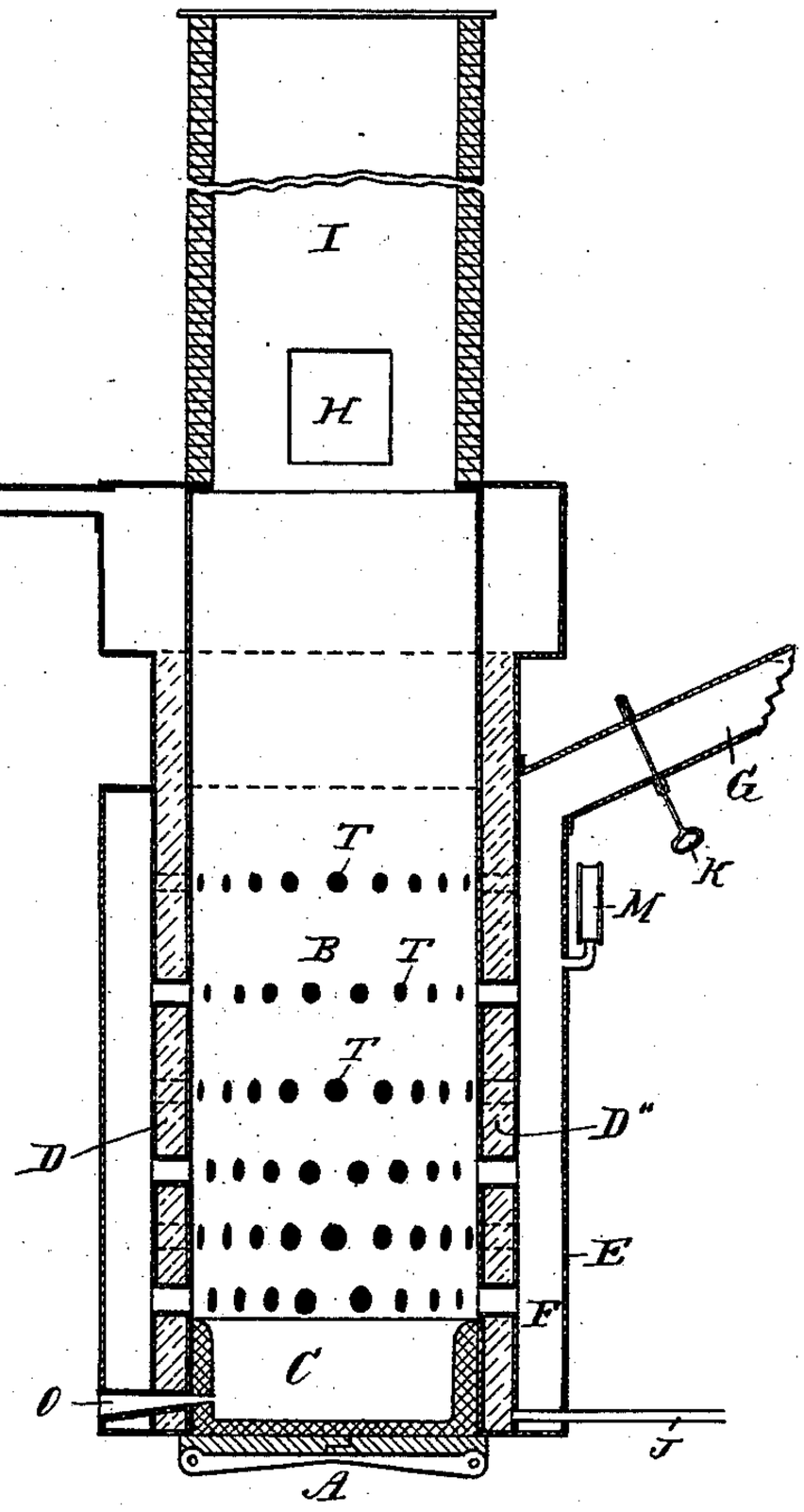
(No Model.)

V. COLLIAU.

STEAM GENERATOR.

No. 356,988. Patented Feb. 1, 1887.



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VICTOR COLLIAU, OF DETROIT, MICHIGAN.

STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 356,988, dated February 1, 1887.

Application filed July 29, 1886. Serial No. 209,394. (No model.)

To all whom it may concern:

Be it known that I, VICTOR COLLIAU, of Detroit, in the county of Wayne and State of Michigan, have invented new and useful Improvements in Steam-Generators; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, which form a part of this specification.

This invention relates to new and useful improvements in steam-generators; and the object of my invention is to improve the efficiency of such generator by applying a more efficient kind of furnace and mode of burning the fuel than has been used heretofore for generating steam for use as a motive power or otherwise.

The kind of furnace I apply in my improved steam-generator is the one known as "cupola-furnace," wherein the combustion of the fuel is carried on by means of a hot-air blast.

As the efficiency of a steam-generator is in proportion to the combustion of fuel, a comparison of the respective amounts of fuel and heat obtained from the ordinary boiler-furnace and the cupola-furnace will readily disclose the superiority of the latter. In the former one pound of coal produces about eight pounds of steam of five atmospheres at a temperature of 150° centigrade, making the total amount of $8 \times 153 = 1,224°$. In the latter with one pound of coke I have melted as much as thirteen and one-half pounds of iron, which, at the melting temperature of 1,200° centigrade, represents $13\frac{1}{2} \times 1,200 = 16,200°$. This is a difference of 15,000° in favor of the cupola-furnace as a direct result of the superior combustion.

Again, in a boiler-furnace under the best conditions of draft the amount of coal that can be burned per hour on a square foot of grate does not exceed one hundred and twenty pounds, while in the hot-blast cupola I have burned as much as eight hundred and twenty-two pounds of fuel per square foot of tuyere per hour, which, utilized for the production of steam, would represent six thousand five hundred and seventy-six pounds of steam per foot square of tuyere, as against twenty-eight pounds made by the Cornish boiler or nine hundred and sixty pounds by the best burning fuel locomotive per square foot of grate. These figures are easily explained when it is considered that two things are essential to the proper combustion of fuel—a sufficient supply of oxygen and a high temperature—and these two must be in the most intimate combination. Now, in the modern boiler-furnace most of the time only a small portion of the fuel on the grate is properly burned, and the rest is distillated, forming hydrocarbon gases, which only help the generation of steam by their temperature; or, if partly inflamed, these gases are soon extinguished in the complicated ducts and pipes of modern boilers, in which it is impossible to maintain combustion.

In carrying out my invention I preferably construct my generator-furnace after the cupola-furnace as improved by me and patented to me by Letters Patent No. 275,355, and combine the same with a boiler in such manner that none of the advantages of efficiency claimed for the cupola-furnace are lost, all as hereinafter shown and described.

In the accompanying drawing my improved steam-generator is shown in vertical central section, and the letters of reference refer to the following parts:

A represents a solid bottom, of any known or desired construction adapted for the purpose desired, which can be dropped. It must be air-tight and fire-proof inside, lined with brick or fire-clay or sand.

B is the cylindrical furnace-chamber. C is the lower section thereof, lined with brick to near the height of the lower tuyeres.

D is the boiler proper, made of double metallic shell, forming an annular water and steam chamber, D″, containing the water to be evaporated, and extending from the bottom of the furnace to the top of the furnace proper, where the steam is contained in a drum, preferably formed by enlarging the outside diameter of the boiler.

E is a metallic shell surrounding the lower portion of the whole, forming an outside inclosing annular air-chamber, F, covering all the tuyeres. It is provided with an inlet, G, which is connected with a blower or fan, (not shown,) of any desired construction, by means of which air is driven into the annular chamber.

Between the air-chamber F and the inside

of the furnace there are several systems and series of tuyeres, T, distributing the blast in the furnace in such manner as to force the blast to strike horizontally the vertical inside shell of the boiler, giving to the whole of the vertical inside shell the maximum of efficiency of evaporation as effectively as the bottom of common boilers are heated on the top of the fire-grate, making the whole of this surface more than ten times as effective as the heating-surface of the common boiler.

The furnace is entirely air and water tight from outside influence, in such a manner that, being located in a steamboat, the fire could not be extinguished, the boat being half-full of water.

O is a slag-hole, which is closed by means of clay and sand, and is opened occasionally to let the slag out, the ashes of the fuel being made fusible by a small addition to the fuel of a base, such as lime.

S is an outlet steam-pipe from boiler to steam-engine.

H is the fuel-loading door, situated above the whole steam-making apparatus and above the steam-dome.

Wood being put in at first at the bottom of the furnace, it is lighted without the use of the blast by leaving all the tuyeres open. The coke or coal is thrown on gradually until, being well ignited, it has attained the top of the higher tuyeres, when blast is applied. The combustion is almost perfect, its produce being but carbonic-acid gas, which, by being an extinguisher, prevents the upper strata of fuel from burning, and combustion ceases entirely about three or four feet above the upper tuyeres, so that there is no inflammable gas escaping, and neither fire nor smoke appears above the loading-doors, and it is as cool there as if there were no fire below.

According to the quantity of ashes contained in the fuel used, so much of a base—such as lime or fluor-spar—is mixed with the fuel before loading, in order to produce a liquid slag which will be drawn out when necessary.

K is a blast-gate to regulate the pressure of the blast, and by so doing it regulates, also, the production and pressure of steam, for, contrary to the old system of making steam, which consists of increasing the quantity of fuel on the grate when more steam is required, in my new furnace-boiler the quantity of fuel is kept constantly at the same height above the upper tuyeres, the intensity of combustion and the production of steam being entirely controlled by the quantity of the blast.

M is the blast-meter on the air-box, to indicate the pressure of blast by which the production of steam is controlled.

J is the feed-water pipe to furnish the water necessary to the boiler provided with pumps and injectors. (Not shown.)

I is the chimney or stack, the higher the better, to help the draft of the furnace.

Another very important advantage of my steam-generator over any other kind is that the whole of my apparatus is entirely cold outside, and that the heat which escapes and makes the care of the old system of boiler so tiresome and uncomfortable to the stokers, especially on the inside of the boat, is all collected by the outside double metallic shell surrounding the lower portion of the whole furnace. The stoking of the furnace is done without the least inconvenience, there being no heat escaping at the feed-doors.

I am aware of the Patent No. 228,852, and make no claim to the construction shown therein as forming part of my invention.

What I claim as my invention is—

1. The combination of the outer shell, the boiler within said shell, extended above the top thereof and terminating in an annular steam-drum, a system of tuyeres affording communication between the exterior and interior of the furnace, a feed-hole above the boiler proper, and a blast-pipe connected with the outer shell above the upper tuyere, substantially as and for the purpose specified.

2. In a steam-generator, the combination of the outer shell, E, annular boiler D within said shell, and extended above the top thereof and terminating in an enlarged annular steam-drum, a system of tuyeres affording communication between the exterior and interior of the furnace, a blast-pipe, G, communicating with the space between the outer shell and the boiler above the upper tuyere, a feed-opening above the top of the drum, and a feed-pipe, J, and slag-hole O near the bottom of the furnace, substantially as described.

VICTOR COLLIAU.

Witnesses:
H. S. SPRAGUE,
E. SCULLY.