their purpose, especially when such conduits are of large dimensions and when the detonation wave is very strong. These devices comprise usually layers of gas permeable masses, for instance of the kieselguhr-earth, or these layers consist of balls, of wire nets, etc. Such layers are disposed in chambers located in said conduits. If the detonation wave is very powerful, it often happens in large conduits that the balls contained between perforated plates are forced apart or the nets are broken. In consequence of that the flame is not quenched, but passes on to the other side of the device.

The object of the present invention is to avoid said drawbacks.

According to this invention the desired end is attained in such a manner, that the grids between which the layers of balls and nets, or of the nets only are located possess bolts or similar means for clamping the said grids in the frame. These frames are disposed in the chamber parallel or almost parallel to the longitudinal axis of the conduits, the walls of the chambers being provided with diaphragms of a material having a small resistance to the tensile stresses, disposed on the walls of the chamber opposite to the outlets of the conduits and perpendicularly to the frames.

Various embodiments of the invention will now be described with reference to the accompanying drawing in which:

Figure 1 is a vertical section of part of a filling for use in apparatus according to the invention.

Figure 2 a partial vertical section through a chest having a filling similar to that of Figure 1 disposed therein in a manner more particularly devised for small pipe lines.

Figure 3 a vertical section of a filling intended for use in a pipe line of larger capacity.

Figures 4 and 5 an elevation and plan of a chest having a filling such as that of Figure 3 arranged within it,

Figure 6 a vertical section of a detail, and

Figure 7 a plan view of a pipe-line installation containing apparatus of the kind shown in Figures 4–6.

Referring primarily to Figure 1, a filling E, constituted by a number of balls is packed closely between grids *b* arranged right across a frame *a*. The two grids *b* are tightly connected together by bolts *c* so that the balls or netting arranged between them are completely protected against being forced apart or displaced. If the filling requires to be of considerable dimensions, it is advantageous that it be divided into separate smaller units which are arranged in a common grid-like frame. The frame *a* is disposed in a chest A as illustrated in Figure 2, which shows a relatively simple arrangement suitable for use with pipe lines of comparatively small capacity or diameter. Gas enters the chest A on one side by a connection C and leaves it on the other side by the connection D. Dummy connections opposite to and at right angles to the connections C, D are closed by sheet metal plates *d*, d_1 d_2 of no great strength. If an explosive wave is created, the gases force out the protective plate *d* and flow, simply due to the suction effect, through the horizontal filling E and emerge, again flowing in the initial direction, through the connection D. The combined effects of the relief of the pressure, the traversal of the interstices of the metal filling E, and the changes of direction serve to localize, or minimize the harmful results of the explosion. Any excessive gas pressure existing after the filling E has been traversed will cause the breakage of the protective plate *d'*. If the explosive wave should approach on the side of the connection D, then the above described action takes place in the reverse sense.

If the filling is large, a larger chest A must be employed. This is not always convenient and for pipe lines of large capacity or diameter the disposition of the apparatus illustrated in Figures 3–5 is to be preferred. The flow of the gases is somewhat differently directed in this case: The chest A is divided into three chambers by fillings E disposed in its interior in the form of an isosceles triangle. The gas enters by way of the pipe F, Figure 5, which is divided into, for example, two branches *g*. It flows into the chest A towards the cover plates d_3, d_4, i. e., perpendicular to the plane of the paper in Figure 3 and outside of the triangle formed by the filling E. The gas then passes through the interstices of the fillings E into the space B within the triangle formed by said fillings, Figures 3 and 4, thereby undergoing a change of direction of flow of 90°. After traversing the fillings, the gas again undergoes a change of direction of flow of 90° into the original direction and passes out through a pipe H.

As far as possible covers or partitions of thin material, such as sheet metal, having little

strength to resist increased pressure are disposed in the chest A in the path of all possible directions of an explosive wave. Thus apart from the covers d_3, d_4, other covers d may be provided in the top and right hand and walls of the chest A. Also similar covers, not shown, may be provided in the side walls of the chest so as to be encountered by any explosive wave traversing the filling E. Furthermore in order that excessive forces due to increased pressure shall not under any circumstances come to act upon the fillings E, these are themselves connected with the chest A by means of sheet metal members f of low strength. This constructional detail is illustrated in Figure 6.

As a further precaution against the occurrence of excessive pressures in the pipe line, similar covers d may, if desired, be arranged also at natural or deliberately provided bends in the pipe line. The number provided depends upon the length of the pipe line and other factors. They may be arranged, for instance, at 10 metre intervals. Such covers are illustrated in Figure 7 which shows diagrammatically an installation wherein gas is drawn from a point P to a point O. The pipe line has a number of bends N, M, etc., with covers d as protection against excessive pressure increase. The installation also comprises a filter L for arresting dust, and a device K containing fillings E disposed as in Figures 3–6.

The apparatus of the invention enables successful results to be obtained even with such powerfully detonating gases as a mixture of oxygen and hydrogen or a mixture of ether vapour with air.

We claim:

1. Apparatus for preventing propagation of detonation waves and flames in conduits and pipe lines for explosive gas mixtures comprising a chamber, a permeable member mounted in said chamber between the inlet and outlet thereof comprising a pair of parallel foraminous grids enclosing permeable filling material and held together by means of bolts, said member being disposed substantially parallel to the longitudinal axes of the inlet and outlet conduits, and low strength connecting members between said member and said chamber.

2. Apparatus for preventing propagation of detonation waves and flames in conduits and pipe lines for explosive gas mixtures comprising a chamber, two pairs of parallel foraminous grid members, each pair enclosing permeable filling material and being held together by means of bolts, the pairs of grid members being disposed in said chamber between the inlet and outlet thereof parallel to the longitudinal axes of the inlet and outlet conduits so as to divide the chamber into a central portion into which one of said conduits opens and outer portions into which the other of said conduits opens, whereby the gas stream is forced to flow through said perforated grid members at right angles to its direction of flow on entering and leaving the chamber.

3. Apparatus for preventing propagation of detonation waves and flames in conduits and pipe lines for explosive gas mixtures comprising a chamber, two pairs of parallel foraminous grid members, each pair enclosing permeable filling material and being held together by means of bolts, the pairs of grid members being disposed in said chamber between the inlet and outlet thereof parallel to the longitudinal axis of the inlet and outlet conduits so as to divide the chamber into a central portion into which one of said conduits opens and outer portions into which the other of said conduits opens, whereby the gas stream is forced to flow through said perforated grid members at right angles to its direction of flow on entering and leaving the chamber and low strength connecting members between said grid members and said chamber.

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CERTIFICATE OF CORRECTION.

Patent No. 2,044,537. June 16, 1936.

STANISLAW DUNIN-MARKIEWICZ, ET AL.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, second column, lines 20 and 37, claims 2 and 3 respectively, for the word "perforated" read "foraminous"; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 25th day of August, A. D. 1936.

Leslie Frazer

(Seal) Acting Commissioner of Patents.