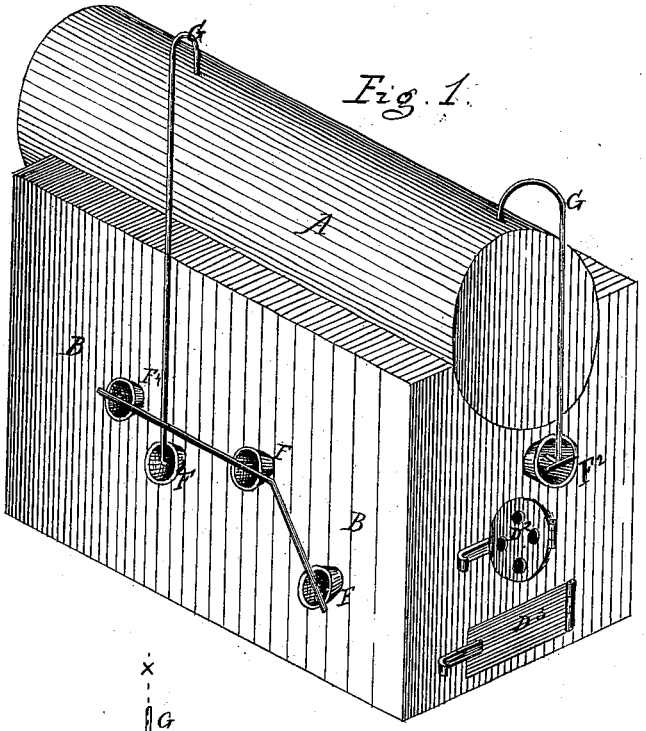
J. T. RICH.

STEAM GENERATOR.

No. 108,935. Patented Nov. 1, 1870.

Fig. 1.



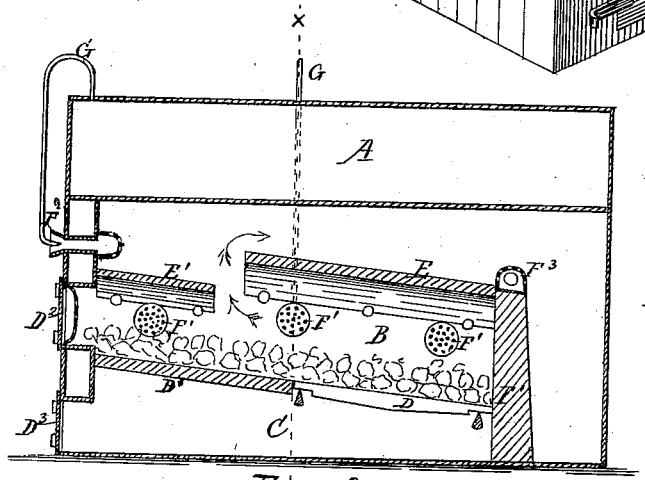


Fig. 2

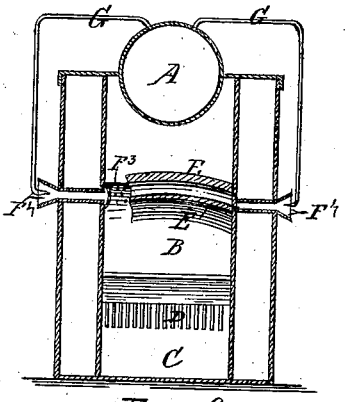


Fig. 3

Attest

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JOHN T. RICH, OF PHILADELPHIA, PENNSYLVANIA.

Letters Patent No. 108,935, dated November 1, 1870.

IMPROVEMENT IN STEAM-GENERATORS.

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

To all whom it may concern:

Be it known that I, JOHN T. RICH, of the city and county of Philadelphia and State of Pennsylvania, have invented certain Improvements in Furnaces for Steam-Generators and for other purposes; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the annexed drawings making part of this specification, in which—

Figure 1 is a perspective view of a steam-generator and its fire-box or furnace, showing the pipes for inducting air and steam into the furnace.

Figure 2 is longitudinal vertical section of the generator and furnace, showing the dead-plate upon which the coal is coked, the grate upon which it is burned, the igniting-arches or diaphragms, the air and steam induction-pipes, the rose-heads for comminuting the jet of air as it passes into the furnace, and the bridge-wall with perforated cap.

Figure 3 is a transverse vertical section, on line *x x* of fig. 2.

Corresponding letters refer to corresponding parts in the several figures.

This invention relates to furnaces for steam-generators and for other purposes; and

It consists in the combination and arrangement of its parts, as will be more fully explained hereinafter, it being designed as an improvement upon the one for which a patent was granted to me on the 15th day of September, 1868.

Experience has demonstrated the fact that the principle upon which the above-referred-to furnace is constructed is the correct one; but it has also demonstrated the further fact that the combination and arrangement of its parts were not the best that could be desired, and hence this invention, the object of which is to remedy the defects which have been found to exist in the furnace referred to, as well as in others which have preceded it.

A in the drawings refers to a steam-generator, which may be of the cylindrical form shown in the drawings, or it may be of any other desired form, such as the locomotive or marine type of generators, which have their furnaces attached so as to form a component part thereof.

B refers to a furnace, to be used in connection with the generator, or for other purposes, which may be constructed as shown in the drawings, where it is shown as separated from the generator. When thus made it may consist of bricks, or any other refractory material; but I prefer to make it of metal, and have it constitute a part of the generator, as in the types above alluded to.

C refers to the ash-pit, which is a space below the dead-plate and the grates, into which the debris of the fuel falls from the grates upon which it is burned.

D refers to the grate, which may be of any approved form, but is only about one-half of the length of the furnace or fire-box. The more volatile the fuel, the shorter should be the grate-bars, and the longer the dead-plate. This grate may be constructed in sections, or it may consist of a plate of metal of the width of the fire-box, having slots formed in it for the passage of air, and the ashes resulting from the burning fuel.

D^1 refers to a dead-plate which is placed in the rear or outer end of the fire-box or furnace, and constitutes a bed upon which the coal is placed when first inserted into the furnace for the purpose of being coked, preparatory to being pushed forward onto the grate to be burned. This plate may be separate from the grate, as shown in the drawings, or it may constitute a part thereof, without apertures for the passage of air; in either case it should be placed in an inclined position, as shown in fig. 2 of the drawings. The outer end of this plate is to be even with or a little below the lower surface of the aperture through which the fuel is inserted; and said plate should extend inward or forward to near the center of the furnace, or at least to a point beyond the inner end of the short diaphragm, in order that the current of air which passes through the apertures in the grate shall not come in contact with the volume of gases generated upon or above such plate, until they reach the point where they are ignited by coming in contact with the incandescent fuel upon the grate, or the flame arising therefrom.

D^2 refers to the door through which the fuel is passed into the furnace or fire-box; it may be of any size and form required, and may, if desired, be provided with apertures for the admission of air to the furnace.

D^3 refers to a door which closes the mouth of the ash-pit. This door is to be left open when a fire is first kindled, and when there is no steam in the generator, for the passage of air to the fuel; but when steam has been generated, and the jets soon to be described are used, it may be closed so as to admit only a small quantity of air below the grate; and thus the combustion of the fuel may be regulated, and only so much gas evolved as can be properly mixed with air preparatory to being burned in the combustion-chamber; or it may be closed entirely, and the air for the support of combustion be admitted through apertures formed in the sides of the furnace or fire-box.

E refers to an igniting-diaphragm or arch, the cross-section of which is segmental in form, its rear end resting against the front or inner end of the furnace or fire-box, or against a bridge-wall or water-bridge or water-leg, when such devices are used. This diaphragm extends from side to side of the furnace, where it rests upon ledges formed upon or attached to the sides of the furnace. This diaphragm has no perforations in it for the passage of the products of combus-

tion, but it has an inclined position, as shown in fig. 2, in order that, as the gases rise from the fuel and are mixed with the requisite quantity of air, which is admitted through the apertures F F, soon to be described, the mixture shall be caused to impinge upon its under surface, and be caused to pass to the rear or outer end of the diaphragm, and then up into the chamber above the same.

E′ refers to another diaphragm, which is similar in construction to the one above described, except that its length is less. Like the other, it rests upon ledges formed upon the sides of the fire-box, its rear or outer end being in contact with the rear surface of the fire-box, from which point it extends to a point just in rear of the point where the other one terminates, as shown in fig. 2, its front end being below the line of the rear end of diaphragm E, thus forming a throat or passage through which all of the products of combustion are made to pass on their way to the flues or outlet. The office of this diaphragm is to conduct the gases which arise from the coal while it is being coked, to, and causing them to mingle with, those which arise from the incandescent fuel upon the grate, the latter being heated to such a temperature as to aid materially in igniting the flame.

F F refer to a series of air-induction apertures, which are so arranged as to be above the fuel but below the igniting-diaphragms, in order that the gases as they arise from such fuel may be thoroughly mixed with air previous to coming in contact with such diaphragms, by which such gases are, owing to the high temperature thereof, ignited, and thus caused to pass into the combustion-chamber above them in the condition of flame. These apertures are formed in the sides of the furnace or fire-box, as shown in fig. 2.

F^1 F^1 refer to rose-heads, which are placed upon the inner surface of the furnace, and over the mouths of the apertures F F, so that as the air passes through them it shall be comminuted into small jets, and thus caused to be more intimately mingled with the gases.

F^2 refers to a funnel-shaped air-induction tube, which is to be arranged in the rear end of the generator, as shown in fig. 2, it being above the igniting-diaphragms, and on a line with the flues or tubes of the generator, so that as the air, or air and steam, is admitted through it, it shall pass directly to the tubes or flues, and thus increase the draught of the furnace, as well as aid the combustion by the addition of fresh oxygen at that point. This aperture is covered upon its inner end with a rose-head for dividing the air into jets, as above described.

F^3 refers to a perforated pipe, which extends across the fire-box or furnace and rests upon the bridge-wall or water-leg when one is used. The air-induction pipes F^4, shown in fig. 3, conduct the air into this perforated pipe, and it passes out through the perforations in small jets, and is caused to mingle with the gases before they pass into the flues, thus supplying the oxygen at that point necessary to enable any portion of such gases to burn in said flues which may pass the combustion-chamber unconsumed.

G G refers to a series of steam-pipes, which conduct steam from the generator to the funnel-mouthed air-passages in which they terminate, as shown in the drawings, in order that as steam is passed through them it shall induce a current of air, which in passing is mingled with it. These pipes are to be provided with suitable valves or cocks, for the purpose of shutting off the steam, and for regulating the amount which is to be allowed to enter.

It will be apparent that where a strong natural draught is to be had, the steam-jets may be dispensed with, or the valves in them may be closed and the air be made to pass into the generator by such draught, or by the partial vacuum caused thereby.

I am aware that the parts above described are not, when separately considered, novel, and hence I make no claim to them except when combined and arranged as intended in this case.

Having thus described my invention,

What I claim, and desire to secure by Letters Patent, is—

1. The combination, in a steam-generator furnace, of the diaphragm F^1, and dead-plate D^1, substantially as and for the purpose set forth.

2. In combination, the grate-bars D, dead-plate D^1, and diaphragms E E′, arranged in relation to each other and to the furnace door, substantially as set forth.

3. In combination, the grate-bars D, dead-plate D^1, diaphragms E E′, and air-passages F F, arranged in relation to each other, substantially as set forth.

4. The arrangement of the rose-head covered air-pipe F^2, substantially as and for the purpose set forth.

5. The combination of the bridge-wall or water-bridge or water-leg, and the perforated pipe F^3, when arranged with reference to the funnel-mouthed air-pipes F^4 F^4, substantially as set forth.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses.

JNO. T. RICH.

Witnesses:

JAS. A. FOUNTAIN,

SAML. P. JONES, Jr.