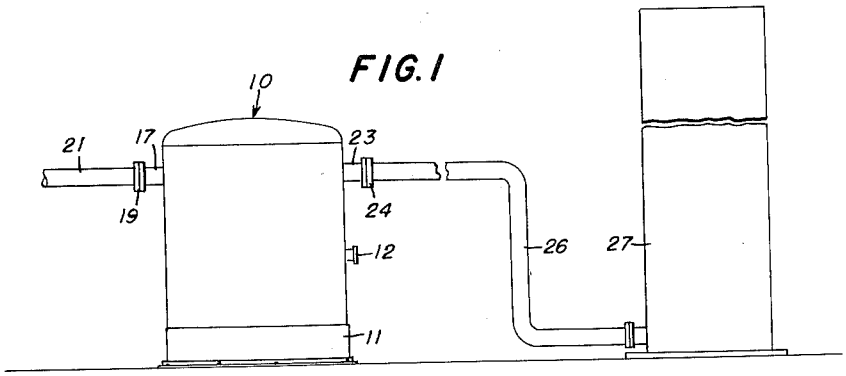
Nov. 20, 1962 R. D. REED 3,064,956

APPARATUS FOR CONTROLLING FLOW OF GASES

Filed Oct. 15, 1958

FIG. 1



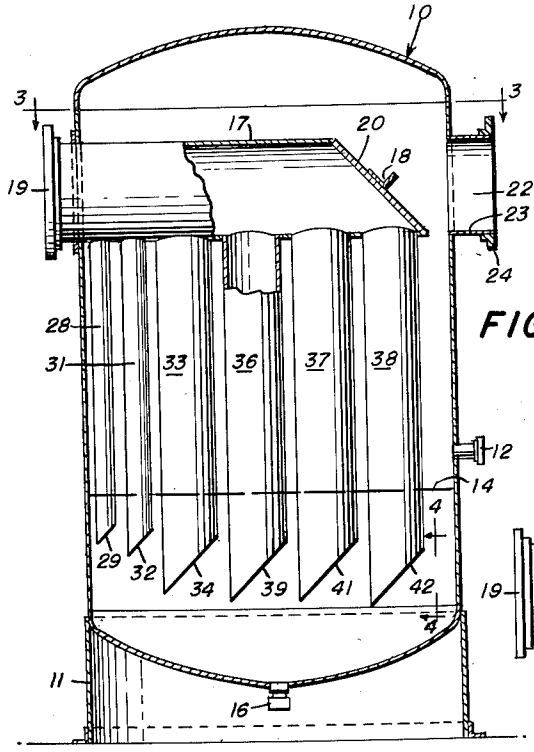
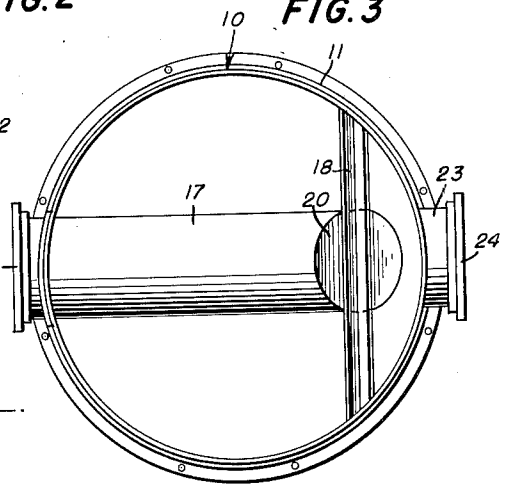


FIG. 2

FIG. 3



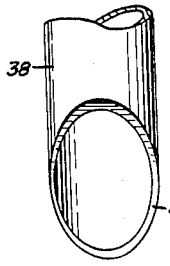


FIG. 4

INVENTOR
ROBERT D. REED

BY

ATTORNEY

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APPARATUS FOR CONTROLLING FLOW OF GASES

Robert D. Reed, Tulsa, Okla., assignor to John Zink Company, Tulsa, Okla., a corporation of Delaware

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2 Claims. (Cl. 261—124)

The present invention pertains to the distribution of gaseous mediums such as a combustible gaseous fuel mixture and more specifically pertains to apparatus which includes a container for a supply of liquid through which the gas will only flow when the pressure applied to the gaseous medium in the supply line upstream of the liquid is greater than that which will displace the liquid above the level of emergence of the gaseous medium in the liquid.

It is known to provide apparatus which has been referred to as a "water seal pot" which allows gases to flow through the water when the pressure in the supply line upstream of the water seal pot is greater than that which will displace the head of water above the point at which the gas is released. One of such known devices includes a tube which guides the gas into a vessel and an upwardly directed open end of the tube is immersed in the water retained in the vessel. The gas when supplied at pressures greater than those required to displace the head of water above the open free end of the tube moves through the liquid. If the point where the gas escapes from the open end of the tube is two inches below the level of the water therein the pressure at which the gaseous medium is supplied must be equal to or exceed two inches of water before there can be any flow of gas through the seal pot. The flow of gas is not constant because the gaseous medium is compressed by the liquid and the movement of the gas through liquid is in the form of large bubbles. The bubbles of compressible gas within an incompressible liquid set up pressure surges both upstream and downstream of the seal pot. It is possible for these surges to vary sufficiently to cause instantaneous interruption of the flow of gases downstream of the water pot. Thus for example when a water seal pot of the type employed in the past is arranged in the gas supply line to a flare stack gas burner the interruption in the flow of gases often causes a rapid extinction of the flame with corresponding rapid reignition which provide a repeating of an objectionable "boom" upon each reignition of the gaseous medium.

It is an object of the present invention to provide improvements in a water seal pot wherein the gaseous medium flowing therethrough is released at a plurality of different zones and levels below the liquid level within the seal pot whereby the gaseous medium is released at a plurality of points and at various levels within the liquid to provide a water seal pot wherein surges in the lines leading to and away from the device are reduced.

Another object of the invention is to provide apparatus for controlling the flow of gaseous medium through a liquid seal wherein means is provided for releasing the gas as a series of small bubbles which do not occur simultaneously to thereby reduce and substantially eliminate objectionable pressure surges in the gas supply line.

A more specific object of the invention is to provide a plurality of tubes which depend from an inlet manifold of a water seal pot which have bevelled lower ends terminating at different levels below the surface of the liquid therein to provide oval shaped openings for the flow of gases from the depending tubes so that the gas escaping from upper ends or the top of the oval openings proceed through small cross sectional areas to form small bubbles to reduce pressure surges in the supply line.

A still further object of the invention is to provide depending tubes in a water seal pot which release the gas therefrom at progressively lower levels as the volume of flow of gas increased whereby the gas is released progressively at more deeply immersed zones with the flow of gas from the lower end of each tube occurring in relatively small areas to provide small bubbles and accordingly reduce pressure surges in the supply line.

Other objects and features of the invention will be appreciated and become apparent as the disclosure proceeds and upon consideration of the accompanying drawing and the following detailed description wherein an embodiment of the invention is disclosed.

In the drawing:

FIG. 1 is a diagrammatic view illustrating a device exhibiting the invention in one application thereof.

FIG. 2 is an enlarged sectional view of a water seal pot embodying the invention.

FIG. 3 is a horizontal sectional view taken on the line 3—3 of FIG. 2.

FIG. 4 is an enlarged view of the lower end portion of one of the depending tubes taken on the line 4—4 of FIG. 2.

Referring to the drawing there is shown at 10 a housing which may be of generally cylindrical formation and provided with a base 11 having an annular flange for supporting the housing in an upright position. The housing provides a container adapted to receive liquid such as water through an opening 12. The liquid is desirably maintained at a level indicated at 14. Suitable drain means is provided such as a drain plug 16 arranged at a lower extremity of the housing 10.

An inlet pipe or manifold 17 is mounted in the upper portion of the housing 10 and it extends diametrically of the container. The upstream end of the manifold 17 is supported on the cylindrical wall of the housing and the inner end may be supported in any suitable manner such as by a bracket 18 welded to the closed end 20 of the manifold and welded to the cylindrical wall of the housing. A flange 19 carried by the inlet end of the manifold 17 provides for connection thereof to a supply line 21. The manifold 17 is arranged diametrically of the housing 10 and is desirably supported with its axis in a horizontal plane. The housing 10 is provided with an outlet opening 22 and a pipe section 23 leading from this outlet and carrying a flange 24 is for the purpose of connecting the device to a conduit 26 leading to any desired gas consumption station or equipment such as a flare stack burner represented at 27.

A tube 28 depends from the inlet manifold 17 as shown in FIG. 2. The tube 28 is welded or otherwise connected to the inlet manifold so as to be supported thereby. The tube 28 is in open communication with the inlet manifold and the lower end is open and bevelled as indicated at 29. The open lower end of the tube 28 terminates below the level 14 of the liquid in the housing 10. Another tube 31 depends from the inlet manifold as shown in FIG. 2 and its point of connection and communication with the manifold is spaced from that of the tube 28. The lower end of the tube 31 terminates below the liquid level 14 and the open end is bevelled as indicated at 32. The tube 31 has a larger diameter than the tube 28 and the upper extremity of the open lower end as provided by the bevel 32 is at a lower level than of the upper end of the bevelled end 29 of the tube 28. An additional tube 33 of larger diameter than the tube 31 is connected to and depends from the inlet manifold 17. The tube 33 is spaced from the tube 31 and its lower end is bevelled as indicated at 34. The upper end of the bevelled surface 34 terminates at a lower level than the corresponding end of the bevelled surface 32. Additional tubes 36, 37 and 38 in open communication with the manifold 17 depend therefrom. The lower ends of these tubes are open and terminate below the level of the liquid within the housing 10. The upper extremity of the bevelled end 39 carried by the tube 36

is at a lower level than the upper extremity of the bevelled end 34. The upper extremity of the bevelled end 41 carried by the tube 37 is at a lower level than the upper extremity of the bevelled end 39 of the tube 36. The upper extremity of the bevelled end 42 carried by the lower end of the tube 38 is at a lower level than that of the upper extremity of the bevelled end 41 of the tube 37.

In operation and when a gaseous medium is supplied through the line 21 at a pressure greater than the height of the liquid maintained at the level 14 above the open ends of the depending tubes the gas begins to flow through the upper extremity of the bevelled surface 29 of the tube 28 because this open end is at a minimum immersion in the liquid. Gas may also flow from the open end of the tube 31 at the upper extremity of the bevelled end 32. Each succeeding tube has the upper extremity of its bevelled end at a slightly greater depth in the liquid. The progressively increased depth provides for release of the gas and makes it impossible for synchronous bubbling of the gas to take place through the liquid and pressure surges are thereby reduced.

The bevelled portion at the lower end of each depending tube which may be at an angle of approximately forty-five degrees with respect to the axis of the associated tube provides an oval opening as shown in FIG. 4 for the flow of gases from each tube. At the upper end portion of each bevelled surface the opening is of a small area and this area increases in proceeding downwardly along the open end portion of each tube. An increase in pressure is required for an increase in flow of the gas in proceeding downwardly along each lower end of the tubes in view of the increasing depth of immersion. Thus as pressures of the incoming gases increase the gas will spill in succession through the progressively more deeply immersed open ends of the tubes. The spill of gas from each tube occurs through a relatively small area at the upper end of the open inclined end so that the bubbles formed will be small and accordingly the bubble induced pressure surges are small.

The device serves to allow flow of gas in one direction such as towards the atmosphere or to the open end of a flare stack burner as represented at 27 in FIG. 1. The flow of gas is downstream of the device when the pressure in the line 21 upstream of the water seal pot is greater than that which is necessary to displace a head of water equal to the vertical measurement between the liquid level 14 and the upper extremity of any one of the open lower ends of the tubes which depend from the inlet manifold 17. If the small tube 28 has the upper extremity of its bevelled surface 29 disposed two inches below the level 14 the pressure in the supply line 21 must exceed two inches of water in order for flow to occur. Reversal of flow cannot occur until the pressure in the line 26 is equal to the level 14 of water above the upper extremity of the bevelled end 29 of the tube 28 plus a pressure greater than that which is applied to the gaseous medium in the line 21. Thus the device may be employed to maintain pressures at the upstream side of the water seal pot greater than the pressures at the downstream side thereof. the device may be employed to provide a seal preventing air from entering the supply line 21 and contacting a combustible gaseous medium.

While the invention has been described with reference to specific structural features and with regard to apparatus for use in controlling the flow of gaseous mediums such as gaseous fuel mixtures it will be appreciated that changes may be made in the overall assembly and the device may be used for other purposes. Such changes and other and further modifications may be made without departing from the spirit and scope of the invention as set forth in the appended claims.

What I claim and desire to secure by Letters Patent is:

1. Apparatus for controlling the flow of the gaseous medium comprising, a closed housing adapted to contain a liquid in the lower portion thereof, said housing having an outlet opening above the level of the liquid, a manifold arranged transversely within the housing above the level of said liquid adapted to receive a gaseous medium under pressure, a series of tubes depending from said manifold into said liquid at spaced intervals, said tubes having progressively larger cross sectional areas, each tube having a bevelled lower end defining its lower open end, said bevelled lower ends on all the tubes facing on one general direction, and the lower open end of the tube having the smallest cross sectional area terminating at one level under the surface of the liquid with the tubes of progressively larger cross sectional areas terminating progressively at greater distances below the surface of the liquid.

2. Apparatus for controlling the flow of a gaseous medium comprising, a closed housing adapted to contain a liquid in the lower portion thereof, said housing having an outlet opening above the level of the liquid, a manifold within the housing above the level of said liquid adapted to receive a gaseous medium under pressure, a series of tubes depending from said manifold into said liquid at spaced intervals, said tubes having progressively larger internal cross sectional areas, each tube having a bevelled lower end defining its lower open end, and the lower open end of the tube having the smallest cross sectional area terminating at one level under the surface of the liquid with the tubes of progressively larger cross sectional areas terminating progressively at greater distances below the level of the liquid.

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