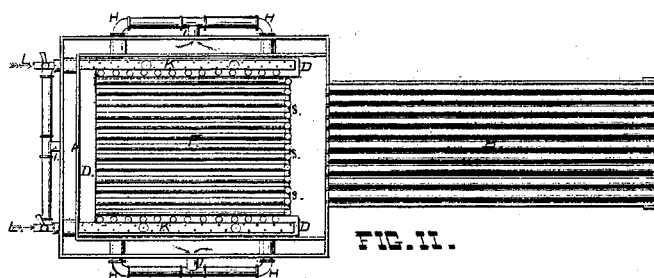
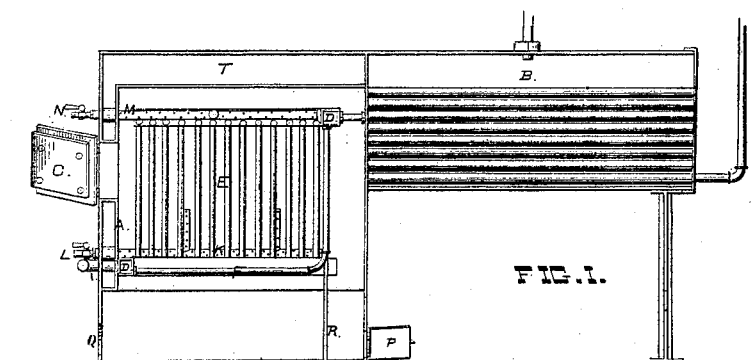


J. L. Judge,
Steam Generator.
No. 112,049. Patented Feb. 21, 1871.

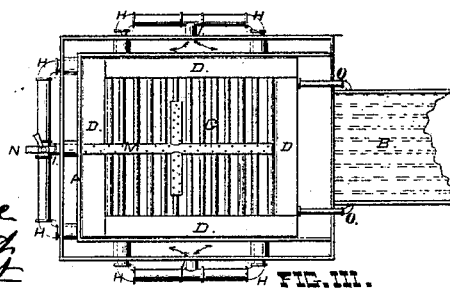


WITNESSES.

John H. Kelly
W. M. Hornor.

INVENTOR.

James L. Judge
By J. B. Smith
Attorney at Law



United States Patent Office.

JAMES L. JUDGE, OF MILWAUKEE, WISCONSIN.

Letters Patent No. 112,049, dated February 21, 1871.

IMPROVEMENT IN STEAM-GENERATORS.

The Schedule referred to in these Letters Patent and making part of the same.

I, JAMES L. JUDGE, of Milwaukee, in the county of Milwaukee, in the State of Wisconsin, have invented certain Improvements in Steam-Generators, of which the following is a specification.

Nature and Object of the Invention.

My invention consists in the construction and arrangement of a basket or cage of tubes, the bottom of which forms the grate, and all inclosed in the fire-box of the boiler, as hereinafter described.

Description of the Drawing forming part of this Specification.

Figure 1 is a side sectional view,
Figure 2, a top sectional view, and
Figure 3, a top view, with the crown-sheet removed.

General Description.

A is the fire-box, surrounding the fire with water.

B, the boiler connected with the fire-box.

C, door through which to feed the fuel.

D, water-flues or cylinders, closed at their ends, and flues entering them on the sides.

E, the side tube passing into flues or cylinders D, forming a connection for the water between the two.

F, hollow grates, their front ends entering the front bottom cylinder D, and bent at their center, and rising at the back, and their upper ends passing into the back top cylinder D, forming a complete passage-way for water from the front bottom cylinder D to the back top cylinder D.

G, top tube across the top of the fire-box, and connecting the top side cylinders D, forming a passage-way for water above the fire.

H, pipes connected with cylinders D, and passing through a pipe of larger size, which is connected to the outside and inside of the fire-box by a screw on each end of it, screwing into the sides of the fire-box.

This pipe passes through the fire-box, and turns outside and connects with a T-pipe, I.

This T-pipe I is screwed into the outside of the fire-box, and thus a complete circulation of the water is effected between the fire-box and the cylinders D. These connections of H and I are made with all the cylinders D and the fire-box in the same manner.

K K, air-tubes with fine holes in them, lying along the sides of the fire-chamber, on top of the lower side cylinders D, and outside of the flues E.

These air-tubes have projecting tubes out from them, and rising above the air-tubes K K, with holes in them.

These air-tubes K K, at their outer ends, pass out through the fire-box, through passage-ways made same as those for pipes H, and have cocks L in their outer ends, to shut off or open, to let in air, as may be required.

M, an air-tube on top of the upper flues G, with projections or branches passing out each way, and the whole filled with little holes for the air to pass out through.

The front end of this tube passes out through the fire-box the same as lower tubes K, and on its outer end there is a cock, N, to let in air as may be required.

O O, pipes from the back top cylinder D to the boiler B, forming water communication.

P, ash-door, to take ashes out of the space between the fire-chamber and the boiler.

Q, the front ash-door.

R, partition between the ash-pit and the space back of the fire-chamber.

S, bars of iron hollowed out on the sides standing up between the back grate flues, making a tight partition between those grate-bars and the space back of them.

T, steam and water-space.

This generator sits in the fire-box of any steam-boiler, the cylinders D, just fitting in so as to leave no space between them and the fire-box.

The fire is built on the grate-flues, and the draught passes around the sides of the heater or basket, and up through and over the top cylinder D to the boiler B, there being about six inches space, more or less, between the back of the grates and the ends of the boiler-flues.

The air for combustion of the fuel passes in through door Q and through the grates, and for the combustion of the gases the air is supplied through tubes K and M into the gas-chamber on the sides and top of the fire-box, and is let in through cocks N and L in such quantities as may be necessary; the water passing into the bottom cylinders D through the connection I and H, in the direction of the arrows, and out again at the top, the side flues E being placed far enough from the sides of the fire-box for air-tubes K to come in, and as the gases from the coal pass through between the flues E, they come in contact and mingle with the air from tubes K, and ignite, thus adding to the combustion of the fuel.

The generator or basket can be all taken out or put in without disturbing the fire-box, the cylinders D all being separate. When separated from their connections, and when the holes are made through the fire-box for the pipes H, and the pipes screwed in, there is no trouble whatever in putting this basket together, and without disturbing the fire-box in the least.

Claims.

I claim as my invention—

1. Hollow grates F, connected to the front bottom cylinder D and the back top cylinder D, and connected to fire-box A by pipes H and I, and with the boiler

B by pipes O, forming a circulation of water from the bottom of the fire-box A with the boiler B, all in combination substantially as described.

2. Side cylinders D, both top and bottom, connected with tubes E and G, and the side cylinders, connected with the fire-box by pipes H and I, to form a circulation of the water, substantially as described.

3. The basket, composed of cylinders D, tubes E,

grates F, tubes G, with connecting-pipes H and I, air-tubes K and M, and connecting-pipes O, in connection with fire-box A and boiler B, all in combination, substantially as described.

JAMES L. JUDGE.

Witnesses:

J. B. SMITH,
W. M. HORNOR.