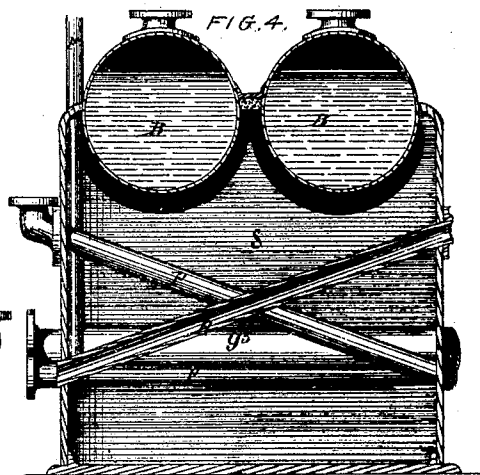
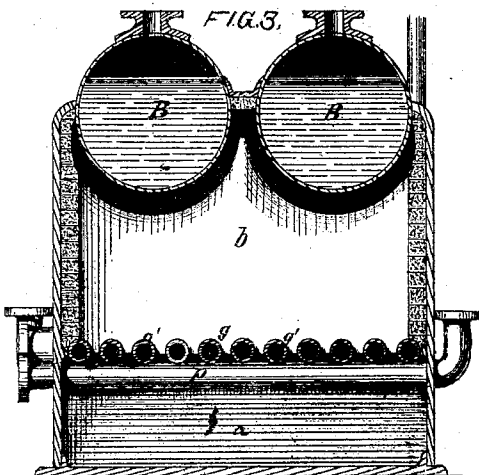
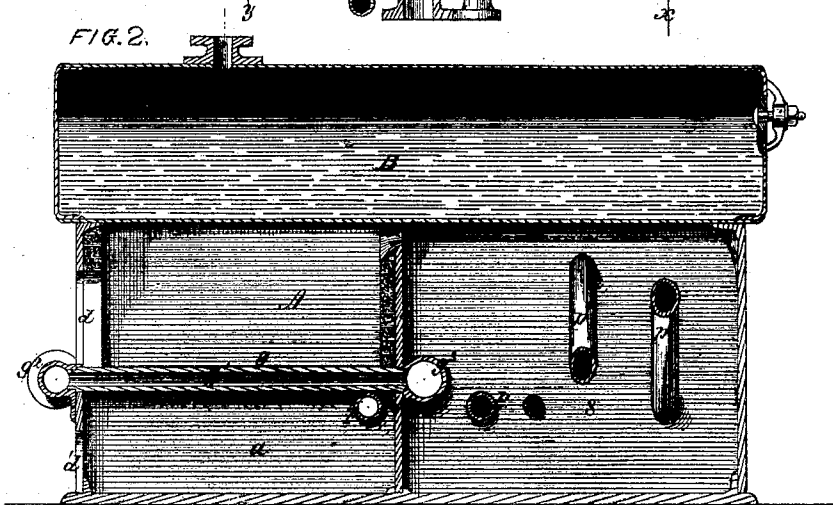
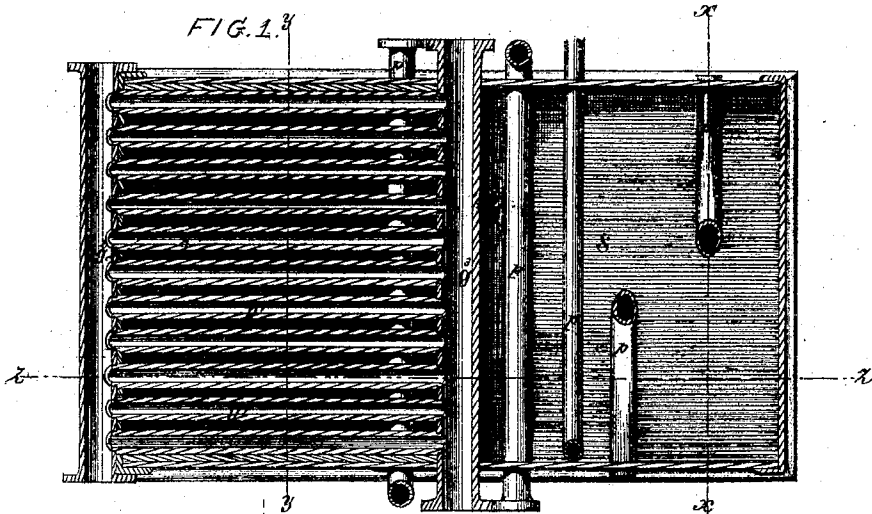


*E. Spencer,*

*Steam Boiler Furnace.*

*No. 100,947.*

*Patented Mar. 15. 1870.*



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# United States Patent Office.

ELIHU SPENCER, OF ELIZABETH, NEW JERSEY.

Letters Patent No. 100,947, dated March 15, 1870.

## HEATING-ATTACHMENT FOR STEAM-BOILERS.

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

I, ELIHU SPENCER, of Elizabeth, county of Union, and State of New Jersey, have invented a new and useful Improvement in Steam-Generator Furnaces.

### *Nature and Objects of the Invention.*

My invention relates to the utilization of the waste heat of the steam-generator furnaces of manufactories, steamboats, &c., by applying the same in a superior manner to heating air for warming purposes.

The furnace is provided, either alone or in connection with hollow grate-bars, for the purpose, with air-pipes or tubes traversing the reverberating or smoke-chamber and the ash-pit immediately beneath the grate. Said pipes pass through the arch, from side to side, or from one side beneath the boiler and up between the boiler and the wall of the arch through the top, and are adapted to receive and deliver the air outside of the furnace in any suitable manner.

### *Description of the Drawing.*

The accompanying drawing represents a horizontal steam-generator furnace provided with my improved air-heating arrangement, in illustrative form.

Figure 1 being a horizontal section in the plane of the grate.

Figure 2, a vertical longitudinal section on the line  $z z$ , fig. 1.

Figure 3, a transverse section on the line  $y y$ , fig. 1.

Figure 4, a transverse section on the line  $x x$ , fig. 1.

Similar letters of reference indicate like parts in the several figures.

### *General Description.*

In the drawing—

A represents the furnace, and

B, the boilers or generators.

$g$  represents the grate.

$b$ , the bridge.

$a$ , the ash-pit.

$s$ , the smoke-chamber.

$d$ , the fire-door, and

$d'$ , the ash-pit door of the furnace A.

$p p$  represent the air-heating pipes or tubes.

$g^1 g^1$  represent hollow bars constituting the grate  $g$ , and

$g^2 g^2$ , respectively, the supply and hot-air drums connecting said bars.

The manner of applying the pipes  $p$  may be varied,

and needs no special description. Their number, also, and the position in which they traverse the furnace are variable.

I propose employing them under the grate, in the ash-pit  $a$ , and in the smoke-chamber  $s$ , as shown, or in either position alone. They are preferably employed in connection with a hollow or air-heating grate, as shown, but may be employed in connection with a grate of other form. The hollow grate, when employed, may be constructed in the usual or other suitable manner. The air to be heated may be taken from the room in which the furnace is located, or external air may be conducted to the several pipes and to the grate.

Any usual or suitable means may be employed for purifying, propelling, and conducting the air.

When the apartments to be heated are above the furnace, as will, in most instances, be the case, no propulsion of the air will be necessary, the tendency of the heated air to rise causing it to traverse its conducting-pipes.

By my invention, without, in the least degree, detrimentously affecting the furnace for its primary use, requiring its enlargement, or increasing the consumption of fuel, I am enabled to heat, by said furnace, the entire establishment in which it is employed, by absorbing otherwise wasted heat and applying it to the air, by apparatus arranged in otherwise unoccupied space, the apparatus being simple, and adapted to be readily and cheaply applied. The invention has, therefore, for its advantage, a nearly net saving of the apparatus, fuel, labor, and room otherwise consumed.

### *Claims.*

I claim as my invention—

1. The arrangement, in a steam-generator furnace, of pipes or tubes  $p$ , adapted for the introduction and discharge of air, and to absorb and impart to the air in passing through them the waste heat of the furnace, substantially as represented and described.

2. The combination of the pipes or tubes  $p$ , arranged and employed substantially as described, and a hollow or air-heating grate  $g g^1 g^2$ , substantially as set forth.

ELIHU SPENCER.

Witnesses:

JOHN M. CLARK, Jr.,

E. H. GIBBS.