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GAS CONTROL AND FEEDING UNIT

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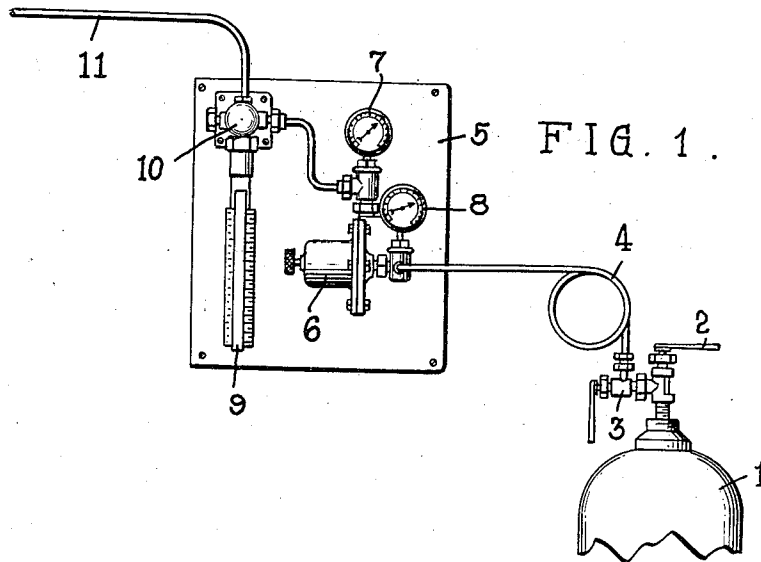


FIG. 2.

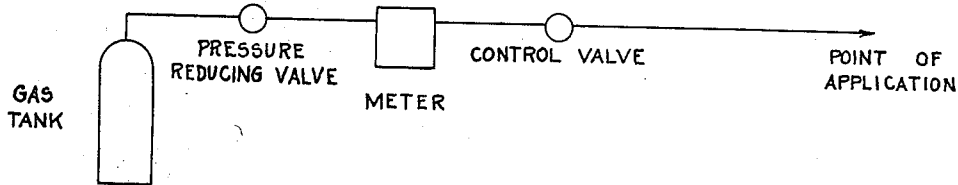
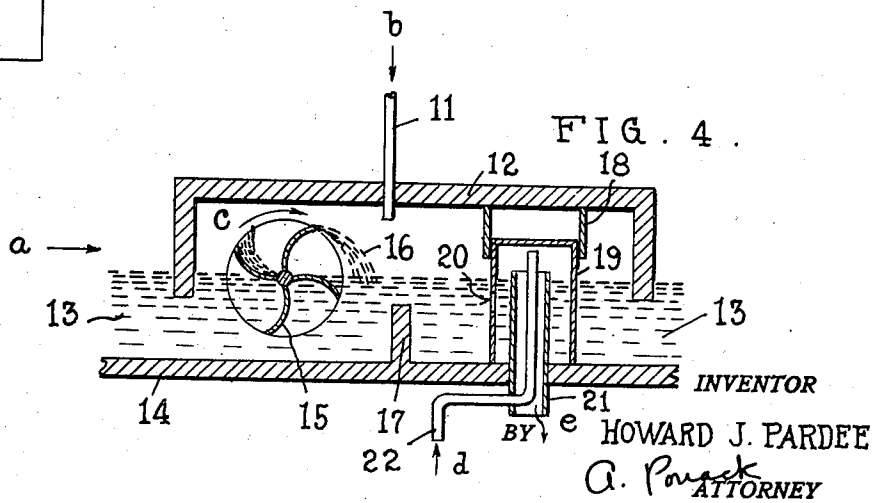
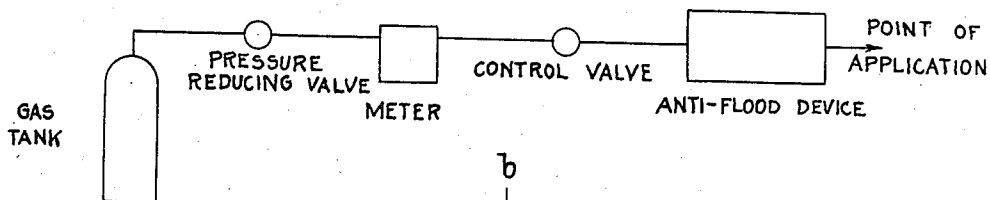


FIG. 3.



UNITED STATES PATENT OFFICE

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GAS CONTROL AND FEEDING UNIT

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3 Claims. (Cl. 73-199)

The present invention relates to a novel and improved gas control and feeding unit. In its broadest aspect, this unit is of general application irrespective of the gas which is being fed or the material which is being treated. In its more specific aspect, the invention has particular relation to that type of unit which is adapted to maintain and control a flow or feed of gas, such as chlorine, ammonia or the like, under pressure, from a source of supply to a body of material, such as water, sewage or the like, which it is desired to treat.

A primary object of the present invention is to improve the construction set forth in applicant's prior patent application, Serial No. 514,884, filed February 10, 1931, and now Patent No. 1,912,383, by simplifying the aforesaid construction without sacrificing any of the advantages thereof, while obviating some of the disadvantages thereof.

A further object of this invention is to provide a gas control unit comprising a pressure reducing valve, a meter, and a control valve, which unit is adapted to be interposed between a source of gas under pressure and a point or points of application, and wherein the relationship of the parts is such that the meter is always under the controlled pressure of the pressure reducing valve and not subject to the fluctuations in pressure which usually occur in the discharge line.

Another object of the invention is to dispose the control valve between the point of application and the remainder of the device and to so control the pressure relationships on the two sides of this valve that variations in the discharge pressure will not affect the weight of gas flowing through the valve.

In the gas control unit of the prior application, above referred to, it was necessary to utilize a carefully built back pressure valve to maintain the requisite pressure on the meter for which the latter was calibrated. The present invention enables such back pressure valve to be eliminated while still retaining the accurately calibrated meter and obtaining an accurate and controlled feed of gas.

Another object of the present invention is to provide an apparatus of the character hereinbefore outlined, wherein the several constituent elements may be of conventional or substantially standard construction.

A further object of the invention is to provide a unit of the character described including means for preventing back flooding of the gas when the latter is turned off, in the case where a gas is being applied to a liquid in which it is soluble.

The foregoing and other objects of the invention, which will be apparent to those skilled in the art from the following detailed disclosure thereof, are attained by the illustrative embodiments of the invention which are described in the specification and shown on the accompanying sheet of drawings.

In said drawing,

Fig. 1 is a somewhat pictorial illustration of an embodiment of the present invention, parts being broken away;

Fig. 2 is a diagrammatic representation of the embodiment shown in Fig. 1;

Fig. 3 is a diagrammatic representation of a second embodiment of this invention;

Fig. 4 is a sectional view illustrating the anti-floor element of the aforesaid second embodiment.

Corresponding reference characters are used to designate corresponding parts throughout the several figures of the drawing.

Reference numeral 1 designates the upper end of a tank of gas, such as chlorine or the like, under pressure. This tank or cylinder is provided at its outlet end with a conventional cylinder valve 2 and auxiliary tank valve 3. Flexible connection 4 constitutes the line between the gas cylinder and the gas control unit.

The gas control unit, which may be mounted on a supporting panel 5 by means of suitable securing elements, consists of a pressure reducing valve 6 and a reduced pressure gauge 7, a tank pressure gauge 8, a meter 9, and a control valve 10. Suitable conduit connections are provided between the several constituent elements of the unit, and a tube 11 leads from the discharge side of the control valve 10 to the point of application of the gas. The gas flows from the supply cylinder to the tank pressure gauge to the pressure reducing valve to the reduced pressure gauge to the meter to the control valve, and thence to the material being treated.

An important feature of the invention is the relationship between the meter and the pressure reducing and control valves. As is particularly illustrated in Fig. 2, the meter is disposed between the two said valves; that is, on the discharge side of the pressure reducing valve and on the inlet side of the control valve.

Any suitable form of meter may be used, although the preferred construction is that of the orifice meter disclosed in the prior application aforementioned. Similarly, any suitable or desirable constructions of pressure reducing and control valves may be employed. Thus, the pres-

sure reducing valve may be similar in construction to pressure reducing valve construction C, D of the aforesaid application, while the control valve may be similar in construction to the control valve E of such application.

The meter is calibrated to indicate the rate or quantity of flow of a particular gas at a given pressure, and the pressure reducing valve is regulated to reduce the pressure of the gas supplied from the cylinder to this definite pressure.

The control valve is on the discharge side of the meter, so that the latter is always under the controlled pressure of the pressure reducing valve and not subject to the fluctuations that usually occur in the discharge line.

Another feature of the present invention is the relationship which is set up between the pressure on the two sides of the control valve. By making the pressure on the discharge of the control valve less than about one-half of the pressure on the inlet of the control valve, it is found that fluctuations of pressure of the gas on the discharge of the control valve will not affect the weight of gas which passes through the valve. In other words, use is made, in the system of the present invention, of a reduced pressure within the unit (i. e., between the discharge of the pressure reducing valve and the inlet of the control valve), which is more than twice the pressure on the discharge of the control valve. It will be understood that this refers to absolute pressures and not to gauge pressures. Thus, if the unit is used to discharge to pressures at about atmospheric (14.7 pounds absolute), then the pressure reducing valve is set to reduce the pressure of the gas from the cylinder to about 25 pounds gauge (about 39.7 absolute), and the meter is calibrated for use at the latter pressure.

A unit characterized by the aforescribed relationships of parts and pressures is simple in construction, but is of high efficiency and functions to maintain its feed of gas with a very high degree of accuracy.

To recapitulate, the present invention provides a gas control unit comprising a pressure reducing valve, an orifice meter or the like, and a control valve, wherein the pressure reducing valve is used to maintain a uniform pressure on the meter, which enables the latter to be accurately calibrated, and also a uniform pressure on the control valve. Then by setting this reduced pressure so that it is more than twice the pressure on the discharge of the control valve, a constant rate of flow through the latter is assured, regardless of possible fluctuations in pressure in the discharge line of the apparatus.

A difficulty which is often encountered in apparatus of the type hereindescribed is that of back flooding, which is particularly prone to occur when liquids are being treated with gases which are soluble therein as, for example, the chlorination of liquid sewage, etc. When the flow of gas, in such an installation, is shut off, the gas which is left in the discharge line dissolves in the liquid, causing the latter to flood back into the apparatus. In view of the fact that the liquid is often corrosive in character, it is apparent that the apparatus is liable to serious damage.

In accordance with the present invention, means may be provided to prevent such back flooding. This may be accomplished by providing an antiflood device at or adjacent the point of application of the gas to the liquid, the antiflood device being preferably cut into the discharge line.

One form of antiflood device is illustrated in detail in Fig. 4 of the drawing. This may comprise a hood 12 into which the end of the discharge line 11 extends. The lower edges of the downwardly directed walls of hood extend beneath the surface of the liquid 13 which is being treated. The latter may be constituted, for example, by a stream of sewage or the like flowing through a suitable conduit or receptacle 14 in the direction of arrow *a*. The aforescribed arrangement provides a sealed chamber under hood 12 and above the surface of the liquid.

Means, such as a paddle 15 or other suitable device, is preferably provided for entraining a portion of the liquid, raising it from the main body of liquid and returning it to the latter in the form of a descending curtain of liquid, substantially as is shown at 16. Paddle 15 or other curtain-forming device preferably extends substantially across hood 12. Paddle 15 is rotatable in the direction of arrow *c*, and may comprise scoops shaped like those illustrated in Fig. 4. The descending curtain of liquid entrains gas which is being delivered, in the direction of arrow *b*, from the discharge line, and carries it down into the body of the liquid stream or the like. The baffle member 17, giving rise to eddies and the like, aids in the intimate admixing of the gas and the liquid.

In the chlorination of sewage, inert gases are formed due to the action of the chlorine on the sewage. This inert gas collects in the top of dome 12, which may be constructed of such dimensions as to insure the presence of sufficient of this gas to replace that which may be dissolved out of the apparatus when the gas, for any reason, is shut off. Solution of the chlorine tends to set up a partial vacuum above the liquid and to draw the latter into the apparatus. However, the inert gas interposes itself between the control unit and the liquid being treated, thus preventing back flooding of the unit by the liquid.

In some cases, the reaction involved may not be of a character to liberate inert gas of the character aforescribed. In this event, a sufficient supply of the latter may be introduced into the hood from an extraneous source. To this end, a substantially cylindrical guide member 18 may project downwardly from the top of the hood to act as a guide for float member 19. The latter may be substantially cylindrical in form and open at its lower end. An opening 20 is provided in the side wall of the float below the normal level of the liquid 13. Conventional means (not shown) may be provided for maintaining the normal level of liquid 13 substantially constant. Overflow conduit 21 extends up into the float to slightly above the normal level of the liquid. Air vent 22 extends into the space at the top of the float 19, air coming in through inlet *d*.

In the event that liquid 13 tends to rise due to the formation of a partial vacuum, as hereinafore described, liquid within float 19 also rises until the top of conduit 21 is reached, whereupon the liquid is discharged at *e*. As the liquid continues to rise outside of the float, the latter is raised, being properly balanced for this purpose. Air from within the float 19, which is adequately supplied through vent 22, will then bubble through opening 20, which will have assumed a position above the level of the liquid within the float, and will break the partial vac-

uum in the apparatus, preventing back flooding of the control unit.

While certain features of the invention have been set forth in great detail, it is not thereby intended to limit the scope of the present invention or otherwise than by the terms of the claims hereunto appended. Thus, it will be understood that the pressure reducing valve may be a positive pressure reducing valve or a pressure reducing vacuum valve, depending upon prevailing pressure conditions.

Having disclosed the invention, what is claimed is:

1. In a gas control unit for feeding gas at a predetermined and regulable rate to a liquid, a control valve, means disposed on the inlet side of said control valve for maintaining the pressure thereon uniformly at more than twice the pressure on the discharge of said control valve, a meter intermediate the latter and said means, and means disposed on the discharge side of said control valve for interposing a second gas between said liquid and control valve when the pressure on said discharge side is reduced to less than atmospheric.

2. Apparatus for supplying a controlled flow of gas to a liquid in which said gas is soluble, consisting of a source of gas under pressure, a pressure reducing valve, a meter, a control valve, and an antiflood device, said constituent parts being connected in series in the order named, the pressure within that portion of the apparatus extending from the pressure reducing valve to

the control valve being more than twice the pressure within the portion which extends from the control valve to the antiflood device.

3. Apparatus for feeding gas to a point of consumption thereof, said apparatus comprising a gas control unit including a conduit portion adapted to be connected at one end to a source of supply of gas under pressure and at the other end to the point of consumption of said gas, means for maintaining the pressure of the gas within said conduit portion at a constant predetermined magnitude, said means consisting of a pressure reducing valve disposed at the inlet end of said conduit portion and regulated to reduce the pressure of the gas from the source of supply to said magnitude, and of a control valve disposed at the outlet end of said conduit portion and regulated to reduce the pressure of the gas passing therethrough to less than half of said magnitude while simultaneously controlling the rate of flow through the unit, and a flow meter interposed intermediate the ends of said conduit portion and between said pressure reducing valve and said control valve, said flow meter being calibrated to indicate said rate of flow of gas through said unit at the pressure corresponding to said magnitude, and said unit comprising no pressure regulating means in addition to said pressure reducing valve and said control valve, a conduit for connecting said unit to said point of consumption, and anti-flood means interposed in said last named conduit.

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