

UNITED STATES PATENT OFFICE.

PEDRO VERA, OF BOGOTA, UNITED STATES OF COLOMBIA.

IMPROVEMENT IN GAS-ENGINES.

Specification forming part of Letters Patent No. **160,130**, dated February 23, 1875; application filed March 29, 1873.

To all whom it may concern:

Be it known that I, PEDRO VERA, of Bogota, in the United States of Colombia, have invented a new and Improved Heat-Generating Machine, of which the following is a specification:

My invention consists of an apparatus for generating heat and motion by causing the explosion of mixtures of hydrogen and oxygen gases in the proportions for forming water, and utilizing the heat generated thereby to convert the water formed into steam; also, to rarefy air.

Figure 1 is a longitudinal sectional elevation of apparatus which I use for carrying out my invention. Fig. 2 is a plan view.

Similar letters of reference indicate corresponding parts.

The apparatus may consist of a hollow cylinder, A, hermetically closed, having pipes A¹ connecting it with pumps A² for introducing air, and a pipe, B, for exhausting it, and containing a strong hollow gun-cylinder, C, divided at the middle by a strong partition, D, and open at each end, the partition having a hole through its center through which a long piston-rod, E, works, projecting out through stuffing-boxes F in the heads of cylinder A, and carrying a disk, G, in front of each end of the gun-cylinder, so arranged that the ends of said gun-cylinder will be alternately closed and opened as it moves forward and back. The gun-cylinder is held firmly in place by rods L at each end, connected to the heads of cylinder A. At each end this piston-rod is connected by a rod, H, with the piston-rod of an air-pump, A². It is also connected by a cross-head, J, with a rod or wire, K, extending outside of cylinder A, from one cross-head to the other. M represents two pipes entering the gun-cylinder, one each side of the partition. Outside of the cylinder A these pipes have a valve, N, and, below the valve, connect, by two branches, O, with a flexible hydrogen-gas holder, P, and by one branch, Q, with a flexible oxygen-holder, R, which have a supply, S, through which they will receive the gases pumped from the bells of a galvanic machine. These holders will be constantly pressed in any manner, in order that the gases may flow rapidly when the valves N are opened.

These valves N are alternately opened by a lug, T, on rod K, and closed by a spring, U, acting on their levers V. W represents small glass insulators fitted in holes in the side of the gun-cylinder, one to each chamber, through which a wire, X, enters each chamber, said wires passing through the side of cylinder A, also insulated, and being free at their outer ends *z z*. Y and Y' represent wires of a small electric machine, one of which connects with cylinder C and the other is to be alternately brought into contact with the free ends of the wires X by the rock-lever *a*².

The apparatus being thus arranged, one of the valves will be opened to set it in motion, and a certain quantity of mixed hydrogen and oxygen gases, in the proportion of two atoms of the former and one of the latter—the quantities for forming water—will flow into one of the gun-chambers. At the same time a current of electricity will be caused to enter the gun-chamber, into which the gas flows, by the wire X of said chamber being brought into contact with the wire Y' of an electric machine by one of the lugs T of the rod K and ignite and explode the mixture by a spark, and form water. This explosion will produce heat in the proportion of 34.462 calories for each gram of hydrogen oxidized according to the experiments of Messrs. Fabre and Selbounann. It will also produce an enormous quantity of electricity, greater than that which may be produced from any galvanic apparatus, because the oxidation of a quantity of hydrogen which can produce one milligram of water sets free sufficient electricity to charge a metallic surface of one square meter twenty thousand times, according to the experiments of Becquerel, Faraday, and others.

By the heat generated in the chemical action the water produced will be instantaneously converted into steam, which will force the piston G from the gun chamber last exploded, so as to change the valves and the wire connections and cause the action to be repeated in the other chamber, and so on. At each stroke of the piston a quantity of air will be introduced into the cylinder A by the pumps A², which will be heated by the heat evolved by the chemical action, (which is latent in the steam which comes from the gun-chambers in-

to the cylinder A,) and expanded, so that it can be utilized as a motive power, being conducted to the engine through pipe B.

Instead of two branches, O, connecting the hydrogen-vessel with the pipes M, one of twice the capacity of the oxygen-pipe Q will answer as well.

I do not pretend that the machine can supply itself with the products of combustion for expanding air, nor that sufficient electricity is generated to produce heating-gases for the machine.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The combination of the gun-cylinder A, flexible hydrogen and oxygen gas holders, valve mechanisms, electrical-engine wires X Y Y', and the device for alternately connecting said wires, substantially as specified.

2. The combination of the air-pumps with the cylinder A and the gas-exploding mechanism, substantially as specified.

The above specification of my invention signed by me this 16th day of January, 1873.

P. VERA.

Witnesses:

IGNACIO ORTEGA,
JOSÉ LUIS GARCIA.