

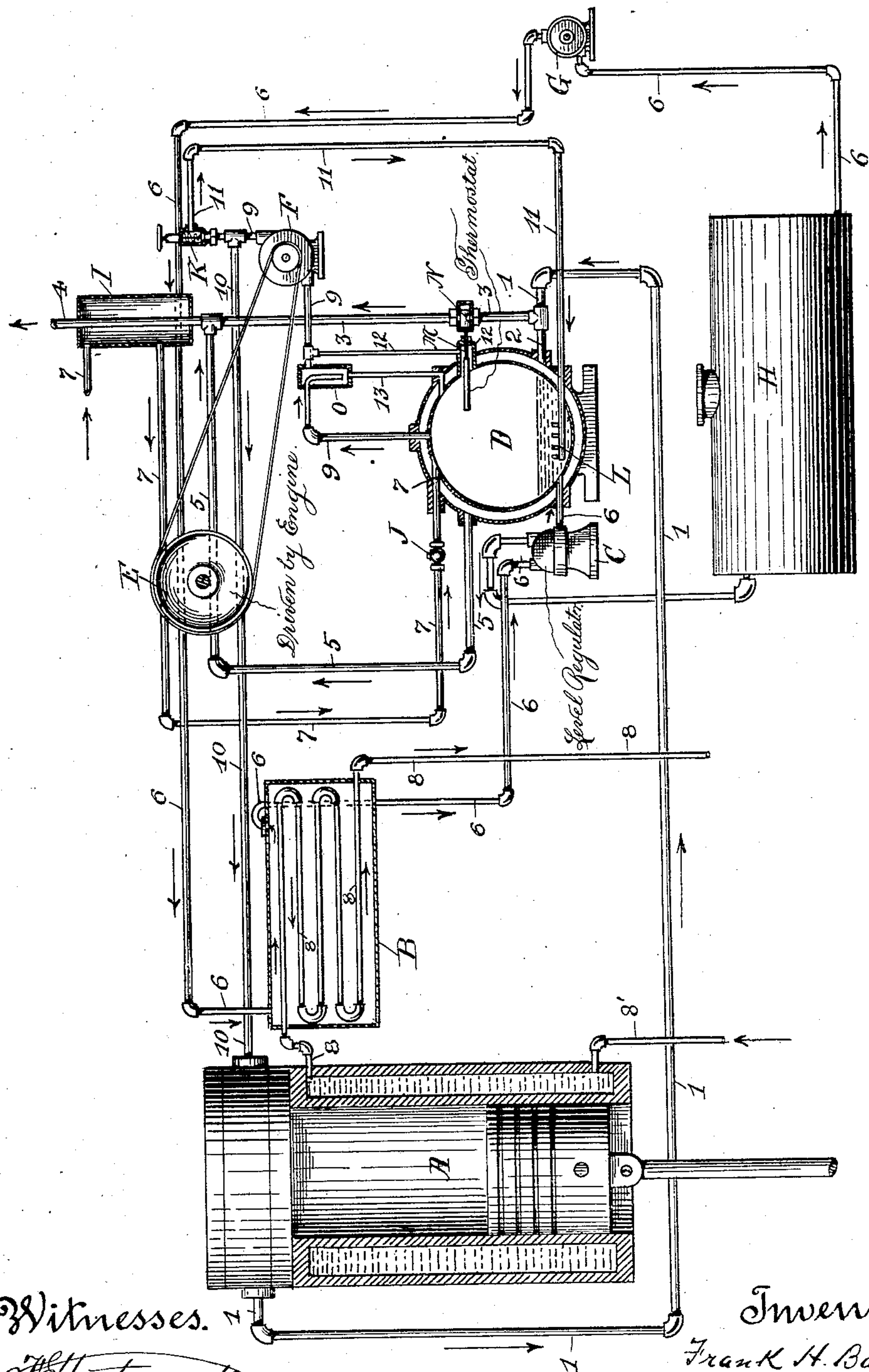
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F. H. BATES.

GENERATING OIL GAS FOR EXPLOSIVE ENGINES.

APPLICATION FILED NOV. 5, 1904.



Witnesses.

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# UNITED STATES PATENT OFFICE.

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## GENERATING OIL-GAS FOR EXPLOSIVE-ENGINES.

No. 868,246.

Specification of Letters Patent.

Patented Oct. 15, 1907.

Application filed November 5, 1904. Serial No. 231,507.

*To all whom it may concern:*

Be it known that I, FRANK H. BATES, a citizen of the United States, residing at Ross Station, Marin county, State of California, have invented certain new and useful Improvements in Apparatus for Generating Oil-Gas for Explosive-Engines; and I do hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to the class of apparatus for vapor or gas generation for use in connection with explosive engines. It concerns conditions affecting the formation of the gas or vapor, its admixture, when necessary, with air and its supply to the engine, all of which, for conciseness, I wish to be understood as included in the title given. In this art of vapor or gas generation, the common practice is to generate an oil-gas from a liquid hydrocarbon, by means of heat supplied, for the sake of economy, by the exhaust gases from the engine, said gas, either alone, or in a mixture with air, being supplied to the engine. While I do not confine myself to this heating medium, nor to the generation of the gas from a particular liquid hydrocarbon, (for my invention, in some of its phases, is independent of these restrictions) I shall herein describe and illustrate the operation of my apparatus in connection with the common practice above stated, that is, supplying the heat to the generator by the exhaust gases from the engine, and using any hydrocarbon, particularly kerosenes, low-grade distillates and crude oils from which to generate the gas or vapor.

A further preliminary explanation seems necessary before describing the nature and objects of my invention. In the prior practice, the generators of this art are adapted to contain the oil, either as a definite body, the level of which should be automatically maintained constant, or to receive it as a flowing body passing through a tortuous course within it in a more or less attenuated stream. An example of the former practice will be found in Letters Patent of the United States Nos. 748,687 and 763,039, granted to me January 5th, 1904, and June 21st, 1904 respectively, while the latter practice is illustrated by Letters Patent of the United States No. 746,914, granted to me December 15th, 1903. My invention is equally applicable, in most of its aspects, to both forms of generators, but as illustrative of a further feature, namely, the agitation of the oil, for the better production of the gas, I deem it best to describe and illustrate my present apparatus in connection with a generator employing a definite constant-level oil body with a regulator to maintain said level.

The object of my present invention, primarily, is to bring about such conditions in connection with the generation of gas or vapor in a generator, and the conduction of said gas or vapor to an explosive engine, as will tend to place at the intake of the engine a gas or

vapor of approximately constant quality and pressure. This object is attained:—First, by the passage of the gas or vapor from the generator, at a constant rate, while returning to the generator, if desirable for reasons of economy, any excess of said gas or vapor over and above that used at the engine. Second,—by the maintenance, in the generator of an approximately constant temperature, as by thermostatic control, in order to produce a gas or vapor of uniform richness; which result is further insured by adding to the accuracy of the temperature control by preheating, preferably by means of the exhaust gases finally expended from the engine-generator-system, any air admitted to the generator, which may be used as a carrier for the gas or vapor; and also by preheating the oil used for gasification or vaporization, preferably by means of the hot water expended from the water-jacket of the engine: or vice-versa, using the exhaust gases to preheat the oil and the jacket water to preheat the air; all, to the end of lessening the difference in temperature between the entering air, the entering oil, and the generator, thus relieving the thermostat to a considerable degree in cold climates. Third, by the agitation of the body of oil within the generator, in case of the use of that form of generator using such a body, as heretofore mentioned, by means of returning the excess of the gas or vapor together with any air mixed therewith, into said body of oil with a suitable spraying action to agitate the oil. Fourth, by the removal of any entrained oil, at the outlet of the generator, due to the velocity of the outgoing gas or vapor.

It is well understood that the close regulation of explosive engines is rendered extremely difficult by the employment of a liquid fuel, either directly, as instanced in the case of gasoline being sprayed into the cylinder, or indirectly, as when a liquid fuel is passed into a generator to be there converted into a gas or vapor. This difficulty arises by reason of the lack of uniform quality and pressure, and the tendency to flood the engine with raw fuel or condensed gas or vapor.

My present invention consists in an apparatus which furnishes a remedy by providing an output from the generator which is maintained practically constant, the pressure at the engine intake being also maintained practically constant and the temperature within the generator being also maintained practically constant, thus insuring a constant quality of gas or vapor.

It may be stated, at this point, that by properly suiting the size of generator to the load or power required at the engine, the vapor tension (proportioned to the temperature of distillation) may be sufficient for the requirements cited: otherwise air may be used as a carrier. It must, therefore, be understood that in hereafter claiming the features of my invention relating to constant rate and pressure, the agitation of the oil and the maintenance of constant temperature, I refer



to and imply gas or vapor, whether alone, or mixed with air as a carrier.

In the accompanying drawing, the figure is a diagrammatic view of my apparatus.

5 In this drawing A is an explosive engine. B is a hot-water heater. C is a regulator of any suitable type adapted to maintain constant the body of oil within the generator D. Such a regulator as I show in my Patent No. 763,039, above referred to, will answer. Its  
10 presence here being merely illustrative of purpose, it needs no further description. E is a driving pulley, which, by means of a belt indicated, operates a fan blower F. G is a pump. H is the oil reservoir. I is a heating shell to preheat the incoming air. J is a check  
15 valve to permit air to enter the generator but to prevent its return. K is a pressure regulator. L is a sprayer immersed in the body of oil in generator D. M is a thermostat which controls a valve N. O is a separator to release and return to the generator the en-  
20 trained oil and condensed vapor, which passes over with the gas or vapor. These several parts and their functions will readily be understood by a description of their connections, and the courses of the several fluids through them.

25 Air enters at 7 to the heating shell I, and passing out through the pipe line 7, as indicated by the arrows, passes through check valve J, (which valve, as stated, prevents its return) and enters the generator D.

The oil is pumped from the tank H, by the pump G,  
30 through pipe line 6, and into and through hot water heater B, and through the regulator C into the generator D. The gas or vapor, or the mixture of gas or vapor and air, as the case may be, passes from the generator D out through the pipe line 9, being induced by  
35 the blower F, driven by pulley E, and is forced against the pressure regulator K, maintaining a constant pressure on the generator side. Said gas or vapor, or mixture of air therewith, is thence, by the blower F forced  
40 on through pipe line 10 to the engine A, while the excess, not used at the engine is returned by pipe line 11, through the sprayer L, and body of oil in the generator to the generator D, thereby agitating the oil.

The exhaust gases from the engine pass by pipe line 1 into the outer casing of the generator D, by the pipe 2,  
45 when the thermostat valve N is closed; and out from the generator casing through pipe line 5 and through the heater shell I, giving up some of their heat to preheat the incoming air.

The thermostat M may be of any suitable character.  
50 It may consist of an aluminium tube exposed to the interior heat of the generator. Its outer end is to be connected with the valve N in such manner as to control said valve. A pipe 12 communicating with the generator surrounds said aluminium tube and thence extends  
55 to and joins the pipe line 9, so that a part of the gas or vapor, or the mixture with air as the case may be, passes in contact with the thermostat tube to control it and thence joins the circulation again. When the temperature in the generator rises too high, the ther-  
60 mostat M opens the valve N, whereupon the exhaust gases are by-passed from pipe line 1 directly through pipe lines 3 and 4, to their discharge, without entering the generator. When the temperature in the generator falls, the thermostat will close valve N and the  
65 exhaust gases will pass into the generator again.

The circulating water enters the engine jacket through pipe 8', and passes out through pipe line 8, which passes through the heater B, giving up some of its heat to the oil in the heater, and thence out to its  
70 discharge.

The separator O may be of any of the well known forms, that here shown consisting of a vessel into which the entering pipe 9 dips, and from the bottom of which a pipe 13 carries the condensed particles and entrained  
75 oil back to the generator.

The pressure valve K may be of any suitable type and is sufficiently indicated in the diagram.

With an apparatus such as I have illustrated, it will be evident that by drawing out of the generator, at all times, the same volume of vapor, or vapor mixed with  
80 air, as the case may be, per interval of time, which implies a discharge from the generator at a constant rate, said rate being sufficient to afford vapor or mixture for the heaviest load intended for the engine, a constant quality of vapor or mixture is maintained, when con-  
85 sidering the generation as taking place under a constant temperature. If the load on the engine lightens, the rate of generation remains the same whether the excess or overflow be passed out to waste, or whether it be re-  
90 turned to the generator, since in the latter case the proportions of the returned excess or charge are unchanged by its passage through the circuit. This constant rate may be maintained by driving the blower F at a fixed speed regardless of the engine load. Furthermore the  
95 maintenance of a constant pressure of the vapor or mixture at the engine intake, say three-tenths of an inch, permits of adjusting the proportions of this vapor or mixture at the engine to the air directly admitted by another intake. This exact proportioning results in the  
100 entrance of a correct combination of vapor or mixture coming from the generator, with air admitted directly to the engine, thereby permitting the governor, if of the throttling type, to maintain this proper combination, while operating under varying loads. Without a con-  
105 stant pressure of the vapor or mixture at the engine intake, the resulting entrance of a varying quantity, as compared to the set quantity of air at the other engine intake would tend to render the governing inaccurate.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is—  
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1. In an apparatus for generating oil gas for explosive engines, the combination of a gas generator and means for withdrawing the gas therefrom at a constant rate, comprising a blower driven at a fixed speed, regardless of the engine load.  
115

2. In an apparatus for generating oil gas for explosive engines, the combination of a gas generator and means for delivering the gas therefrom to the engine at a constant pressure, comprising a pressure regulator and a blower driven at a fixed speed, regardless of the engine  
120 load.

3. In an apparatus for generating oil gas for explosive engines, the combination of a gas generator, means for withdrawing the gas therefrom at a constant rate comprising a blower driven at a fixed speed regardless of the engine load, and means for delivering said gas to the engine at a constant pressure comprising a pressure regu-  
125 lator disposed between the blower and the engine.

4. In an apparatus for generating oil gas for explosive engines, the combination of a gas generator, means for withdrawing the gas therefrom at a constant rate comprising a blower driven at a fixed speed regardless of the engine load, and means for returning the excess of gas not  
130 used at the engine to the generator.



5. In an apparatus for generating oil gas for explosive engines, the combination of a gas generator, means for delivering the gas therefrom to the engine at a constant pressure comprising a pressure regulator and a blower driven at a fixed speed regardless of the engine load, and means for returning the excess of gas not used at the engine to the generator. 80
6. In an apparatus for generating oil gas for explosive engines, the combination of a gas generator, means for withdrawing the gas therefrom at a constant rate comprising a blower driven at a fixed speed regardless of the engine load, means for delivering said gas to the engine at a constant pressure comprising a pressure regulator disposed between the blower and the engine, and means for returning the excess of gas not used at the engine to the generator. 85
7. In an apparatus for generating oil gas for explosive engines, the combination of a gas generator adapted to contain a body of oil from which the gas is generated, means for withdrawing the gas from the generator at a constant rate, and means for returning the excess of gas not used at the engine into the body of oil with an agitating action to said oil. 90
8. In an apparatus for generating oil gas for explosive engines, the combination of a gas generator adapted to contain a body of oil from which the gas is generated, means for delivering said gas to the engine at a constant pressure, and means for returning the excess of gas not used at the engine into the body of oil with an agitating action to said oil. 95
9. In an apparatus for generating oil gas for explosive engines, the combination of a gas generator, means for withdrawing the gas therefrom at a constant rate comprising a blower driven at a fixed speed regardless of the engine load, means for delivering said gas to the engine at a constant pressure comprising a pressure regulator disposed between the blower and the engine, and means for returning the excess of gas not used at the engine into the body of oil with an agitating action to said oil. 100
10. In an apparatus for generating oil gas for explosive engines, the combination of a gas generator, means for withdrawing the gas therefrom at a constant rate comprising a blower driven at a fixed speed regardless of the engine load, and means for separating from said gas during its passage from the generator to the engine any entrained oil and condensed vapor. 105
11. In an apparatus for generating oil gas for explosive engines, the combination of a gas generator, means for delivering the gas to the engine at a constant pressure comprising a pressure regulator and a blower driven at a fixed speed regardless of the engine load, and means for separating from said gas during its passage from the generator to the engine any entrained oil and condensed vapor. 110
12. In an apparatus for generating oil gas for explosive engines, the combination of a gas generator, means for withdrawing the gas therefrom at a constant rate comprising a blower driven at a fixed speed regardless of the engine load, means for delivering said gas to the engine at a constant pressure comprising a pressure regulator disposed between the blower and the engine and means for separating from said gas during its passage from the generator to the engine any entrained oil and condensed vapor. 115
13. In an apparatus for generating oil gas for explosive engines, an explosive-engine-generator-system including a gas generator and a gas engine, in combination with means for preheating air by a heating medium expended from said system, means for mixing said pre-heated air with the oil gas in the generator, and means for withdrawing said mixture from the generator at a constant rate, comprising a blower driven at a fixed speed regardless of the engine load. 120
14. In an apparatus for generating oil gas for explosive engines, an explosive-engine-generator-system including a gas generator and a gas engine, in combination with means for preheating air by a heating medium expended from said system, means for mixing said pre-heated air with the oil gas in the generator, and means for delivering said mixture to the engine at a constant pressure, comprising a pressure regulator and a blower driven at a fixed speed regardless of the engine load. 125
15. In an apparatus for generating oil gas for explosive engines, an explosive-engine-generator-system including a gas generator and a gas engine, in combination with means for preheating air by a heating medium expended from said system, means for mixing said pre-heated air with the oil gas in the generator, means for withdrawing said mixture from the generator at a constant rate comprising a blower driven at a fixed speed regardless of the engine load, and means for delivering it to the engine at a constant pressure comprising a pressure regulator disposed between the blower and the engine. 130
16. In an apparatus for generating oil gas for explosive engines, an explosive-engine-generator-system including a gas generator and a gas engine, in combination with means for preheating the liquid hydrocarbon from which the gas is generated by a heating medium expended from said system, means for delivering said pre-heated liquid hydrocarbon to the generator wherein it is vaporized, and means for withdrawing said vapor from the generator at a constant rate, comprising a blower driven at a fixed speed regardless of the engine load. 135
17. In an apparatus for generating oil gas for explosive engines, an explosive-engine-generator-system including a gas generator and a gas engine, in combination with means for preheating the liquid hydrocarbon from which the gas is generated by a heating medium expended from said system, means for delivering said pre-heated liquid hydrocarbon to the generator wherein it is vaporized, and means for delivering said vapor to the engine at a constant pressure, comprising a pressure regulator and a blower driven at a fixed speed regardless of the engine load. 140
18. In an apparatus for generating oil gas for explosive engines, an explosive-engine-generator-system including a gas generator and a gas engine, in combination with means for preheating the liquid hydrocarbon from which the gas is generated, by a heating medium expended from said system, means for delivering said pre-heated liquid hydrocarbon to the generator wherein it is vaporized, means for withdrawing said vapor from the generator at a constant rate comprising a blower driven at a fixed speed regardless of the engine load, and means for delivering it to the engine at a constant pressure comprising a pressure regulator disposed between the blower and the engine. 145
19. In an apparatus for generating oil gas for explosive engines, an explosive-engine-generator-system including a gas generator and a gas engine, in combination with means for preheating the liquid hydrocarbon delivered to the generator by a heating medium expended from said system, means for pre-heating the air by a heating medium expended from said system, means for delivering said pre-heated hydrocarbon and pre-heated air separately to the generator, and means for withdrawing the mixture of gas and air from the generator at a constant rate, comprising a blower driven at a fixed speed regardless of the engine load. 150
20. In an apparatus for generating oil gas for explosive engines, an explosive-engine-generator-system including a gas generator and a gas engine, in combination with means for preheating the liquid hydrocarbon delivered to the generator by a heating medium expended from said system, means for pre-heating the air by a heating medium expended from said system, means for delivering said pre-heated hydrocarbon and pre-heated air separately to the generator, and means for delivering the mixture of gas and air from the generator to the engine at a constant pressure, comprising a pressure regulator and a blower driven at a fixed speed regardless of the engine load. 155
21. In an apparatus for generating oil gas for explosive engines, an explosive-engine-generator-system including a gas generator and a gas engine, in combination with means for preheating the liquid hydrocarbon delivered to the generator, by a heating medium expended from said system, means for pre-heating the air, by a heating medium expended from said system, means for delivering said pre-heated hydrocarbon and pre-heated air separately to the generator, means for withdrawing the gas and air from the generator at a constant rate comprising a blower



driven at a fixed speed regardless of the engine load, and means for delivering them to the engine at a constant pressure, comprising a pressure regulator disposed between the blower and the engine.

- 5 22. In an apparatus for generating oil gas for explosive engines, an explosive-engine-generator-system including a gas generator and a gas engine, in combination with means for passing the requisite quantity of exhaust gases from the engine to supply the heat for the generator, means for  
10 automatically by-passing any excess of said exhaust gases,

not needed by the generator, a blower driven at a fixed speed regardless of the engine load, and a pressure regulator, whereby the gas is withdrawn from the generator at a constant rate, and delivered to the engine at a constant pressure.

In witness whereof I have hereunto set my hand.

FRANK H. BATES.

Witnesses:

C. H. RITTENHOUSE.

S. D. BISHOFF.