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[54] **FLARE INSTALLATION FOR THE COMBUSTION OF HYDROCARBON GAS WITH PRIOR ADMIXING OF AIR**

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[51] **Int. Cl.** **F23d 13/20**

[58] **Field of Search** ..... 431/202, 5; 23/277 C

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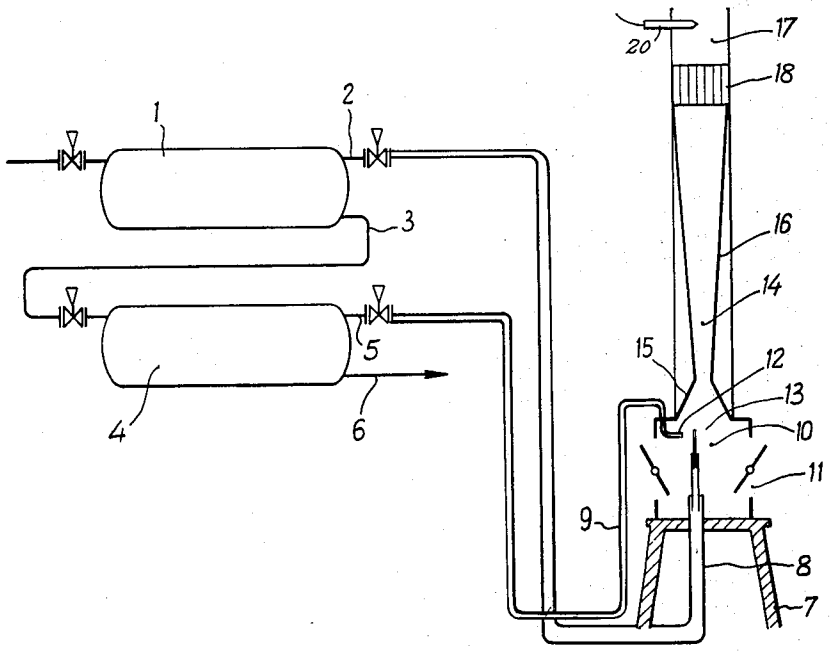
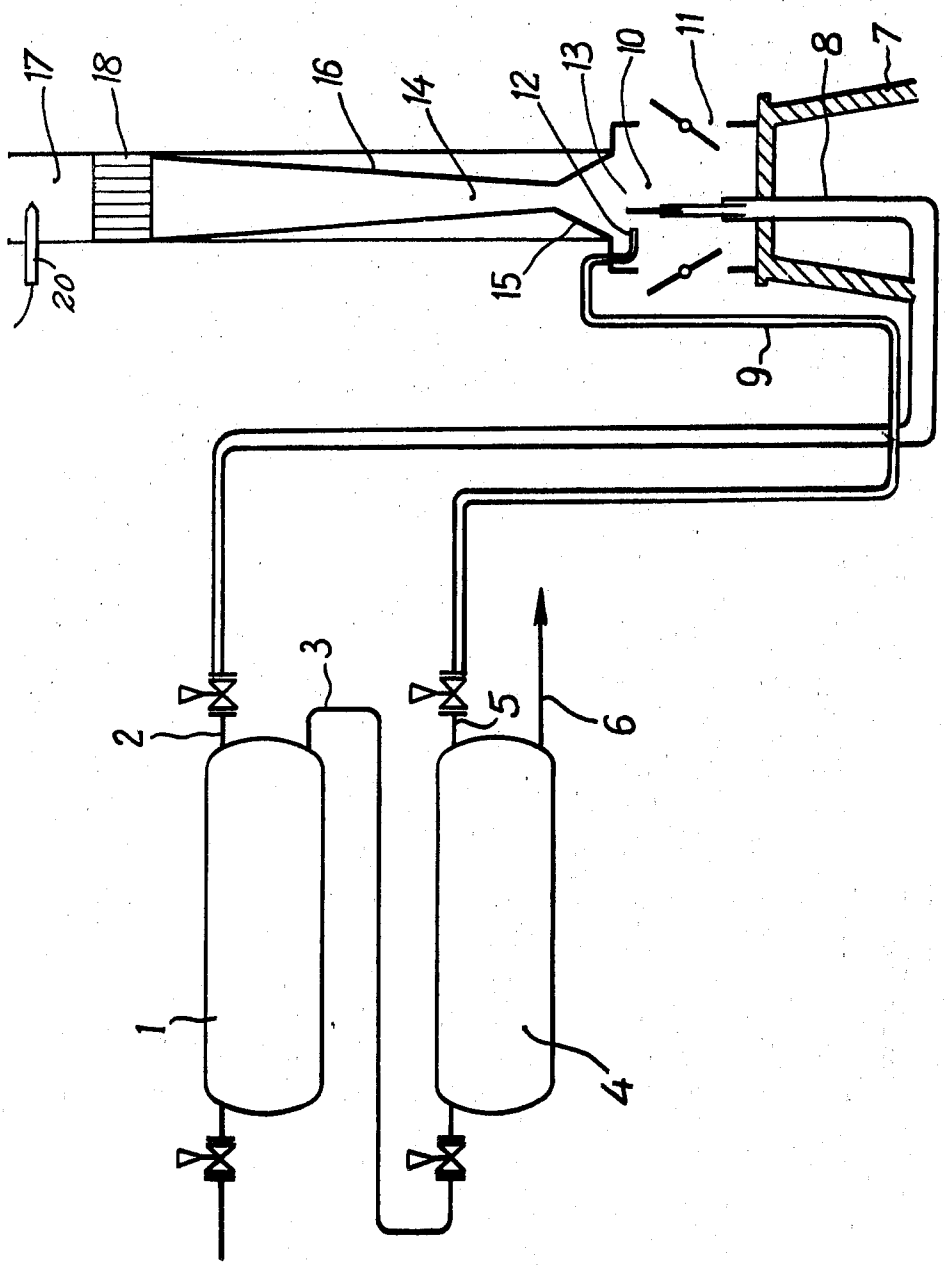
[57] **ABSTRACT**

An improved flare installation to burn excess hydrocarbon gas, comprising a mixing chamber receiving atmospheric air and having an inlet for gases from a low-pressure separator, and an injector for gas from a high-pressure separator, on the same axis as a mixer, while a burner is provided below this chamber. The improved device is specially suitable for the non-polluting burning of gases accompanying liquid hydrocarbons in production fields, during testing, or in refinery plants.

3 Claims, 1 Drawing Figure

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FLARE INSTALLATION FOR THE COMBUSTION OF HYDROCARBON GAS WITH PRIOR ADMIXING OF AIR

This invention concerns an improved device for the combustion of hydrocarbon gases, with prior admixing of air.

More particularly, it concerns an improved device providing for non-polluting combustion of gases, especially gases accompanying liquid hydrocarbons, which must be disposed of for want of commercial outlets.

The problem of eliminating such gases occurs in the testing of new gas or oil wells, in the operation of oil fields, and in the operation of processing and refining plants.

In oil fields, current practice is to use a flare to burn the gases from the separators that cannot be marketed for numerous reasons, mainly involving geographical location, size of local stocks, and possible output.

Gas discharged by high-pressure and low-pressure separators are usually sent to different flares. Combustion is always incomplete, since the oxygen supply is insufficient, obtained as it is by diffusion around the flame. This results in constant black smoke and the fall-out of unburnt matter in the form of carbon particles or droplets of hydrocarbons condensed by the process of expansion, while the flame itself is of high radiance and brilliance.

Moreover, when the gas source is under high pressure, such as several tens of bars, the cooling effect associated with expansion is so considerable that the production of hydrates may cause obstruction of the flare line.

The polluting effect of such devices is certain, and moreover it is generally very conspicuous, with psychological consequences that may be even more serious than the actual pollution.

The device according to the invention obviates these drawbacks by feeding the flares with a mixture of gas and air in proportions ensuring complete combustion, thus avoiding pollution, practically eliminating heat radiation, and precluding the formation of hydrates.

This new installation for the combustion of excess gas from wells or hydrocarbon processing plants, with means for the separation of oil or condensate from gas, and passages to convey such gas after it has been separated from the oil or condensate, is characterized by the fact that it is supported on a raised structure above ground level and comprises a feed chamber provided with adjustable air inlets, a mixing chamber adjacent to the divergent passage which may be preceded by a convergent passage, at least one injector of combustible gas under pressure, located at the opening between the feed chamber and mixing chamber, and a burner at the opposite end of this mixing chamber, opening into the atmosphere, and comprising means for igniting the flare, and means of controlling combustion.

In one recommended embodiment, the installation comprises an inlet passage for combustible gas, leading from the storage tanks and low-pressure separators to the feed chamber, above the pressurized combustible gas injector.

In the same embodiment, the means of adjusting the air supply consist of a system to control the position of the pressurized combustible gas injectors in relation to the opening between the feed chamber and mixing chamber.

In another embodiment, applicable to high flow rates, the means supporting the device consist of a tower made up of assembled sectional or tubular components with struts and wind-braces, provided with convenient means for fixing the high-pressure and low-pressure gas feed pipes and electric cables for igniting the flare and controlling combustion.

In still another embodiment, applicable to comparatively small flow rates, the means supporting the burner consist of a braced upright tube, provided with side openings for the admission of air, the mixing chamber being located above these openings, and the tube being equipped with convenient means for fixing the high-pressure and low-pressure gas feed pipes and electric cables required for igniting the flare and controlling combustion.

Such a device is illustrated by way of example below.

The FIGURE shows, at a production centre, means of separating oil or condensate from gas, consisting of a high-pressure separator (**1**) fed from a well or a collector (not shown here), with a high-pressure gas outlet (**2**) and an outlet (**3**) for partially degassed liquid. This liquid is fed into a low-pressure separator (**4**) with low-pressure gas outlet (**5**) and an oil or condensate outlet (**6**).

The flare installation is fixed above ground level on a support (**7**), which may be a structure consisting of assembled sectional elements with struts and wind-braces, bolted together and provided with the necessary means of fixing the high-pressure and low-pressure gas feed pipes (**8** and **9** respectively) and electric cables required for igniting the flare and controlling combustion (not shown here).

The feed chamber (**10**) is provided with adjustable air inlets (such as **11**), and an inlet for the admission of combustible gas from the low-pressure separator, located above an injector (**13**) of combustible gas from the high-pressure separator. This injector is located on the axis of a mixing chamber (**14**) adjacent to the feed chamber, which also includes a convergent passage (**15**) followed by a divergent passage (**16**). The position of the outlet of the injector (**13**), relative to the plane of the mixing chamber entrance, is adjustable by translational movement along the mixing chamber axis by means of a telescopic system (**19**), for example. The choice of the position of the injector outlet constitutes one of the parameters determining the air/gas ratio in the mixing chamber. At the end of the divergent passage (**16**) a combustion flue (**17**) opens into the atmosphere through an interposed grid or funnel (**18**), to prevent flashback. The devices (**20**) for igniting the torch and controlling the flame are conventional.

This flare device makes it possible to obtain a gaseous mixture ensuring complete combustion. The flame obtained is thus transparent and of low radiance, the combustion gases released are neutral and non-polluting, and the combustion process does not produce any unburnt matter, liquid or solid. Moreover, the dilution, in air let in at the surrounding temperature, of the combustible gases cooled by expansion precludes any extensive cooling, likely to produce hydrates.

The operation of the combustion device requires no power supply: the air required for combustion is supplied by atmospheric induction through an injector which works by using part of the power supplied by the high-pressure gas. Where the plant is fed with gaseous

residues from refineries, it may be advisable to supply either additional combustible gas at high pressure, or sufficient power to draw in the volume of air required for the combustion of gases composed of heavy substances and supplied at comparatively low pressure.

What is claimed is:

1. A flare device for the combustion of excess combustible gas, said device comprising

means for separating said combustible gas from oil and condensate contained therein and for supplying separated combustible gas through two different ducts at two different pressures,

a feed chamber provided with adjustable air inlet means,

a high pressure injector connected to introduce combustible gas from the duct carrying gas at the higher of said pressures into said feed chamber and thereby suck air into said feed chamber through said air inlet means,

means for introducing combustible gas from the other of said ducts into said feed chamber at a point near the upper end of said injector,

a mixing chamber connected to receive combustible gas and air from said feed chamber and defining a gas flow passage which diverges as it approaches the end thereof remote from said feed chamber,

and a burner supplied through said diverging passage, said burner being equipped with means for igniting said combustible gas.

2. A flare device as claimed in claim **1** comprising means for adjusting the position of the outlet end of said injector relative to the connection between said feed and mixing chambers.

3. A flare device as claimed in claim **1** in which said divergent passage is preceded by a convergent passage in said mixing chamber communicating directly with said feed chamber.

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