

UNITED STATES PATENT OFFICE.

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STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 408,613, dated August 6, 1889.

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To all whom it may concern:

Be it known that we, OLIVER FRENCH GILBERT and GILBERT WARD FARRAR, citizens of the United States, residing at East Saginaw, in the county of Saginaw and State of Michigan, have invented new and useful Improvements in Steam-Generators, of which the following is a specification.

This invention relates to steam-generators in which the gaseous vapors of liquid hydrocarbons are employed as fuel; and it consists in certain improvements in the construction of the said generator, as will be hereinafter more fully described, and particularly pointed out in the claims.

In the drawings, Figure 1 is a vertical sectional view of a steam-generator equipped with our improvements. Fig. 2 is a horizontal sectional view taken on the line xx of Fig. 1. The same letters refer to the same parts in both figures.

A designates the outer shell or casing of the boiler, the ends of which are provided with the heads B B, which may be constructed of cast-iron, and which may be either bolted to flanges formed upon the ends of the shell or be connected by means of long bolts upon the outside of the shell or casing.

C designates an interior shell, the bottom of which D is connected with the top or crown sheet E by means of the tubes or flues F. The boiler is a vertical one, and the interior shell occupies about two-thirds of the height of the outer casing, the upper portion of which forms the steam-space G. The water-space is formed by the lower portion of the outer case and by the flues F of the inner casing, which latter constitutes the fire-box. It is obvious that the water should always be sufficiently high to cover the crown-sheet of the fire-box.

H is a live-steam pipe extending laterally from near the upper end of the steam-space G. Said pipe is provided with a globe-valve I, from whence a branch J extends downwardly, as shown. In the branch J is placed a check-valve K, which is kept automatically open, or away from its seat L, by the action of a spring M, coiled upon the stem N of the said check-valve. The tension of said spring may be regulated by means of a screw-threaded plug O, working in a yoke P and

having a perforation, through which the stem N extends, the inner end of said plug affording a bearing for one end of the spring N.

The steam-pipe J is connected at its lower end with an injector Q, which supplies the fuel from a suitably-located tank. (Not shown in the drawings.) From the injector Q the steam-pipe J extends through the shells or casings A C into the fire-box, where it has a return-bend R.

S designates a pipe or flue, constructed of fire-clay or other suitable refractory material, arranged vertically in the front portion of the fire-box and provided with an opening T for the passage of the pipes J R, said opening being suitably connected with corresponding openings in the casings A C, which said openings are connected steam-tight by means of a suitable flange or collar U. An additional opening or openings V are also formed in the casings A C for the escape of the products of combustion, the openings in the inner and outer casings being connected steam-tight by means of collars or flanges W.

The fire-box is provided near its lower end with an opening X, connected steam-tight with a corresponding opening Y in the boiler-shell A by means of a flange or follower Z. The pipe S is also provided with a transverse opening A', registering with the openings X Y. Through the latter openings passes a horizontal tube or flue B', the outer end of which is closed by a cap C', through which passes an extension D' of the steam-pipe R, which constitutes the burner. The lower side of the tube B' has an opening E', through which extends a torch F', which is kept constantly burning.

Our improved boiler is to be provided with water-supply and steam pipes suitably connected thereto, and suitable pipes are also to be provided for the escape of the products of combustion.

The operation of this invention will be readily understood from the foregoing description, taken in connection with the drawings hereto annexed. The globe-valve I regulates the escape of steam, which passes through the pipes H J and through the check-valve located in the latter to the injector Q, where it becomes charged with hydrocarbon. The mix-

ture of steam and hydrocarbon now passes through the pipes J R, which extend through the upper portion of the fire-box, and which are consequently always heated to a very high temperature. The hydrocarbon vapor now passes through the downward extension of the pipe R and to the burner E', where it is ignited by the torch F'. The flame is supplied with oxygen by the air entering through the opening T at the upper end of the fire-clay pipe S and rushing downwardly through said pipe to the transverse opening A' at its lower end. Should the fire become too hot and the pressure of steam too great, the pressure of the steam will overcome the pressure of the spring upon the check-valve K and serve to close the said check-valve, thus automatically stopping the supply of fuel and putting out the fire in the fire-box. As soon as the steam-pressure becomes lowered, the pressure of the spring will overcome that of the steam upon the check-valve, which is consequently opened, and the fuel-supply becomes instantly operative, the torch F' serving to ignite the fuel as soon as the latter begins to pass through the burner.

Having thus described our invention, we claim—

1. In a steam-generator, the combination, with an outer shell or casing, of an interior shell or casing constituting the fire-box, said inner casing having openings near its upper and lower ends connected with corresponding openings in the outer casing by steam-tight flanges or collars, a refractory tube arranged vertically in the inner casing and provided at its upper end with an opening registering with the openings in the shells or casings and

at its lower end with a transverse perforation, and the fuel-supply pipe entering through a tube adjusted in the lower openings of the casings, substantially as set forth.

2. The combination of the outer casing constituting the boiler, the inner casing constituting the fire-box, the steam-pipe equipped with a globe-valve and a check-valve, an injector connected with said steam-pipe and supplying liquid hydrocarbon, a refractory air-supply pipe located in the fire-box, and a torch arranged below the burner of the fuel-supply pipe, substantially as set forth.

3. The combination of the outer casing or boiler, the inner casing or fire-box, and the fuel-supply pipe extending through the tube-casings and having a return-bend in the fire-box, substantially as set forth.

4. The combination of the outer shell or boiler, the inner shell or fire-box, the vertical water-flues connecting the heads of the latter, the refractory air-supply pipe located in the fire-box, the fuel-supply pipe having a check-valve adapted to regulate the steam-supply, said fuel-supply pipe extending through the upper portion of the fire-box, a torch arranged to ignite the fuel, and suitably-arranged pipes to carry off the products of combustion, all arranged and operating substantially as and for the purpose set forth.

In testimony that we claim the foregoing as our own we have hereto affixed our signatures in presence of two witnesses.

OLIVER FRENCH GILBERT.
GILBERT WARD FARRAR.

Witnesses:

CHAS. C. MILLER,
EMMA L. MILLER.