

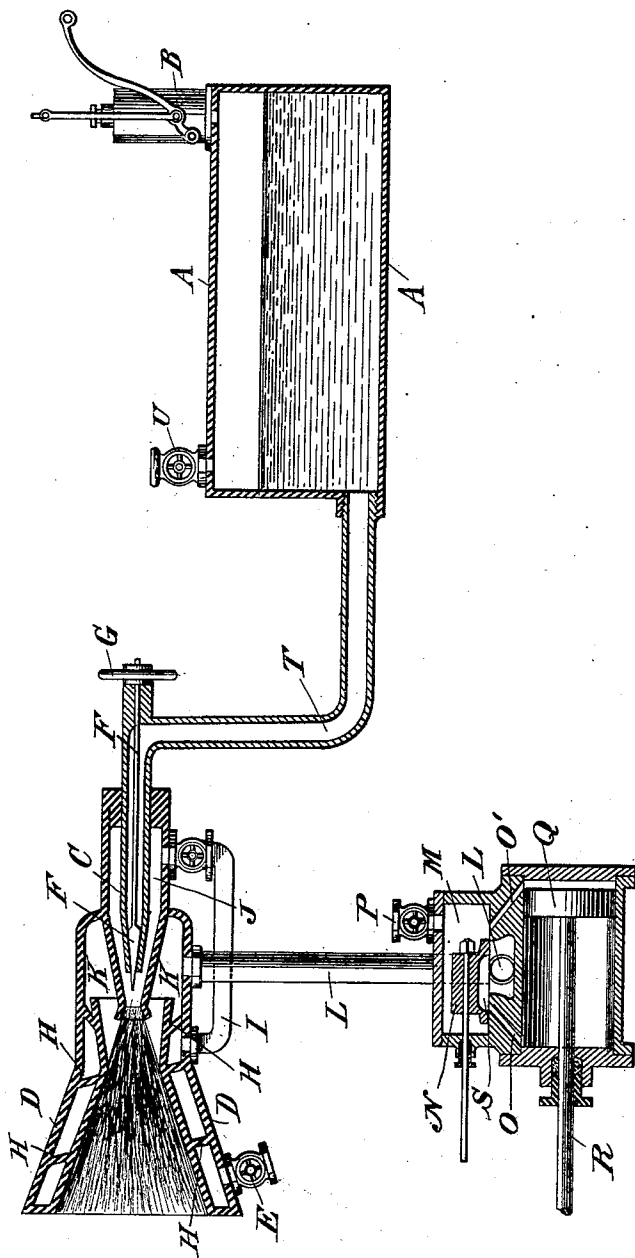
No. 650,355.

Patented May 22, 1900.

G. E. HESSE.
VACUUM ENGINE.

(Application filed July 26, 1899.)

(No Model.)



Witnesses
Edward D. Leland.
Edgar R. Mead.

Inventor
Gustaf Emil Hesse
By his Attorney
Phillips Abbott

UNITED STATES PATENT OFFICE.

GUSTAF EMIL HESSE, OF NEW YORK, N. Y., ASSIGNOR OF ONE-THIRD TO
ARTHUR E. PIORKOWSKI, OF SAME PLACE.

VACUUM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 650,355, dated May 22, 1900.

Application filed July 26, 1899. Serial No. 725,141. (No model.)

To all whom it may concern:

Be it known that I, GUSTAF EMIL HESSE, a citizen of the Kingdom of Sweden, and a resident of the city of New York, county and State of New York, have invented a new and useful Motor or Vacuum Engine, of which the following is a specification, reference being had to the accompanying drawing, in which the invention is represented in longitudinal vertical section, such parts only of the apparatus being shown as are essential to an understanding thereof.

In my invention an apparatus in some respects resembling that of an injector and in some respects that of a Bunsen burner is employed to act as an agent by which a vacuum is created within a chamber which is connected to the slide-valve chest of the cylinder of the engine in such manner that a vacuum more or less complete is created alternately at the opposite ends of the cylinder, and provision is made for the admission of atmospheric air alternately to the opposite side of the piston from that on which the vacuum is produced, so that the piston is driven alternately from end to end of the cylinder by partial or full atmospheric pressure.

Referring to the drawing, A is a tank adapted to contain liquid fuel or inflammable gas under pressure. When liquid fuel is used, air is pumped into the tank to a suitable pressure by means of the pump B, which may be of any preferred form. Under this pressure the fuel is forced out through the nozzle C, which may be of the ordinary injection form, where it mixes with cold or heated air drawn directly from the atmosphere or supplied under pressure, as preferred. I ordinarily give preference to heated air, and in order that the air may be heated I provide a double-walled conical device D immediately in advance of the nozzle C, in the outer wall of which device I provide an air-entrance cock E, by which the air-supply is regulated. The supply of fuel is regulated by the usual pin-cock F, which is actuated by a hand-wheel G or otherwise, as preferred. In order that the air may be made to pass around the conical device, between the walls thereof, and thus become heated, I divide the space between the two walls by a spiral partition H, which

connects with the pipe I, the other end of which opens into a passage-way J, adjacent to the tube of the injector or nozzle.

The mixture of fuel (whatever it may be) and air is of course to be of such character that it will burn upon ignition, and thereby create a vacuum within a chamber K, which is in direct communication with what would ordinarily be the exhaust-pipe L of the engine-cylinder. This pipe connects, as shown, with the slide-valve chest M of the cylinder, which is provided with the usual slide-valve N, operated by the engine in any suitable manner, and is likewise provided with the usual ports O and O', connecting with the opposite ends of the cylinder.

P is an air-inlet valve adapted to admit external air under ordinary atmospheric pressure to the inside of the valve-chest. This entrance-valve is provided with a suitable regulating-cock, so that the amount of air admitted to the cylinder may be regulated, thus determining the speed of the piston.

Q is the piston of the cylinder, and R the piston-rod.

T is a pipe connecting the tank with the injector. U is a filling-valve for the tank.

All of the valves or cocks of this apparatus are preferably provided with regulating devices, so that the quantity of the material, whatever it may be, passing through may be regulated as desired.

The operation is obvious. The burning of the fuel at the nozzle under pressure, as stated, creates a decided vacuum (more or less complete, depending upon the volume of the flame, the size of the apparatus, the degree of pressure, &c.) within the chamber K, and this vacuum extends through the pipe L to the valve-chest, thence through the opening S in the slide-valve and ports O O' to the interior of the cylinder. As the slide-valve reciprocates from end to end of its chest the ports O and O' are alternately exposed, whereupon the external air, which enters the upper part of the valve-chest through the entrance-cock P, passes alternately through these ports and presses against the side of the piston opposite that upon which the vacuum is then existing. This pressure will be approximately fifteen pounds to the square inch if the

vacuum created be practically complete, or of a less degree if the vacuum is partial only.

From the foregoing it will be seen that the fuel in my engine is employed solely as a means for generating the vacuum, the pressure of the atmosphere being employed as the agent for driving the piston, and that many advantages result from this construction, whereby the engine is peculiarly adapted to certain work—as, for instance, the driving of automobile carriages, small boats, and the like.

It will be obvious to those who are familiar with this art that changes may be made in the details of construction of the apparatus without departing from the essentials thereof. I therefore do not limit myself to the details above described.

Wherever in the claims hereof I use the word "valveless," I wish it to be understood as meaning that my vacuum-generating apparatus has no valves actuated by the mechanism and necessary for the alternating operation of its parts, as has been the case in most engines of this general character heretofore known, so far as I am aware, and that I do not refer to the pin-valve which regulates the admission of fuel nor to the air-valve which admits air to my burner, because these two devices are not valves in the sense referred to. On the contrary, they are mere regulating devices, which adjust once for all the admission of the fuel and air, and when once adjusted need not be changed unless an increase or decrease in the power is desired.

Having described my invention, I claim—

1. The combination of an apparatus having a combustion-chamber adapted to continuously burn fuel, means to continuously supply fuel to said combustion-chamber, a part or chamber adjacent to the combustion-chamber within which the uninterrupted combustion continuously produces a partial vacuum, an engine-cylinder provided with suitable valves, and a pipe connecting said vacuum-chamber with the cylinder, for the purposes set forth.

2. The combination of an apparatus having a combustion-chamber adapted to continuously burn fuel, means to continuously supply fuel to said combustion-chamber, a part or chamber adjacent to the combustion-chamber within which the uninterrupted combustion continuously produces a partial vacuum, means to put the fuel under pressure, an engine-cylinder provided with suitable valves, and a pipe connecting the vacuum with the cylinder, for the purposes set forth.

3. The combination of an apparatus having a combustion-chamber adapted to continuously burn fuel, an air-duct for supplying oxygen to the fuel located in the wall of the combustion-chamber, a chamber adjacent to the combustion-chamber within which a partial vacuum is continuously maintained by the combustion of the fuel, an engine-cylinder

provided with suitable valves, and a pipe connecting the vacuum-chamber with the cylinder, for the purposes set forth.

4. The combination of a reservoir adapted to contain fuel, a burner, means to continuously convey the fuel to the burner, a chamber adjacent to the burner within which the uninterrupted combustion of the fuel continuously produces a partial vacuum, an engine-cylinder and its piston; a duct connecting the chamber with the exhaust of the cylinder, and means to permit atmospheric air to alternately impinge upon the piston of the cylinder at the side opposite that where the vacuum is present, for the purposes set forth.

5. The combination of a reservoir adapted to contain fuel, a burner, means to continuously convey the fuel to the burner, a chamber adjacent to the burner within which the uninterrupted combustion of the fuel continuously produces a partial vacuum, an engine-cylinder and its piston; a pipe connecting the vacuum-chamber with the cylinder of the engine, means to permit atmospheric air to alternately impinge upon the sides of the piston opposite that where the vacuum is present, and means to regulate the speed of the motor by allowing more or less air to enter the cylinder, for the purposes set forth.

6. A power-generator embodying a valveless apparatus provided with a combustion-chamber adapted to continuously burn fuel, means for continuously supplying fuel to the apparatus, a chamber adjacent to the combustion-chamber within which the continuous combustion of the fuel maintains a partial vacuum, a cylinder provided with a piston removed from said combustion apparatus whereby the former will be always cool or relatively cool, means connecting the combustion apparatus and the cylinder whereby the vacuum or partial vacuum generated in the former may be alternately present at the opposite ends of the latter, and means for admitting air at atmospheric pressure alternately at the sides of the piston of the cylinder where the vacuum is not present, for the purposes set forth.

7. The combination of a burner, a chamber within which the air and fuel mix adjacent to the burner, a vacuum-chamber inclosing said first-named chamber, a combustion-chamber in front of the vacuum-chamber, and a pipe to extend the vacuum-chamber to the point of use, for the purposes set forth.

8. The combination of a burner, a chamber within which the air and fuel mix, a combustion-chamber surrounded by an air-flue for the purpose of heating the air, a vacuum-chamber adjacent to the combustion-chamber, a pipe connecting the air-flue with the mixing-chamber, and another pipe for extending the vacuum-chamber to the point of use, for the purposes set forth.

9. The combination of a burner, a chamber within which the air and fuel mix, a combus-

tion-chamber in front of said mixing-chamber, a vacuum-chamber adjacent to the burner, a fuel-tank connected with the burner, an air-compressing pump connected with the fuel-tank, and a pipe which connects with the vacuum-chamber and extends it to the point of use, for the purposes set forth.

10 10. The combination of a burner, a chamber within which the air and fuel mix, a combustion-chamber in front of said mixing-chamber, a vacuum-chamber adjacent to the burner, and an air-flue surrounding the combustion-chamber and having an opening for the admission of the air at the coolest part thereof, whereby the air will be heated to a high degree prior to reaching the mixing-chamber, for the purposes set forth.

20 11. The combination of a burner, a chamber within which the fuel and air mix, a combustion-chamber in front of said mixing-chamber, a vacuum-chamber adjacent to the burner, and an air-flue arranged spirally around the combustion-chamber, for the purposes set forth.

25 12. The combination of a burner, a vacuum-chamber adjacent to the burner, a chamber within which the air and fuel mix surrounding the burner, a combustion-chamber having a conical shape in front of the mixing-cham-

ber, whereby the burning gases may expand as they burn, for the purposes set forth. 30

13. The combination of a burner, a chamber within which the air and fuel mix, a vacuum-chamber, a combustion-chamber, a fuel-supply pipe, a cylinder with its valves and connections, and a pipe connecting the vacuum-chamber with the exhaust of the cylinder, for the purposes set forth. 35

14. A motor embodying the combination of apparatus to burn fuel and thereby uninterruptedly produce a vacuum or partial vacuum, a cylinder removed from the combustion apparatus whereby the cylinder will be always cool or relatively so, a piston in the cylinder, means connecting the combustion apparatus and the cylinder provided with devices whereby the vacuum may be alternately present in the opposite ends of the cylinder, and means for admitting air at atmospheric pressure alternately to the sides of the piston opposite the vacuum, for the purposes set forth. 40 45 50

Signed at New York, in the county of New York and State of New York, this 25th day of July, A. D. 1899.

GUSTAF EMIL HESSE.

Witnesses:

PHILLIPS ABBOTT,
EDGAR R. MEAD.