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PROCESS FOR SUPPLYING FUEL TO HEAT ENGINES.

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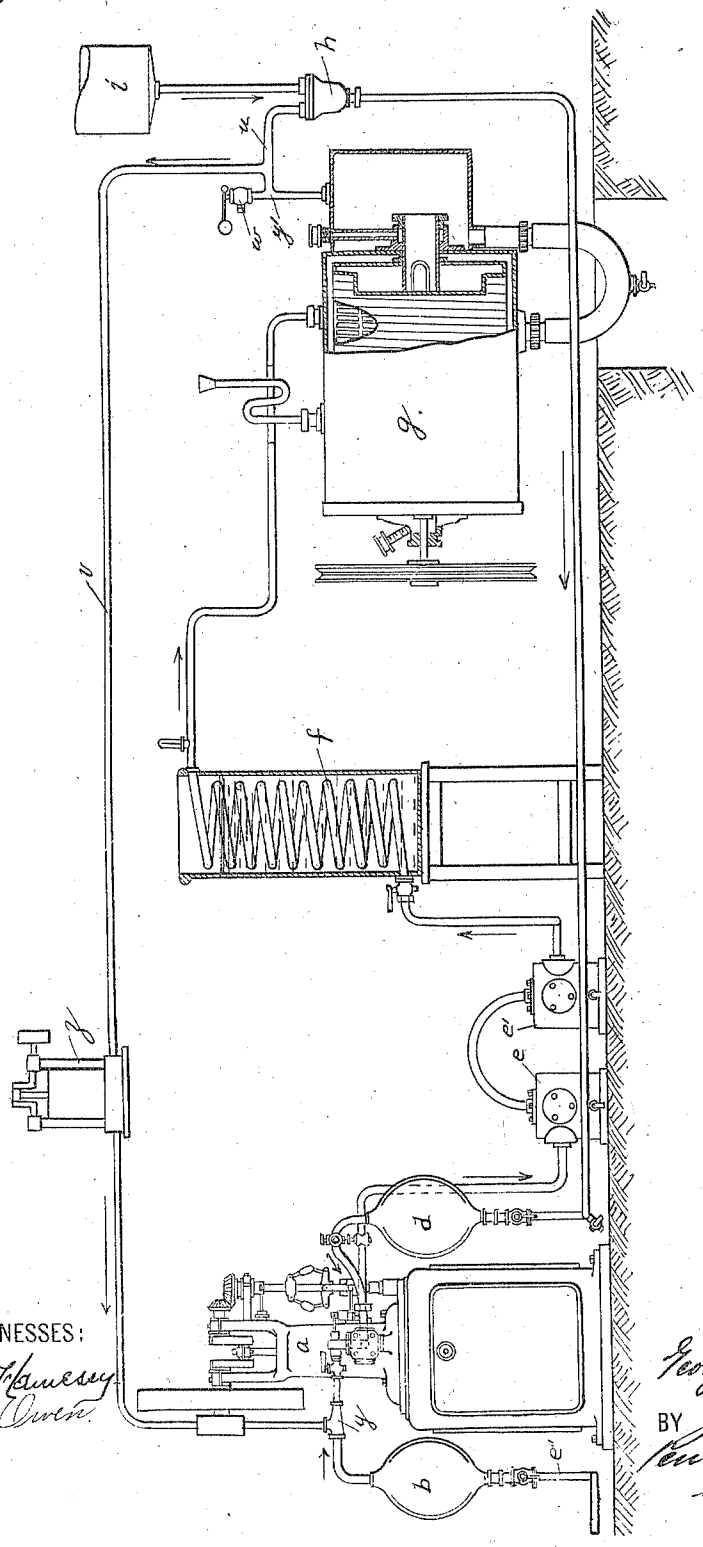
965,632. Patented July 26, 1910.



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PROCESS FOR SUPPLYING FUEL TO HEAT-ENGINES.

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To all whom it may concern:

Be it known that I, GEORGE F. JAUBERT, of 155 Boulevard Malesherbes, Paris, France, have invented certain new and useful Improvements in Processes for Supplying Fuel to Heat-Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention has for its object a process for regulating the supply of fuel to heat engines, principally internal combustion motors, working on a closed cycle. In these motors, for example, those of the Diesel type, the gases produced by combustion after suitable treatment receive an addition of oxygen or of gas highly charged with oxygen, and are then divided into two parts, of which one passes directly to the motor, while the other, suitably compressed by a special pump, is used to inject the fuel into the cylinder.

Since it is difficult to exactly regulate the amount of oxygen admitted, it may happen, that the presence of an excess of oxygen in the compressed gas which serves to inject petrol or other fuel, may cause the sudden explosion of the petrol on account of the high pressure to which the mixture is subjected. This may give rise to explosions in the feed system, and may cause the rapid deterioration of the injection orifice.

The invention has as its principal object to avoid this defect.

The process consists in injecting petrol or other liquid fuel, by the help of compressed gas less highly charged with oxygen than the gas drawn directly into the motor cylinder to be used as fuel, so as to avoid bringing an excess of highly compressed oxygen into contact with the liquid fuel, and to prevent the formation of explosive mixtures in the feed-pipes of the motor.

The working is as follows.—The gases resulting from the combustion are directed when they leave the motor cylinders into a convenient receiver where they are divided into two currents, of which the one intended as the primary oxygen carrier or firing mixture, after having been purified, washed or cooled, if necessary, may receive a suitable addition of oxygen in the usual manner before entering the motor cylinder. The rest of the gas is subjected to suitable purifying and cooling, and then, after having received a less addition of oxygen, is compressed in any desired quantity by a pump to a sufficient pressure to cause the injection of the petrol. This quantity of petrol mixing in the motor cylinders with the suitably-compressed firing mixture, is ignited in the usual way.

In the accompanying drawing I have illustrated a convenient arrangement of apparatus for carrying out the process of the invention. *a* is a gas engine, to which the combustible gas is supplied by means of the injector *y* from a rubber pocket *b*, into which the gas is supplied from the conduit *e''*. The regenerated air charged with oxygen is drawn from the rubber pocket *d*. After combustion, the exhaust gases escape from the engine *a* and having passed through a suitable expansion chamber *e*—*e'* are cooled in a worm *f*, which is surrounded by cold water. From this they pass into a purifier *g* of the scrubber type, containing an alkaline solution, (caustic soda, potash, or lime), which absorbs the carbonic acid. The gases pass from the purifier through a pipe *y'* containing a safety valve *w* to allow the excess of gas to escape. Beyond the safety valve one branch pipe *v* leads to a compressor *z* and from there to the injector *y*. Another branch *u* leads to a mixer *h* where the gases receive an addition of oxygen derived from the oxygen-container *i*, of any appropriate type. The regenerated gases return to the rubber pocket *d*, from which they are again drawn by the engine. If desired, a second branch may lead from the oxygen-container to some point in the pipe leading to the compressor, the connection being so controlled that oxygen at reduced pressure may be admitted to the gases flowing toward the injector.

The advantages are as follows.—Since the fuel and the gas which causes its injection only receive a minimum quantity of oxygen, they will not, by uniting, form an explosive mixture, so that the danger of sudden explosion in the feed-pipe system is prevented as well as the deterioration of the injection orifice. Instead of injecting the fuel by the help of gas slightly charged with oxygen, the inert gases leaving the cylinder can be used, simply purified, without any addition of oxygen. In this manner, all risk of explosion is completely avoided, while the mo-

tor is placed under conditions for favorable working. If the gases intended to be mixed with oxygen are not to be purified or cooled, they can be left in the motor cylinders, only the necessary amount of gas being allowed to escape to inject the fuel. The oxygen intended to form the explosive mixture is then injected directly into the cylinders.

The receivers used to separate the gases of combustion may be of any desired construction, and a safety-valve may be placed as usual at some convenient place in the cycle to allow the excess of gas to escape.

The invention can be applied to all kinds of motors working on a closed cycle, and is particularly applicable to motors, for submarines and submersible boats.

What I claim is:—

1. A process for supplying fuel to heat engines working on a closed cycle and in which the fuel is injected into an oxygen-containing gas or firing mixture within the cylinder, which consists in charging a portion of the products of combustion with oxygen, and admitting the portion so charged into the cylinder, purifying, washing and compressing a separate portion of the products of combustion without addition of oxygen, and injecting a liquid fuel into the cylinder by means of said separate compressed portion.

2. A process for supplying fuel to heat engines working on a closed cycle, and in which the fuel is injected into an oxygen-containing gas or firing mixture within the cylinder, which consists in injecting oxygen into one portion of the gases resulting from combustion to form a supporter of combustion, purifying another portion of the products of combustion, and injecting a liquid fuel into the cylinder by means of said purified portion.

3. A process of operating heat engines on a closed cycle which consists in cooling and purifying the gases resulting from combustion, charging a portion of the cooled and purified gases with oxygen to form a supporter of combustion and returning the said charged portion to the combustion chamber, compressing a separate portion of the cooled and purified gases, and injecting a liquid fuel into the combustion chamber by means of said separate compressed portion.

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Witnesses:
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