May 2, 1944. H. BEDDOES 2,348,104

SAFETY DEVICE FOR GAS PRODUCING SYSTEMS

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Fig. 2.

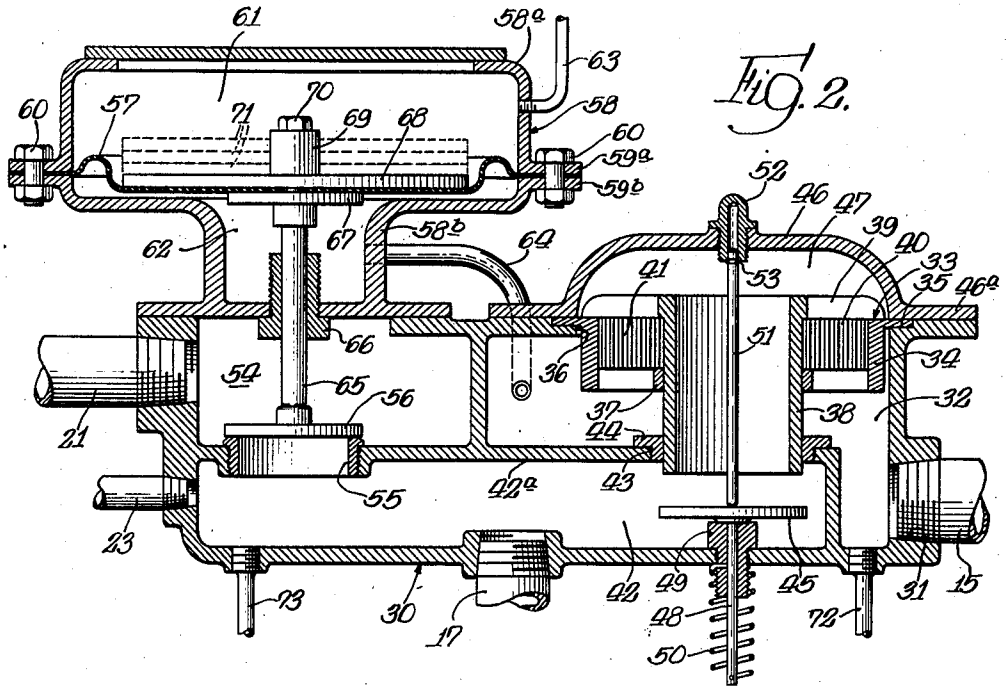
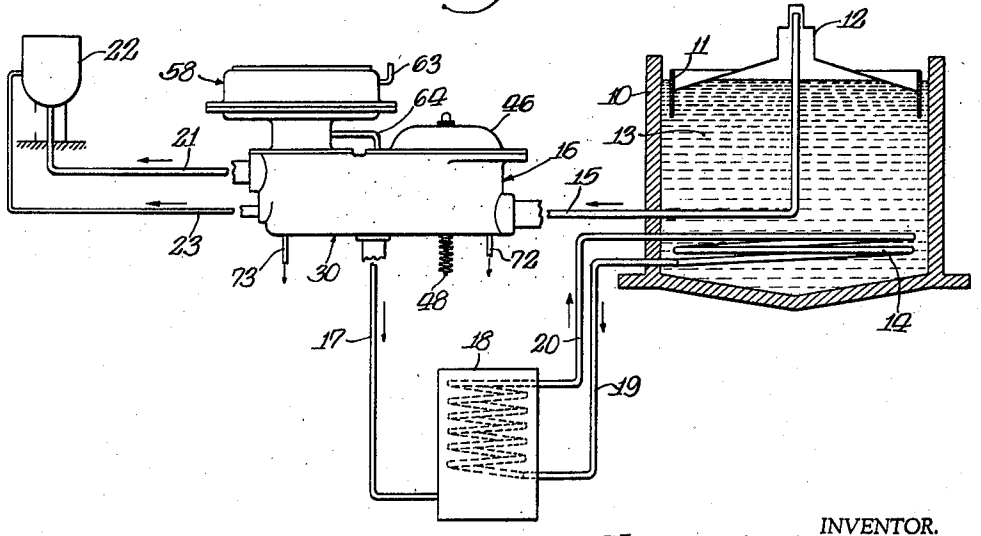


Fig. 1.



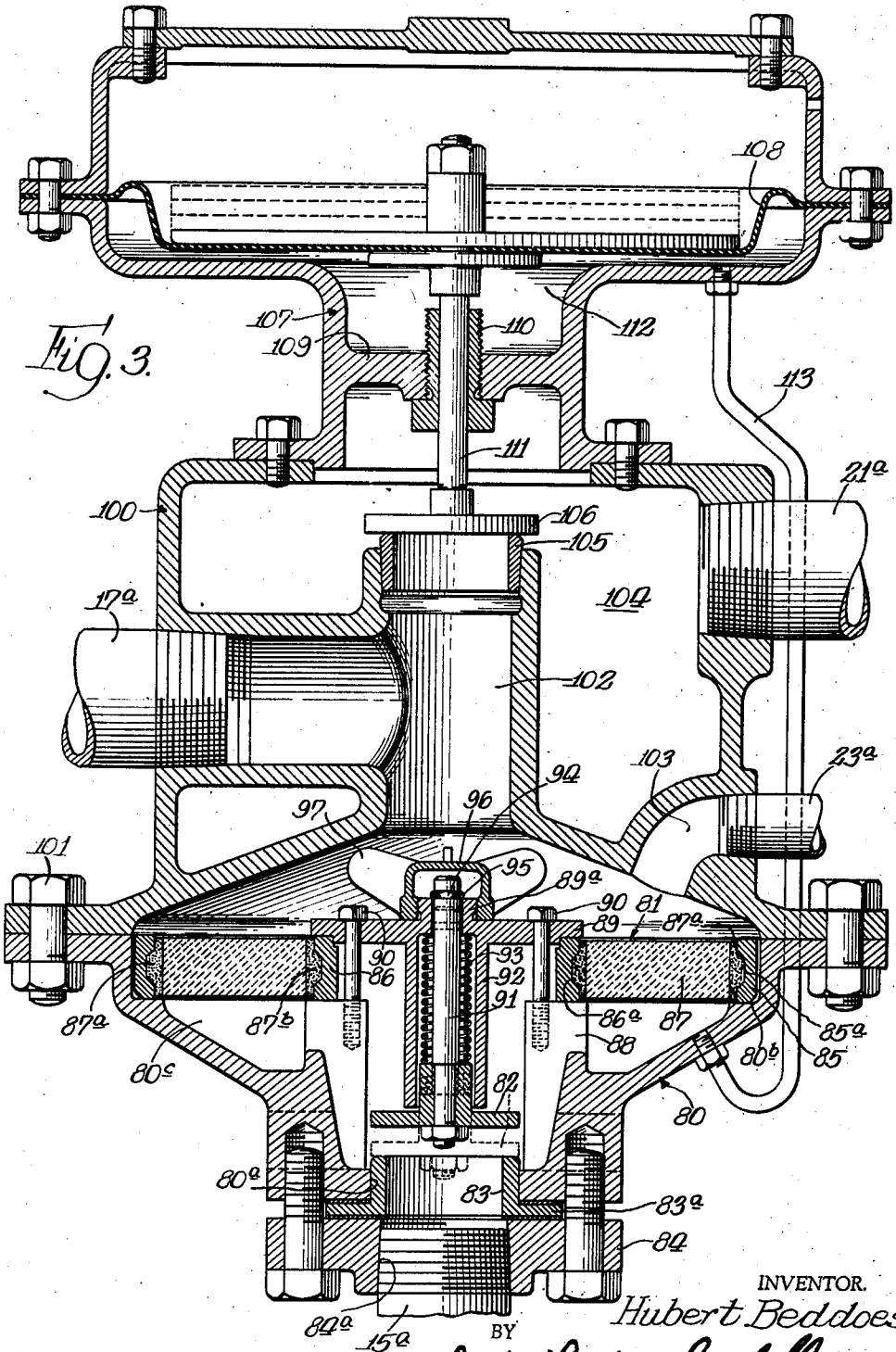
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Filed Dec. 31, 1941 2 Sheets-Sheet 2

Fig. 3.



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SAFETY DEVICE FOR GAS PRODUCING SYSTEMS

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Application December 31, 1941, Serial No. 425,248

10 Claims. (Cl. 158—99)

This invention relates generally to safety devices for gas producing systems and it has to do particularly with a device of this character especially well adapted for use in sewage systems of that type wherein gas produced in the digestion of sewage is utilized for heating or power purposes or is burned for the purpose of odor control.

In the digestion of sewage a combustible gas is formed. Such gas is formed at varying rates, depending upon the character of the sewage, the amount of solids introduced into the digester from time to time and the size and temperature of the digester. In systems of the foregoing character, more gas may, therefore, be generated than is required for consumption purposes and it is necessary to discharge the excess gas to a point of waste consumption. Sewage digestion is usually carried on in a closed tank type digester having either a fixed cover with liquid seals for preventing the escape of gas, or a floating cover of the general type adapted to float upon the liquid in the tank to control scum formation and aid digestion. In the use of digesters having both types of covers it is highly desirable that the gas be discharged as rapidly as it is generated to avoid the build-up of an excessive pressure in the digester. Otherwise, in the use of a fixed cover type digester, the excess pressure may break through the liquid seals and allow gas to escape, thereby producing objectionable odor conditions as well as hazardous explosive conditions. Also, in the use of the floating cover type digester, an excess gas pressure will cause the cover to rise away from the body of the digesting material therein with loss of advantage of scum control with a consequent loss of efficiency in operation of the digester.

To offset the foregoing objectionable conditions, it is customary to control the gas formed in the digester in such a way that it is discharged as it is generated and, if more gas is generated than is required at the point of utilization (boiler, etc.), the excess is discharged to a point of waste where it is burned or otherwise consumed. The utilization device or devices may have their own controls determining the amount of gas required, and there may be times when no gas is required, in which case the gas control must be such as to discharge all gas to a point of waste disposal. In other words, the gas controls must be such as to discharge all gas to a point of utilization or a point of waste or both without pressure back-up in the digester. Separate pressure relief and fire control devices have heretofore been employed for the foregoing purpose, one device controlling the gas flow to the point of utilization and the other controlling the flow to a point of waste, where the gas is usually disposed of by a main burner having a constantly burning pilot. The pilot burner is constantly supplied with gas from the digester. In the use of such prior devices, it has been necessary to interconnect the same for the desired gas flow control. Such prior arrangements have necessitated complicated piping arrangements which required considerable skill in setting up the same and which at all times invited hazardous explosive conditions due to improper installation. They were also quite expensive to install and to maintain.

Also, in prior safety devices, it was necessary to employ a flame arrester unit with each control device to prevent backfiring which would, otherwise, be likely to result in an explosion at the source. This added considerably to the initial cost and maintenance of equipment in addition to further complicating the piping arrangement.

One of the objects of my invention is to provide improved safety control means of the foregoing character by which all of the foregoing objectionable conditions are avoided.

Another object is to provide an improved safety control device for controlling gas generated in a sewage digester, which device is of simple and inexpensive construction, is of compact form, is so easy to install that it may be installed by unskilled labor without danger of explosions through improper piping, is foolproof from the safety standpoint, is easy to maintain, is adapted to prevent backfiring, and is adapted to maintain proper gas pressure conditions in a more positive and efficient manner than heretofore.

A further object is to provide a single safety device for controlling the flow of gas to a point of utilization or to a point of waste or to both, which device is so constructed and arranged that all pipe connections are direct without interconnections.

Still another object is to provide a device of the foregoing character wherein a single flame arrester is employed for controlling the flow of gas to a point of utilization, a point of waste consumption, and to a pilot burner, the arrangement being such that the flame arrester is disposed between the gas source and all gas flow controlling means.

Other objects and advantages will become ap-

parent as this description progresses and by reference to the drawings, wherein,

Figure 1 is a diagram illustrating one form of system embodying the invention;

Fig. 2 is an enlarged vertical sectional view of the releif valve device shown in Fig. 1; and

Fig. 3 is a vertical sectional view of a modified form of relief valve structure embodying the invention.

My invention is well adapted for use in connection with a sewage system of the type shown in Fig. 1. Such system may include a digester 10 of the general type disclosed in the above-mentioned Downes patent. This digester includes a floating cover 11 having a central gas dome 12 wherein gas generated in the digestion of the sewage is collected. The cover 11 is arranged to float on the top of the material 13 contained in the tank and, as hereinabove explained, it is desirable that the gas generated and received in the dome be discharged as rapidly as it is generated, otherwise, the cover may be raised by the excess pressure above the material 13 with the objectionable results already explained.

It is customary to use the gas generated in the digester in the operation of the sewage system. It may be used in a boiler which is employed for heating purposes, such, for example, as supplying heating coils 14 located in the bottom of the digester for the purpose of increasing the digestion action. To the foregoing end, there is employed a discharge pipe 15 leading from the gas dome 12 downwardly through the digesting material 13 and thence outwardly to a pressure relief device 16 with which my invention is particularly concerned. From the device 16 the gas is fed through pipes 17 to a point of utilization which, in this case, is a boiler 18 that is directly connected through circulating pipes 19 and 20 to the digester heater coils 14. The pressure control device 16 is also directly connected through pipe 21 to a waste burner 22, which may take any suitable well-known form. There is also a pipe connection 23 leading directly from the pressure relief device 16 to a pilot burner (not shown) associated with the waste burner 22, which pilot burner may take any suitable and well-known form.

The boiler 18 may include its own controls (not shown) for determining the amount of gas to be consumed thereby. If the amount of gas generated in the digester exceeds the requirements of the boiler 18, the excess gas is discharged by the pressure relief device 16 to the waste burner where it is consumed. In this way, the gas generated in the digester is constantly discharged and maintained at a maximum pressure which will not disturb the proper operation of the cover 11. It will be seen from the foregoing, and by reference to Fig. 1, that all of the pipe connections through which the gas flows are direct connections leading from the pressure relief device 16 and that all such connections are so arranged that they may be made simply and without the necessity of cross connections for pilot control or otherwise.

The pressure relief device 16 is so constructed and arranged that only one such device need be employed in the system while, at the same time, gaining all of the advantages from the standpoints of pressure relief and flame arresting that were obtained with prior multiple devices. The device shown in detail in Fig. 2 includes a casing 30 having a gas inlet 31 to which is connected the inlet end of pipe 15 leading to the digester 10 (Fig. 1). The inlet end of the casing 30 is provided with a chamber 32 having an enlarged opening 36 in its upper part in which is mounted a flame arrester unit 33. This flame arrester is of cylindrical form and it comprises an outer ring member 34 having an annular flange 35 at its upper edge seated upon the upper wall of the casing 30. The ring 34 is provided with an internal web portion having a central axial ring section 37 which guidingly receives a tubular conduit member 38 having at its upper end a plurality of radial arms 39 which seat upon the upper edge of the ring 34. Confined between the ring 34 and the member 38 is a flame arrester unit 40 of the well-known ribbon type having a plurality of vertically extending, narrow gas passageways 41.

The casing 30 is provided with a second chamber 42 which is connected by pipe 17 to the boiler 18. The upper wall 42a of the chamber 42 is provided with a threaded opening 43 in which is received a flanged bushing 44 that guidingly receives and supports the lower end of the tubular conduit member 38. The tubular body of the member 38 is long enough to project slightly below the bushing 44 so that its lower end serves as an annular seat against which a valve 45 is adapted to seat under circumstances which will be explained hereinafter. The flame arrester unit 33 is covered by an annular dome-shaped casing section 46 having an annular flange 46a secured to the upper side of the casing 30 with its dome portion disposed over the flame arrester unit 33 and forming thereabove a chamber 47. With this arrangement the chamber 32 is separate and distinct from the chamber 42, being connected therewith only through the flame arrester element 40 and the tubular member 38.

The valve 45 is held open at all times except in the event that gas on the side of the flame arrester unit 33 next to the boiler 18 and opposite the digester 10 should become ignited. In that case means are provided for causing the valve 45 to close and thereby shut off the connection between the boiler 18 and the gas source. Specifically, the valve 45 includes a stem 48 reciprocably supported in a valve guide 49 carried by the bottom of the casing 30. A tension spring 50 having one end connected to the lower end of the valve stem 48 and its other end connected to the valve guide 49 constantly urges the valve stem 48 and the valve 45 upwardly toward a closed position against the lower end of the tubular member 38. Closing movement of valve 45 is normally prevented by a stem 51 so mounted that its lower end abuts the upper side of the valve 45 and its other end is received in a bore in a bushing 52 threadedly received in and carried by the dome section 46. The stem 51 is provided near its upper end with an annular groove supporting a ring of fusible material 53 which is adapted to melt, for example, at a temperature of from 300° to 400° F. This ring 53 is of larger diameter than the bore of the bushing 52 so that when the ring 53 is in place it abuts the lower edge of the bushing 52 and holds the stem 51 and valve 45 in the open position shown in Fig. 1. However, if the gas should become ignited on the boiler side of the flame arrester element 40, the heat developed would in a very short time melt the ring 53 releasing the

stem 51 so that the spring 50 will move the same and the valve 45 into seating engagement with the lower end of the member 38, thereby cutting off the gas flow between the boiler 18 and the gas source. In case of fire, the flame arrester 40 is of such construction, as is well known, that it will prevent backfiring therepast, and the flame arresting action is fully effective for a period of time sufficient to permit melting of the fusible ring 53. In other words, the ring 53 will melt and the valve 45 will be closed before the flame arrester element 40 becomes ineffective to prevent the flame to pass thereby.

A pressure relief means is also mounted in the casing 30 on the boiler side of the flame arrester unit 33. The arrangement is such that if the boiler 18 or other point of utilization is not handling all of the gas generated, the pressure relief mechanism will function to discharge the excess gas to the waste burner 22 (Fig. 1). More particularly, the casing 30 is provided with another chamber 54 which is connected by the pipe 21 (Figs. 1 and 2) to the waste burner 22. The upper wall 42a of chamber 42 is provided with an opening in which is threadedly mounted a bushing 55 serving as a seat for a valve 56 which controls communication between the chambers 42 and 54. The valve 56 is normally held closed except when the gas pressure at the digester and in the chambers 32 and 42 exceeds a predetermined amount.

Valve 56 is controlled by pressure means which includes a flexible weighted diaphragm 57 mounted in a casing section 58 disposed above the chamber 54. The casing section 58 is divided into two parts 58a and 58b having annular flanges 59a and 59b secured together by stud-and-bolt devices 60 and between which the edge of the diaphragm 57 is secured. In this way the casing section 58 is divided into chambers 61 and 62, one above the diaphragm 57 and vented to atmosphere through an outlet 63, and the other beneath the diaphragm and connected to the inlet chamber through a conduit 64. Valve 56 is provided with a stem 65 which extends upwardly and slidably through a bushing 66 secured in an opening in the bottom of the casing section 58b. The upper end of the stem 65 is connected to the diaphragm 57 by a plate member 67 fixed to the stem 65 and engaging the underside of the diaphragm and a plate member 68 engaging the upper side of the diaphragm and fixed to the stem by a sleeve 69 and nut 70. The diaphragm is weighted by one or more plates 71 supported by plate 68 for holding the valve 56 closed except when a predetermined pressure is present in chamber 62 and acting on the underside of the diaphragm to raise the latter and, in turn, the valve 56.

The pilot burner (Fig. 1) for the waste burner 22 is constantly supplied with gas from the chamber 42 through pipe 23. In this way the pilot burner is directly connected with the gas source by way of the valve 45 so that it burns constantly and is ready for ignition of the gas in the waste burner 22 when the valve 56 opens and discharges excess gas to waste. The bottom portions of the chambers 32 and 42 are provided with drain outlets 72 and 73 for removal of condensation that may be formed in these chambers. These drain outlets may be normally closed by manually operable valves (not shown) or any other suitable means.

Briefly, the operation of the foregoing structure is as follows: The valve 45 being normally open, gas flows from the digester 10 through the pipe 15 into the chamber 32, thence upwardly through the flame arrester 40 and then downwardly through the tubular member 38 into the chamber 42. From the chamber 42 the gas is delivered from the pipe 17 to the boiler 18 or other point of utilization. Gas is also delivered from chamber 42 through the pipe 23 to the pilot burner. If it is desired to limit the pressure in the digester to, for example, four and one-half inches, the gas flow will continue as just stated until the four and one-half inch pressure is exceeded. When that happens, the pressure in chamber 62, which is the same as the pressure in chamber 32 and at the source, raises the diaphragm 57, opening the valve 56 and discharging the excess gas from the chamber 42 into the chamber 54 and outwardly through the pipe 21 to the waste burner 22. As soon as the pressure in chambers 62 and 32 is lowered below the maximum, the valve 56 closes so that gas is then fed only to the point of utilization. If the gas should for any reason become ignited and tend to burn back toward the digester, the flame arrester 40 will prevent passage of the burning gases into the chamber 32 and eventually the fusible ring 53 will release the stem 51 and permit the valve 45 to close. When the valve 45 is closed, all danger of fire reaching the chamber 32 and the digester through the pipe 15 is avoided. If such a condition should happen, operation may be resumed by installing a new fusible ring 53 to hold the valve 45 in its open position.

In Fig. 3 I have shown another form of pressure relief device embodying my invention. In this form, the parts are compactly arranged by disposing the waste control valve and diaphragm operating structure in superimposed relation upon the inlet valve and flame arrester structure. This form includes an annular casing structure having a lower section 80 supporting a flame arrester unit 81 and an inlet valve 82. The bottom of the section 80 is provided with an opening 80a in which is received a bushing 83, the upper rim of which serves as a seat for the valve 82. The bushing 83 is provided with an annular flange 83a which extends under the bottom of the section 80 and is clamped in place thereon by a ring section 84 having a threaded opening 84a to which one end of the inlet pipe 15a leading to the digester is connected.

The flame arrester unit comprises outer and inner concentric rings 85 and 86 between which is confined a body of porous refractory material 87 which serves as a flame arresting element. This material is sufficiently porous to permit the flow of gas therethrough while preventing backfiring or the like as in the case of the flame arrester element 40 of the first form. The body 87 is secured to the rings 85 and 86 by any suitable cement material such, for example, as lute. The bonding together of these parts is facilitated by providing annular grooves 85a and 86a in the inner faces of the rings 85 and 86 and channels 87a and 87b in the inner and outer peripheries of the body 87, which grooves and channels are filled with the cement. The flame arrester unit 81 is supported in the upper portion of the casing section 80 by mounting the ring 85 upon an annular casing ledge 80b and by supporting the inner ring 86 upon annularly disposed radial ribs 88 formed integral with the casing 80. The arrester unit 81 is clamped in place on the casing by a plate member 89 seated on the upper edge of the inner ring 86 and clamped in place by stud bolts 90 passing through the plate 89 and engaging the ribs 88.

The valve 82 is provided with a stem 91 which

extends upwardly through a depending tubular guide 92 integral with the plate 89. A spring 93 is disposed in the tubular guide 92 under compression so that it tends to urge the valve 82 downwardly against its seat 83, as shown in dotted lines in Fig. 3. It is restrained against such movement, however, by extending the valve stem 91 upwardly through an opening in the plate 89 and by providing its projecting end portion with an annular groove 94 in which is received a fusible ring 95 of larger diameter than the plate opening through which the stem passes. This fusible ring 95 is similar to the fusible ring 53 of the first form and holds the valve 82 open except in case of fire which will melt the fusible ring releasing the valve stem for movement by the spring 93 to close the valve 82. To insure a more rapid pickup of heat from gases burning at the upper side of the flame arrester, I provide a hollow cage-like member 96 threaded upon a central projection 89a on the upper side of the plate 89 through which the valve stem 91 passes. This cage 96 houses the projecting end of the valve stem 91 and it is provided with a plurality of radial fins 97 which insure a rapid pickup and transfer of heat to the plate 89 and the connected parts, thereby insuring a rapid transfer of heat to the fusible ring 95.

An intermediate casing section 100 is mounted directly upon the casing section 80, being secured thereto by a plurality of annularly arranged nut-and-bolt devices 101. This casing section is provided with an inner chamber 102 which is connected by a pipe 17a to the boiler or other point of utilization. This chamber 102 is also connected through passage 103 and pipe 23a to a pilot burner associated with a waste gas burner such as shown in Fig. 1. In the normal operation of the device and so long as the gas generated in the digester is being used or consumed by the boiler or the like, gas will flow from the digester through the pipe 15a past the valve 82 into the chamber 80c below the flame arrester 81, through the flame arrester element 87 into the chamber 102 and through the pipe 17a to the boiler. However, in case the pressure of the gas in the digester exceeds the maximum of, for example, four and one-half inches, means are provided for discharging the excess gas to a waste burner as in the first-described form. Specifically, the casing section 100 is provided with an outer chamber 104 surrounding the chamber 102. The upper end of the inner chamber 102 is connected to the outer chamber 104 through an opening in which is mounted a bushing 105 serving as a seat for a pressure relief valve 106. The outer chamber 104 is adapted to be connected to a waste burner through a pipe 21a.

A third casing section 107, in which is mounted a diaphragm 108, is superimposed upon the casing section 100. The section 107 is provided with a partition 109 which closes the upper end of the chamber 104 and which is provided with a central opening receiving a threaded valve stem guide 110. The valve 106 is provided with a stem 111 which slidably passes through the guide 110 and is connected to the diaphragm 108 in a manner similar to that connecting the valve stem of the valve 56 with the diaphragm 57 of the first form. By the foregoing arrangement, a chamber 112 is formed beneath the diaphragm 108, which chamber is connected with the inlet chamber 80c by a pipe 113. When the maximum pressure to be maintained in the digester is exceeded, through the generation of an excess amount of gas or through reduction in the boiler requirements, the pressure in chamber 112 raises the diaphragm 108 and, in turn, the valve 106 and discharges the excess gas into chamber 104 and thence through the pipe 21a to the waste burner. Other than just described, the construction and operation of this form of device is substantially the same as the form of Fig. 2.

I believe that the operation and advantages of my invention will be well understood from the foregoing description. My invention overcomes the objections existing in devices used heretofore. A single device is employed for controlling the flow of gas to a point of consumption, such as a boiler, to a waste burner, and to a pilot burner. A simple and compact structure for accomplishing the foregoing result is provided. The parts are so arranged that a single flame arrester element may be employed for preventing explosive results due to backfiring from the point of utilization or from a waste burner or from a pilot burner. The device is of such character that pipe connections leading thereto and therefrom may be very simply made and do not require the use of skilled labor in making the same. Mistakes in piping are avoided by the simplification of piping, thereby avoiding the hazardous conditions due to improper piping that exist in prior structures. Furthermore, my invention greatly increases the efficiency of gas control, insuring proper and most efficient operation of the digester at all times.

I claim:

1. In a device of the character described, a casing having an inlet connection, and at least two separate discharge connections, a valve controlling the flow of gas between said inlet connection and one of said discharge connections, flame arresting means between said inlet connection and said one discharge connection, heat controlled means for normally holding said valve open, a second valve between said one discharge connection and another of said discharge connections, and means normally holding said second valve closed to prevent discharge of gas through said other discharge connection, said means being controlled by pressure at said inlet opening to open said second valve when the pressure at said inlet is increased to a predetermined extent.

2. In a device of the character described, a casing having an inlet chamber with an inlet connection, a main discharge chamber having a discharge connection, a waste discharge chamber having a discharge connection and a pressure chamber connected to said inlet chamber, a valve controlling the flow of gas from said inlet connection to said main discharge chamber, heat controlled means normally holding said valve open, flame arrester means between said inlet and main discharge chambers, a second valve between said discharge chambers, and a weighted diaphragm mounted in said pressure chamber subject to the pressure in said inlet chamber and connected to said second valve, the arrangement being such that when the pressure in said inlet chamber and, in turn, said pressure chamber is increased to a predetermined extent said diaphragm is raised to open said second valve and discharge gases from said main discharge chamber into said waste discharge chamber and out through its discharge connection.

3. In a system of the character described, a gas generating source, gas utilization means, a waste gas burner and a pilot burner for the waste

gas burner, and pressure relief means which comprises a casing having an inlet chamber connected to the gas source, a discharge chamber connected to the gas utilization means and to the pilot burner, a second discharge chamber connected to the waste burner, and a pressure chamber constantly connected to said inlet chamber, a valve between said inlet and first discharge chambers, heat control means normally holding said valve in open position, a second valve between said discharge chambers, pressure controlled means located in said pressure chamber and normally holding said second valve closed so that gas flows normally only to the utilization means and pilot burner, the arrangement being such that when the pressure in said inlet chamber exceeds a predetermined amount, said pressure controlled means is actuated to open said second valve and discharge gas to the waste burner.

4. In a system of the character described, a gas generating source, gas utilization means, a waste gas burner and a pilot burner for the waste gas burner, and pressure relief means which comprises a casing having an inlet chamber connected to the gas source, a discharge chamber connected to the gas utilization means and to the pilot burner, a second discharge chamber connected to the waste burner, and a pressure chamber constantly connected to said inlet chamber, a valve between said inlet and first discharge chambers, heat control means normally holding said valve in open position, a second valve between said discharge chambers, pressure controlled means located in said pressure chamber and normally holding said second valve closed so that gas flows normally only to the utilization means and pilot burner, the arrangement being such that when the pressure in said inlet chamber exceeds a predetermined amount, said pressure controlled means is actuated to open said second valve and discharge gas to the waste burner, and a single flame arrester device, mounted in said inlet chamber between said first valve and the gas source and simultaneously serving to prevent back-fire from the point of utilization, the pilot burner and the waste burner.

5. In a structure of the class described, comprising a casing divided into an inlet chamber and adapted to be connected to a gas source, a discharge chamber connected to said inlet chamber and adapted to be connected to a gas utilization means, a second discharge chamber connected to said first discharge chamber and adapted to be connected to a waste burner, and a pressure chamber connected with said inlet chamber for equalization of pressure therein, a valve controlling communication between said inlet and first discharge chambers, heat controlled means for normally holding said valve in open position, a valve for controlling communication between said discharge chambers, a pressure actuated device in said pressure chamber normally holding said second valve closed and adapted, upon a predetermined increase in the pressure of the gas in said inlet and pressure chambers, to open said second valve, and a single flame arrester means in said inlet chamber where it is disposed between the gas source and said discharge chambers.

6. In structure of the class described, a casing divided to provide an inlet chamber having an inlet connection, and a discharge chamber having a discharge connection, flame arresting means in said inlet chamber for controlling the flow of gas to said discharge chamber which includes a tubular member extending from the side of said means opposite said inlet connection into said discharge chamber and providing a valve seat at its discharge end, a valve in said discharge chamber, spring means urging said valve toward said valve seat, and heat controlled means for holding said valve open to interconnect said chambers which includes a stem member slidably engaged with the casing at one end and said valve at the other end, and a fusible ring member carried by said stem and engaging said casing normally preventing slide movement of said stem in said casing and thereby holding said valve open, said ring member being adapted upon being heated to a predetermined extent to fuse and release said stem and permit said spring means to close said valve.

7. In structure of the class described, a casing having partitions dividing it into an inlet chamber having an inlet connection, a main discharge chamber having a discharge connection and a waste discharge chamber having a discharge connection, flame arrester means in said inlet chamber, a valve in said main discharge chamber controlling communication between said inlet and main discharge chamber, heat controlled means normally holding said valve open, a valve in said waste discharge chamber controlling communication between said discharge chambers, and means normally holding said second valve closed, said means being controlled by the gas pressure in said inlet chamber for opening said second valve when a predetermined pressure is present in said inlet chamber.

8. In structure of the class described, a casing having partitions dividing it into an inlet chamber having an inlet connection, a main discharge chamber having a discharge connection, a waste discharge chamber having a discharge connection, and a pressure chamber connected to said inlet chamber, flame arrester means in said inlet chamber between said inlet connection and the connection between said inlet and main discharge chambers, a valve in said main discharge chamber controlling communication between said inlet and main discharge chambers, heat controlled means normally holding said valve open, a valve in said waste discharge chamber controlling communication between said discharge chambers, and means normally holding said second valve closed, including a diaphragm in said pressure chamber connected to said second valve and weighted to a predetermined extent to normally hold said second valve closed, said diaphragm being adapted to be raised to open said second valve when the pressure in said inlet and pressure chambers is increased to a predetermined extent.

9. In structure of the class described, a casing having a lower or inlet chamber, a main discharge chamber superimposed upon said inlet chamber, a waste discharge chamber surrounding said main discharge chamber, and a pressure chamber superimposed upon said waste discharge chamber, means connecting said pressure chamber with said inlet chamber, a valve controlling the inlet of gas to said inlet chamber, flame arresting means between said inlet and main discharge chambers, heat controlled means supported by said flame arresting means for normally holding said valve open and adapted to close said valve when a predetermined tem-

perature is reached in said main discharge chamber, a second valve in said waste discharge chamber, and means located in said pressure chamber for normally holding said second valve closed and adapted, when a predetermined pressure is reached in said inlet and pressure chambers, to move said second valve to an open position.

10. In a device of the character described which comprises a casing having a lower section having an inlet chamber therein with a connection adapted to be connected to a gas source, an intermediate section having an inner discharge chamber having a connection adapted to be connected to a point of gas consumption, and an outer discharge chamber adapted to be connected to a point of waste, an upper section having a pressure chamber therein, means connecting said pressure chamber with said inlet chamber, a valve controlling the flow of gas into said inlet chamber, flame arresting means between said valve and said inner discharge chamber, a second valve controlling the flow of gas between said discharge chambers, and pressure controlled means in said pressure chamber connected to said second valve and adapted when subjected to a predetermined pressure to move said second valve to an open position and adapted when subjected to a predetermined lower pressure to close said second valve to close communication between said discharge chambers.

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