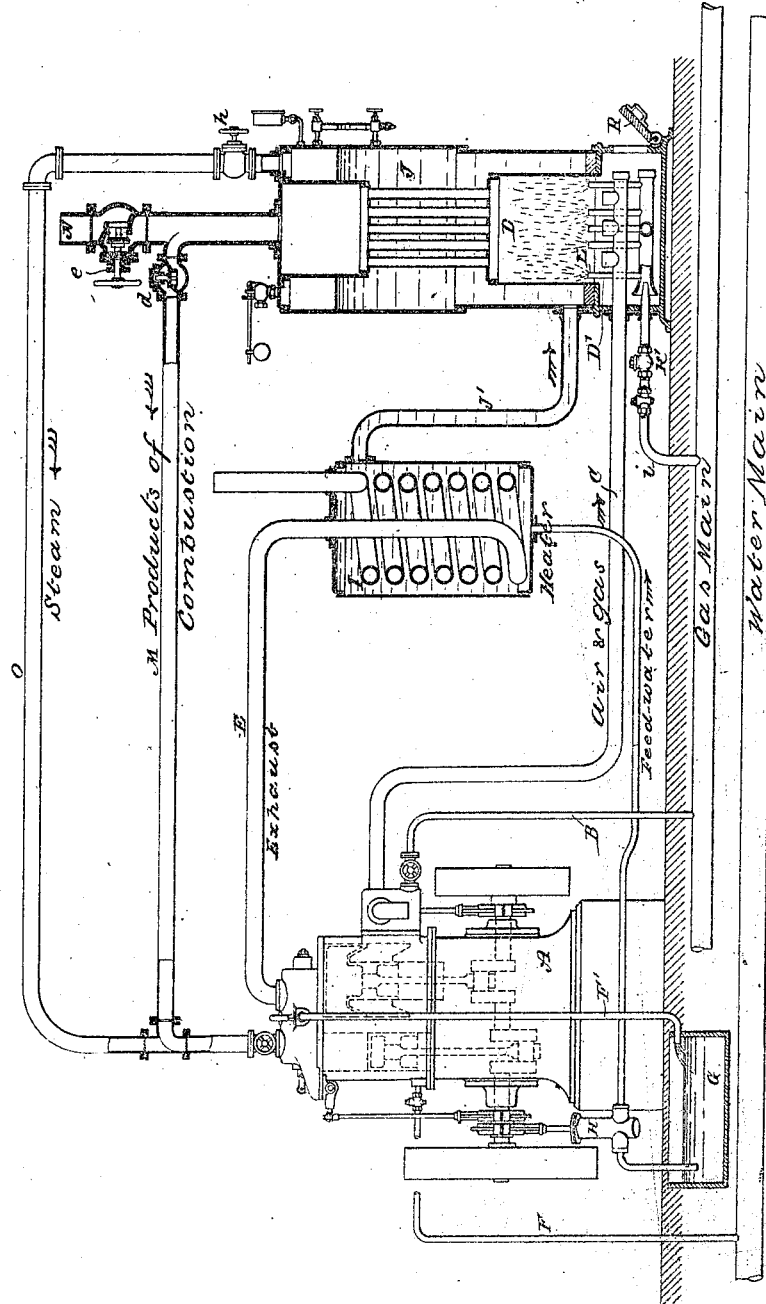


(No Model.)

A. SCHMID & J. C. BECKFELD.
GAS ENGINE.

No. 421,524.

Patented Feb. 18, 1890.



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UNITED STATES PATENT OFFICE.

ALBERT SCHMID AND JOHN CHARLES BECKFELD, OF ALLEGHENY, PENNSYLVANIA.

GAS-ENGINE.

SPECIFICATION forming part of Letters Patent No. 421,524, dated February 18, 1890.

Application filed July 12, 1889. Serial No. 317,278. (No model.)

To all whom it may concern:

Be it known that we, ALBERT SCHMID, a citizen of the Republic of Switzerland, and JOHN CHARLES BECKFELD, a citizen of the United States, both residing at Allegheny, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Gas-Engines, of which the following is a specification, reference being had to the drawings accompanying and forming a part of the same.

This invention relates to gas or air and gas engines of the type known as "continuous-combustion engines," and more particularly to large engines of said type, which require the application of force from some independent source—such as a steam-boiler—to start them in operation.

The object of the invention is primarily to increase the efficiency of such engines by utilizing the waste heat from the combustion of the gases to vaporize water or other fluid to be used in conjunction with the expanded products of combustion in operating the engine; secondly, to dispense with an independent steam-boiler for furnishing the steam to start the engine, and, lastly, to improve the engine by utilizing as much as possible of the heat developed in the operation of the engine and applying it to assist in furnishing the driving-power.

We have illustrated these improvements in the accompanying drawings in connection with a gas-engine of special character. Any engine, however, adapted to be operated by a constant expansion of gases such as takes place in continuous-combustion engines may be used. We therefore omit a detailed description of the engine proper, deeming it sufficient to say that the special form shown herein is constructed in substantially the manner described in an application of J. Charles Beckfeld and Albert Schmid, filed of even date herewith, and serially numbered 317,277.

Referring to the drawings, the figure is a view in side elevation and part section of the entire system or combination of all the parts and devices pertaining to our invention.

Let A designate the gas-engine proper; B, a pipe from the street-main or other supply of

gas, through which gas is admitted or drawn into the engine under one of the pistons and, together with a proper proportion of air, is subsequently forced through a pipe or tube C into a combustion-chamber D, where it is ignited and burned.

E is the exhaust from the engine, through which the products of combustion, after having done their work, are expelled.

F is a pipe from a water-main or other supply and connecting with a water-jacket surrounding the cylinders and working parts of the engine.

F' is the discharge-pipe from the water-jacket. It empties into a tank G, from whence, by a small pump H, driven by an eccentric on the main shaft of the engine, it is forced into the chamber I. The exhaust-pipe E runs through this chamber, being coiled therein, so that the heat from the exhaust-gases is imparted to the water therein, which has already been warmed in the water-jacket on the engine.

The combustion-chamber D is inclosed in or surrounded by a chamber or boiler J, and a communication is maintained from the vessel I with said chamber by a pipe J'.

The combustion-chamber D communicates through a pipe M with the engine, and contains a check-valve b, which prevents back pressure from the engine entering the combustion-chamber. From the said chamber D leads also a pipe or vent N, normally closed by a valve c. The chamber I communicates with the engine cylinders or pipes M through a pipe O.

The combustion-chamber D contains a series of burners L, supplied with gas from the gas-main or other source, and is provided with a door R, which may be closed air-tight. The pipe C from the engine is also provided with a series of burners D', for the combustion of the mixed gas and air supplied by the engine. The pipe i, which conveys gas from the main to the burners L, is provided with a check-valve K', to prevent back-pressure in the mains in the event of a rise in pressure in the combustion-chamber.

The operation of this device is as follows: The gas from the main is admitted to the burners L and ignited. The door R is open

while this combustion is taking place, and the valve *e* is also open, so that a draft is provided through the combustion-chamber.

When sufficient steam has thus been generated in the boiler or chamber J, the engine is started. When by the operation of the engine a supply of air and gas is forced through the pipe C and the burners G', it is ignited and the door R and valve *e* are closed, and the connection with the gas-main cut off. The expanded products of combustion, together with the steam generated by the combustion entering the engine-cylinders then maintain the engine in operation.

It will be seen that by the construction above described provision is made in every practicable way of utilizing the waste heat and economizing power. The devices which enter into the combination which our invention involves may be greatly varied in construction, and we do not limit ourselves to the special construction shown, as will be seen from the subjoined claims.

It will be seen that the construction above described obviates the necessity of an independent boiler or source of power for starting the engine, while the steam generated in the chamber J not only supplies the necessary lubrication, but assists in driving the engine.

What we claim is—

1. The combination, with an engine of the kind described, of a boiler or water-chamber, and a combustion-chamber inclosed or surrounded thereby, connections from both chambers to the engine, and two sets of burners contained in the combustion-chamber, one set being supplied by a gas or fuel independently of the engine, the other being fed by gas or fuel by the operation of the engine, and means for controlling the supply of fuel to said burners, as set forth.

2. The combination, with an engine of the kind described, of a water-chamber or boiler, and a combustion-chamber inclosed or surrounded thereby, connections from both chambers to the engine, two sets of burners contained in the combustion-chamber, and pipes or tubes supplying gas or similar fuel to said burners, one leading directly from a gas-main

or source of supply, the other being connected with a pumping-cylinder in the engine, as set forth.

3. The combination, with a gas-engine of the kind described, of a water-chamber or boiler, and a combustion-chamber inclosed or surrounded thereby, connections from both chambers to the engine, and two sets of burners in the combustion-chamber, a gas-supply connected with one set, and an air and gas supply connected to the other, as set forth.

4. The combination, with an engine of the kind described, of a steam boiler or generator connected with the engine-cylinders, a combustion-chamber inclosed or surrounded by the boiler and provided with draft-passages capable of being closed air-tight, two sets of burners in the combustion-chamber, one connected with a supply of gas alone, the other with a supply of air and gas under pressure, as set forth.

5. The combination, with an engine of the kind described, of a water-chamber or boiler, a combustion-chamber inclosed or surrounded by the same, a feed-water chamber connected to the boiler, and the exhaust-pipe arranged to heat the water in said chamber as set forth.

6. The combination, with the cylinders of an air and gas engine, of a combined boiler and combustion-chamber, valve-controlled connections for the steam and expanded gases between the cylinders and the said chambers, and independent sources of heat for generating the steam, as herein set forth.

7. The combination, with the cylinders of an air and gas engine, of a boiler for generating steam connected therewith, a combustion-chamber provided with draft-passages closing air-tight, and also connected with said cylinders, and two sets of burners in the combustion-chamber, one adapted to be supplied with gas or similar fuel and the other with a mixture of gas and air.

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