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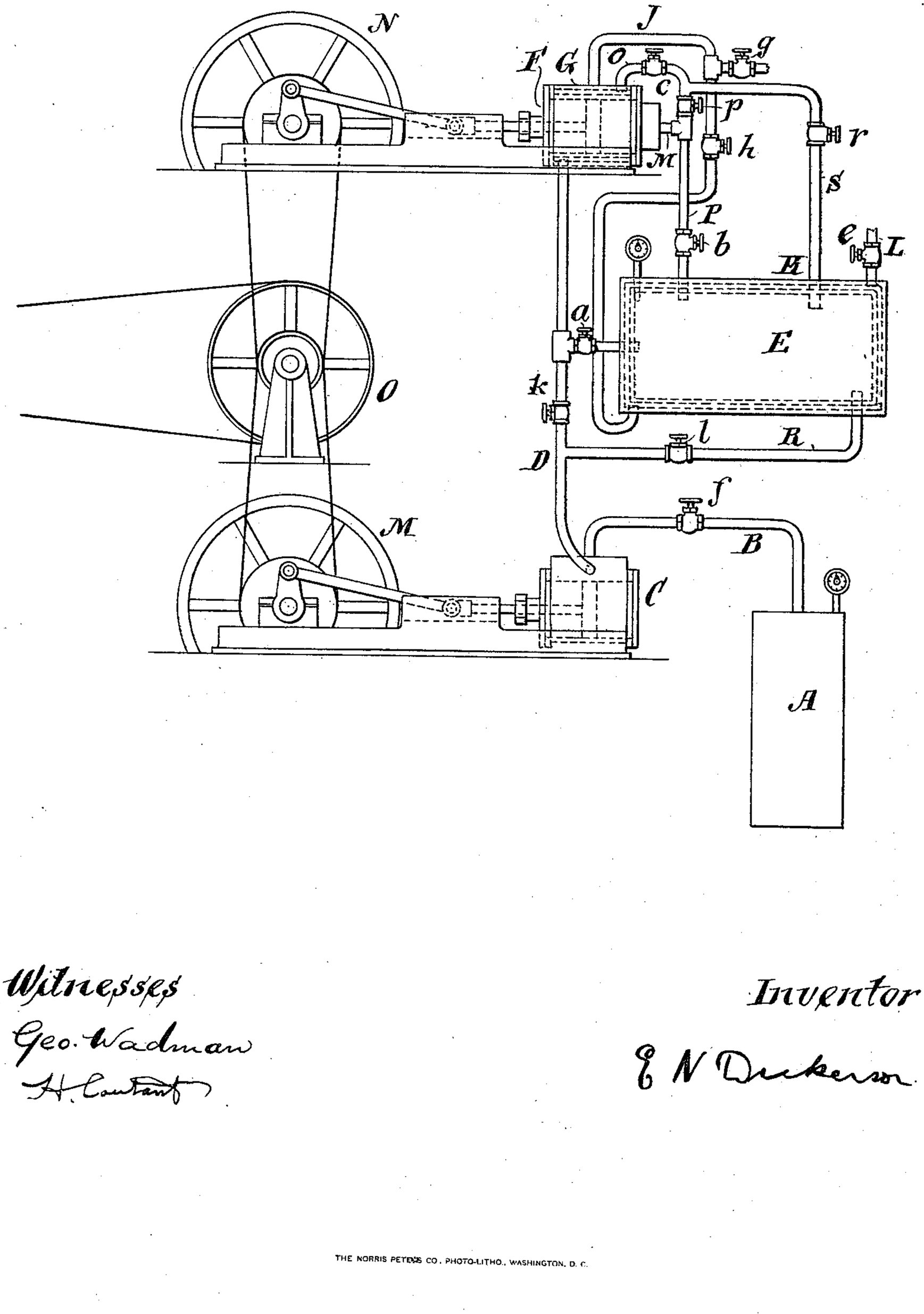
E. N. DICKERSON.

PROCESS OF AND APPARATUS FOR GENERATING POWER FROM COMPRESSED GASES.

(Application filed Feb. 27, 1895.)

(No Model.)



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PROCESS OF AND APPARATUS FOR GENERATING POWER FROM COMPRESSED GASES.

SPECIFICATION forming part of Letters Patent No. 607,655, dated July 19, 1898.

Application filed February 27, 1895. Serial No. 539,873. (No model.)

To all whom it may concern:

Be it known that I, EDWARD N. DICKERSON, of No. 253 Broadway, in the city, county, and State of New York, have invented a new and useful Improvement in Processes of and Apparatus for Generating Power from Compressed Gases by Expanding and Subsequently Burning the Same, of which the following is a full, true, and exact description, reference being had to the accompanying drawing.

This invention is designed to utilize the power derived from the expansion of such gases as acetylene, which may be liquefied and which are combustible.

Acetylene gas can be readily liquefied, and also as it expands from its liquefied condition can be used to drive a motor and can be subsequently utilized in a gas-engine by burning or exploding the same in such gas-engine. Such liquefied combustible gas in expanding from a liquid to a gaseous condition maintains constantly its maximum pressure, say, for acetylene gas, six hundred and fifty pounds (650 lbs.) to the square inch at normal temperatures. This pressure will continue until all of the liquefied gas is exhausted, whereas if a compressed but non-liquefied gas is used the maximum pressure constantly diminishes, and if in this case a reducing-valve reducing the pressure to the minimum desired pressure be employed, independent of any loss of power which might result from such reduction, it is obvious that a motor-cylinder of much greater capacity is required to do the same work than is the case where the maximum gaseous pressure from the liquefied gas is constantly employed. It is obvious likewise that in this expansion from a liquid to a gaseous condition "units of cold," so to speak, are produced, which can be used advantageously in reducing the excessive temperature of the explosion-cylinder without employing any additional cooling means or material. The expansion of liquefied acetylene through a motor produces a low degree of temperature in the expanded acetylene, and I propose to utilize this cold in a gas-engine where such cold is desirable, while at the same time the heat derived from the explosion in the gas-engine can be used to heat the acetylene which has been cooled by its expansion in the motor. The special value of this operation is that the expansion of the liquefied gas from the condition of a liquid to a gas requires for its conversion from one form of matter to another a large number of heat units. The cold thus produced is used in the subsequent explosion-cylinder, thereby preventing the overheating of that cylinder, it being well known that gas-explosion cylinders require an independent cooling medium for their practical operation, whereas by the operation of this device the necessity of such independent cooling medium is in whole or in part dispensed with.

My invention will be readily understood from the accompanying drawing, which represents a diagrammatic plan, partly in elevation, of my invention.

A represents a receptacle containing liquefied combustible gas, by preference liquefied acetylene. At ordinary temperatures this gas liquefies at a pressure of from six to seven hundred pounds per square inch. The gas passes by pipe B through valve *f* to motor C, which may be of any ordinary suitable construction, where it does the work of driving the fly-wheel M. In doing this work and in expanding from the chamber A the temperature of the acetylene has become much reduced. Thence the cold gas passes by pipe D, the cocks *a* and *l* being closed, to the exterior jacket of gas-engine G, which it cools in place of the ordinary water-current. Passing through the jacket, the gas escapes by pipe *o* through open cock *c* and is then exploded in the chamber, cock *b* being closed. The exhaust-gases pass to pipe J and may escape to the atmosphere through exhaust-cock *g*. If, however, it is desirable to use these hot gases to warm the incoming gas, the cock is opened, which allows the exhaust-gases to pass into the chamber E. Then the cock *g* being closed and the cock *h* being opened the heated gases enter the jacket surrounding the reservoir E and escape through the exhaust-pipe L, the valve *e* being open. If it is desired that all the gases escaping from the motor C shall pass through the reservoir E, the cock *k* is closed and cock *l* opened, when the exhaust from the motor C passes by pipe R through reservoir E and thence to the gas-engine, where, as usual, the gas and air are combined and exploded. In case it is de-

sired to make an interchange of heat subsequent to cooling the cylinder the arrangement is as follows: The exhaust from motor C passes by pipe D, cocks *a* and *l* being closed, through the jacket G of the cylinder F, and thence by pipe *o* to pipe S, cock *p* being closed and cock *r* being opened. Thence escaping by pipe P through cock *b* it enters the cylinder through pipe M, escapes as before by pipe J, cock *g* being closed, enters the jacket of reservoir E, and escapes by pipe L through cock *e*. In this way the cold gas is used to cool the gas-engine. It subsequently acquires heat from the exploded gas before it is itself exploded.

The fly-wheel M, driven by motor C, and the fly-wheel N, driven by motor G, may be belted together to the counter-shaft *o*, or their power may be used independently of each other, or they may be connected otherwise than as shown.

It is apparent that the principle of this invention can be used in other forms than that indicated, the essential novelty of the process being the cooling and subsequent driving of a gas-engine by expanded liquefied gas.

I am aware that it has been proposed to construct apparatus in which a compressed gas, non-liquefied, is used to operate an engine by direct pressure and subsequently a gas-engine by its explosion. In this case the cold produced from the expansion of the liquefied gas is not utilized. It is further apparent that the gas-pressure of such device is constantly diminishing, thereby making a varying power, or else, if a reducing-valve be employed, which has not been proposed, a much less pressure than the maximum pressure can alone be utilized. It is obvious that though my invention works best as shown, wherein the combination of the motor-cylinder and the explosion-cylinder is employed, yet parts of the invention—as, for instance, the cooling effect in the explosion-cylinder—can be utilized independent of the motor-cylinder, in which case the gas would pass directly to the explosion-cylinder, instead of through the motor-cylinder.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The within-described process of generating power consisting in first producing a liquefied gas, then releasing the pressure and expanding the gas in contact with a movable object thereby securing the cooling of the gas, then passing the gas to an explosion-chamber to cool the latter, and then combining the gas with air and exploding the mixture in said chamber in contact with another movable object, substantially as described.

2. The process of generating power from liquefied gas, which consists in expanding the same through a motor, thereby cooling the gas, in utilizing said cooled gas in the jacket of an explosion-engine, and in exploding the gas with air in the gas-engine, substantially as described.

3. The process of generating power from liquefied gas, which consists in expanding the same through a motor, thereby cooling the gas, in utilizing said cooled gas in the jacket of an explosion-engine, and in exploding a mixture of the gas and air in the gas-engine, having previously heated the gas to be exploded by the exploded gas, substantially as described.

4. The combination of the liquefied-gas receptacle A, the motor C, the jacketed gas-engine G, the intermediate reservoir E, and the connections shown for cooling the gas-engine G and exchanging heat between the cooled gas coming from the motor C and the products of combustion from the gas-engine, G, substantially as described.

5. The combination of the liquefied-gas receptacle A, motor C, jacketed gas-engine G, jacketed reservoir E, and connections shown for leading the expanded cooled gas through the jacket of the gas-engine in connection with the reservoir E, and the connections shown from the exhaust of the gas-engine for warming the cooled gas in the reservoir E, substantially as described.

6. The combination of a receptacle for containing liquefied gas, a connection from said receptacle to a motor driven by the pressure of the gas, a motor driven by the pressure of the gas, a jacketed gas-engine operated by the explosion of said gas, a connection from the motor to the jacket of the gas-engine, and from the jacket of the gas-engine to the interior of the gas-engine, substantially as described.

7. The combination of the liquefied-gas receptacle A, and motor C, driven by the pressure of the gas, with the gas-engine G, primarily cooled by the gas from the motor C, and subsequently operated by the explosion of the gas derived from said motor C, the said motor C and the gas-engine E being connected with and operating a driving-shaft, substantially as described.

8. The within-described improved mode of preventing the undue heating of parts of a gas-engine, consisting in conducting to said parts the gas resulting from releasing the pressure upon a combustible gas in a liquid state, substantially as described.

9. In the art of obtaining motive power from liquefied gas, releasing the pressure upon said liquefied gas and conducting the resultant gas to the heated parts of a gas-engine, then passing the gas in contact with parts heated by the exhaust, and combining air with the gas, and exploding the mixture, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

E. N. DICKERSON.

Witnesses:
H. COUTANT,
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