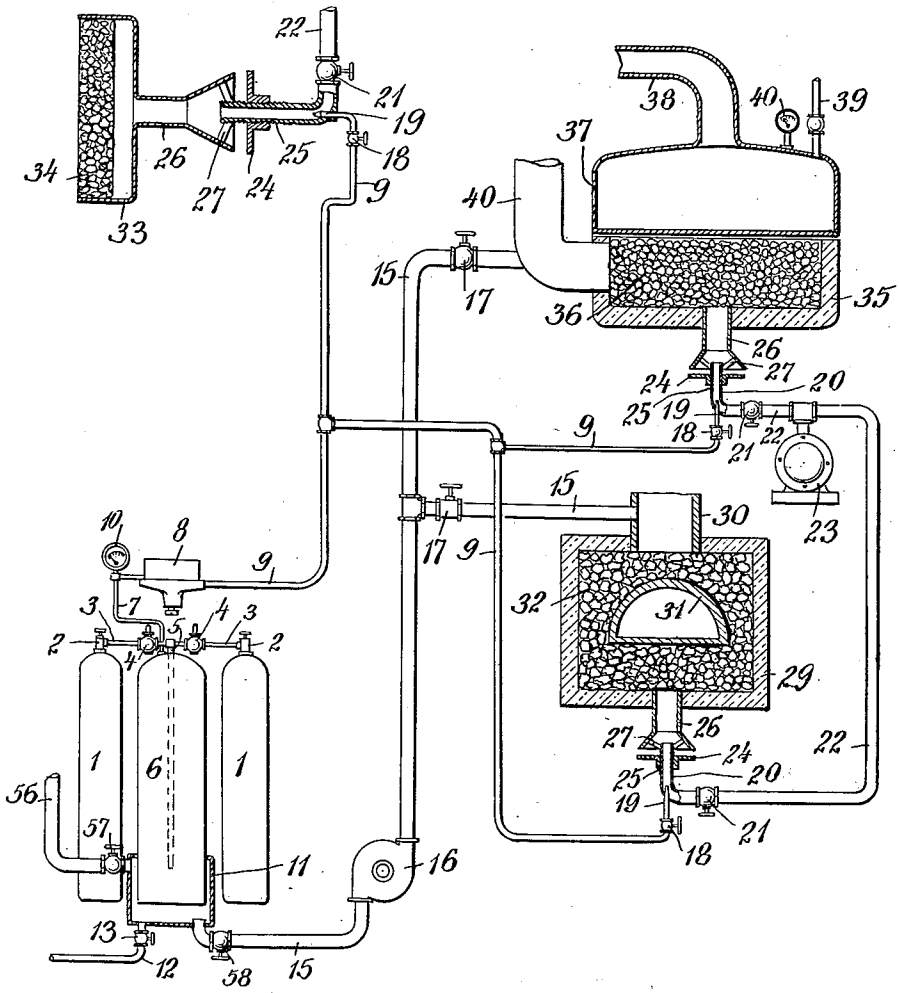
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GAS DISTRIBUTION APPARATUS.

APPLICATION FILED MAY 8, 1912. RENEWED OCT. 9, 1918.

1,304,754. Patented May 27, 1919.



WITNESSES

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GAS-DISTRIBUTION APPARATUS.

1,304,754. Specification of Letters Patent. Patented May 27, 1919.

Application filed May 8, 1912, Serial No. 695,924. Renewed October 9, 1918. Serial No. 257,533.

To all whom it may concern:

Be it known that I, CARLETON ELLIS, a citizen of the United States, and resident of Montclair, Essex county, New Jersey, have made certain new and useful Inventions Relating to Gas-Distribution Apparatus, of which the following is a specification, taken in connection with the accompanying drawing, which forms part of the same.

This invention relates especially to apparatus for distributing gas from liquefied or highly compressed gas stored in steel cylinders or containers for transportation by expanding and simultaneously heating the gas in an expansion chamber so as to promote uniformity in the gas supplied therefrom to the service pipe, special injecting and mixing devices being used to preferably incorporate with the rich combustible gas ample air for its combustion and then burn the explosive mixture under advantageous conditions within porous and permeable combustion beds.

The accompanying drawing is a diagrammatic elevation of an illustrative embodiment of the invention, parts being shown in section.

In the arrangement shown 1 is a gas storage cylinder containing the highly compressed or liquefied gas commercially produced in various ways. This liquid gas cylinder is provided with a suitable valve 2 conducting the gas through the pipe 3 to a suitable reducing valve 4 from which it enters the expansion chamber 6 through the supply pipe 5 which may extend to a considerable distance down into the chamber as indicated by the dotted lines in the figure. In this way the expansion chamber may be kept under a comparatively moderate pressure, such as several pounds per square inch more or less, and the gas supplied thereto from one or more of the detachably connected liquid gas cylinders as shown. The gas from this expansion chamber 6 may enter the delivery pipe 7 preferably connected to the upper part of this chamber and connecting with the service valve 8 in which the pressure is still further reduced if desired and kept constantly at about six to ten ounces or more per square inch as it is supplied through the service pipes, such as 9, throughout the system. Gages such as 10 may be connected where necessary for observation and regulation purposes to indicate when it is necessary to regulate the valves and to replace an exhausted liquid gas cylinder. Since liquid gas of this character is rich in the heavier gaseous hydrocarbons and may have a heating value as high as 1000 or 1500 B. T. U. per cubic foot or considerably more in the case of liquefied natural gas as usually produced, it is highly desirable to secure uniformity in the gaseous mixture which is fed into the service pipes and this may be considerably promoted by heating the expansion chamber through any suitable heater, such for instance, as the heating jacket 11 which may surround the lower part of this expansion chamber and be supplied with heating steam or hot water, etc., as through the pipe 12 in amounts controlled by the heating valve 13. If desired also hot gases may be supplied to this heating jacket either in place of or in addition to the steam or hot water as through the heating pipes 15 which may be connected through cut-off valves 17 with any suitable flues so as to draw hot combustion gases therefrom by suction or by means of a centrifugal fan or pump 16. These hot gases thus pass into the jacket 11 when the valve 58 is open and are discharged through the discharge flue 56. In this way any tendency to stratification of the expanded gas from the liquid gas cylinders is overcome and for this same reason it is desirable to extend the feeding pipe 5 from the liquid gas connections considerably into the expansion chamber and preferably toward the bottom thereof, or at least within the heater device, as indicated, so as to promote the uniformity of the gas delivered from the upper part of the chamber into the delivery pipe 7. In this way the heavier hydrocarbons, such as the butane, butylene, propane and propylene, are kept in gaseous condition and properly incorporated with the other gaseous constituents.

Various utilizing devices may be connected with this gas distributing system to use the rich gas produced thereby for various purposes which may advantageously include heating and distilling, an illustrative distilling arrangement being shown as comprising a pot still 37 having the connected vapor pipe 38 and provided with a suitable valved inlet pipe 39. This still may be conveniently heated by the heating furnace having its walls or furnace lining 35 composed

of firebrick or other suitable refractory material and having one or more exhaust flues 40 with which the pipe 15 may be connected. The furnace may have a bed of suitable refractory material 36 such as lumps or pieces of firebrick, magnesite or the like, preferably of about one inch mesh or so so as to allow the passage of gaseous material therethrough without offering undesirable resistance. One or more injecting pipes, such as 26, may be arranged in connection with this heating furnace, the injecting pipe being indicated as having a flared lower end within which the injecting throat 20 is mounted by suitable internal ribs or brackets 27. Part of this injecting throat 20 may be formed with the thread 25 upon which may be adjustably mounted the damper 24 so as to adjust the air opening around the lower end of this throat. If desired air under pressure of one to two ounces or so may be supplied to the injecting throat in amounts regulated by the valve 21 by the air line 22 supplied with air at the desired pressure by any suitable air pump 23. The service pipe 9 may be provided with an injecting valve 18 so as to control the amount of this rich fuel gas delivered through the injector nozzle 19 preferably directed toward the injecting throat and injecting pipe so as to have an energetic injecting action therein and draw in the air supplies at the various points indicated. In this way the large amount of air required for the combustion of such rich fuel gas may be incorporated therewith so as to form a substantially homogeneous explosive gaseous mixture within the injecting pipe which is thereupon injected into the bed of refractory granular combustion accelerating material to normally burn therein with accelerated surface combustion, the velocity of the gas in the injecting pipe being preferably so great as to normally prevent backfiring therein. It is of course understood that in starting this device the gas may be turned on and lighted at the top of the heating furnace and then the air may be gradually turned on so as to heat the refractory material in the granular bed which thereupon effects the highly accelerated surface combustion of the gaseous material securing high combustion efficiency and intense heat, and then the combustion gases passing through the granular material beyond becomes sufficiently diffused so as to exert the desired heating action on the still or other heat-utilizing device. In this way a readily controllable and efficient heating of oil and other stills may be secured by the use of liquid gas of this character which has many commercial advantages.

Other heat-utilizing devices may be connected with the system to utilize this gas in other ways and a form of muffle furnace is shown in the figure as having the firebrick walls 29 containing suitable refractory material 32 arranged in the form of a bed around a muffle such as 31. The explosive gaseous mixture may be formed in a similar way in this case and injected through the injecting pipe 26 into this bed of granular refractory material within which it is burned in sufficient quantities to secure the desired heat in the muffle, the products of combustion being preferably withdrawn through the flue or chimney 30. Another heat-utilizing device which may be used in connection with this system is the porous and permeable diaphragm 34 of refractory material which may be mounted within the metallic casing 33 connected to the injecting pipe 26, this diaphragm 34 being formed of aggregated porous grains or particles of about uniform mesh varying between about $\frac{1}{16}$th and $\frac{1}{8}$th of an inch for various uses. The diaphragm particles may be conveniently cemented together as by coating them with a comparatively small percentage of comparatively fusible material and then calcining the molded mass at high temperature to produce a highly porous refractory diaphragm having tortuous passages therethrough. When this explosive gaseous mixture is formed in this way and injected into the diaphragm casing it passes through the diaphragm and burns within the surface layer so as to heat the same to incandescence and be available as a uniform and desirable source of heat for many purposes.

What is claimed is—

1. In gas distribution apparatus, an expansion chamber, a delivery pipe connected to the top of said expansion chamber, a service valve connected to said delivery pipe to regulate the gas pressure, a service pipe connected to said service valve, a steam jacket heater arranged around the bottom of said expansion chamber, a supply pipe arranged to deliver gas into the portion of the expansion chamber surrounded by the heater, a reducing valve connected to said supply pipe, and a liquid gas container detachably connected to said reducing valve to supply rich gas to said supply pipe.

2. In gas distribution apparatus, an expansion chamber, a delivery pipe connected to the top of said expansion chamber, a heater arranged around the bottom of said expansion chamber, a supply pipe arranged to deliver gas into the portion of the expansion chamber surrounded by the heater, a reducing valve connected to said supply pipe, and a liquid gas container detachably connected to said reducing valve to supply rich gas to said supply pipe.

3. In gas distribution apparatus, an expansion chamber, a delivery pipe connected to said expansion chamber, a heater arranged around a portion of said expansion chamber, a supply pipe arranged to deliver

gas into the portion of the expansion chamber surrounded by the heater, a reducing valve connected to said supply pipe, and a liquid gas container detachably connected to said reducing valve to supply gas to said supply pipe.

4. In gas distribution apparatus, an expansion chamber, a delivery pipe connected to said expansion chamber, a heater arranged around the bottom of said expansion chamber, a supply pipe to deliver gas to said expansion chamber, a reducing valve connected to said supply pipe, and a liquid gas container connected to said reducing valve to supply gas to said supply pipe.

5. In gas distribution apparatus, an expansion chamber, a delivery pipe connected to said expansion chamber, a service valve connected to said delivery pipe to regulate the gas pressure, a service pipe connected to said service valve, a heater arranged around a portion of said expansion chamber, a supply pipe arranged to deliver gas into the portion of the expansion chamber surrounded by the heater, a reducing valve connected to said supply pipe, and a compressed gas container detachably connected to said reducing valve to supply rich gas to said supply pipe.

6. In gas distribution apparatus, an expansion chamber, a delivery pipe connected to said expansion chamber, a service valve connected to said delivery pipe to regulate the gas pressure, a service pipe connected to said service valve, a heater arranged to heat said expansion chamber, a supply pipe to deliver gas to said expansion chamber, a reducing valve connected to said supply pipe, and a compressed gas container connected to said reducing valve to supply rich gas to said supply pipe.

7. In gas distribution apparatus, an expansion chamber, a delivery pipe connected to said expansion chamber, a heater coöperating with said expansion chamber, a supply pipe to deliver gas to said expansion chamber, a reducing valve connected to said supply pipe, and a compressed gas container connected to said reducing valve to supply gas to said supply pipe.

8. In gas distribution apparatus, an expansion chamber, a delivery pipe connected thereto, heating means coöperating with said expansion chamber, a supply pipe connected with said expansion chamber, a source of highly compressed gas connected to said supply pipe, and a service pipe connected to receive substantially homogeneous gas from the delivery pipe.

9. In gas distribution apparatus, an expansion chamber, a jacket heater arranged to heat the expansion chamber, a compressed gas container, a supply pipe for delivering gas from said container to the expansion chamber, a delivery pipe connected to the expansion chamber, a gas consuming device supplied through said delivery pipe, means for supplying combustion gases from said consuming device to said heater, and means for supplying steam to said heater.

10. In gas distribution apparatus, an expansion chamber, a heater arranged to heat the expansion chamber, a compressed gas container, a supply pipe for delivering gas from said container to the expansion chamber, a delivery pipe connected to the expansion chamber, a gas consuming device supplied through said delivery pipe, and means for supplying combustion gases from said consuming device to said heater.

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