

(No Model.)

F. J. FURMAN.
STEAM HEATER.

No. 421,261.

Patented Feb. 11, 1890.

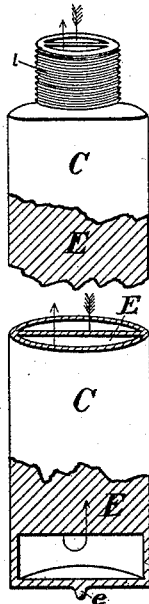
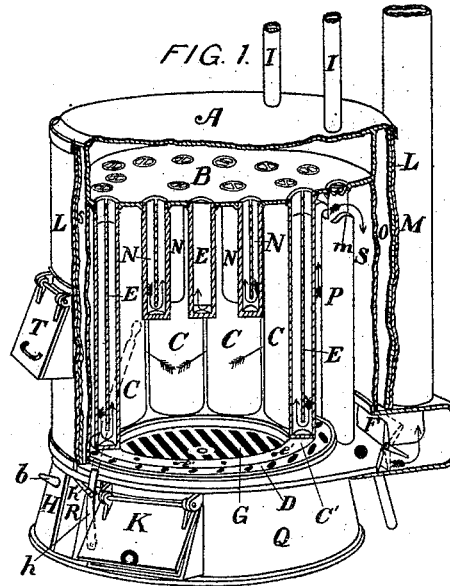


FIG. 3.

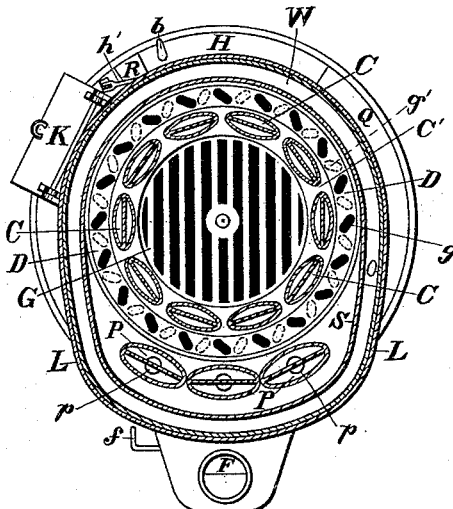


FIG. 2.

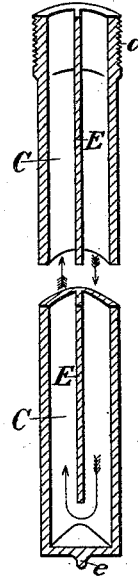


FIG. 4.

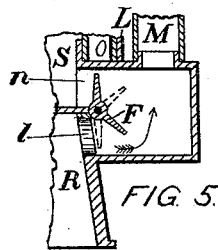


FIG. 5.

WITNESSES.

Albert E. Leach -
M. S. Thompson

INVENTOR.

Fredric J. Furman
By his Attorney.
[Signature]

UNITED STATES PATENT OFFICE.

FREDRIC J. FURMAN, OF GENEVA, NEW YORK, ASSIGNOR TO THE HEREN-
DEEN MANUFACTURING COMPANY, OF SAME PLACE.

STEAM-HEATER.

SPECIFICATION forming part of Letters Patent No. 421,261, dated February 11, 1890.

Application filed July 1, 1889. Serial No. 316,122. (No model.)

To all whom it may concern:

Be it known that I, FREDRIC J. FURMAN, a citizen of the United States, residing at Geneva, in the county of Ontario and State of New York, have invented certain new and useful Improvements in Steam-Generators, of which the following is a specification, reference being made to the accompanying drawings.

Figure 1 is a perspective view of my improved heater with parts cut away to show the interior. Fig. 2 is a transverse section taken through the fire-pot. Fig. 3 is a perspective view of portions of one of the circulatory tubes. Fig. 4 is a perspective sectional view of said tube, and Fig. 5 shows in section the operation of my improved damper.

My invention consists in the improvements hereinafter described in steam-generators for general heating purposes.

A represents the top plate, which covers the steam and water dome and extends beyond and around the outer jacket of the heater. This outer jacket L is of galvanized or other iron, and is coated on its inner surface with a fire-proof lining, preferably of asbestos.

S is the inside jacket, between which and the fire-proof lining O is left an air-space W, Fig. 2.

The ash-pit R is surrounded by the outer wall Q, and above it rests the plate C'. This plate has a circular opening, below which is hung the grate G in a frame attached to the plate C' in the usual manner.

The fire-pot is surrounded by a series of elliptical circulatory tubes C, which rest on the base-plate C' and screw into the top plate B of the fire-pot. These tubes are elliptical in section, as shown in the drawings, and each is provided with a diaphragm E, preferably made integral with the tube, extending up and down lengthwise through its greatest diameter. This diaphragm extends from the open top of the tube to within a short distance from the closed bottom thereof, as shown in Figs. 1, 3, and 4. The tubes C are preferably provided on the under side with projections e, which fit into recesses e' in the base-plate C', while by means of the

screw-threads a on their upper cylindrical ends they are tightly screwed into the top plate B, which forms also the base of the steam and water dome. These circulatory tubes are disposed lengthwise around the fire-pot in a circle, so as to expose their broadest surface to the fire, in the position shown in Fig. 2, a slight distance being left between them. The fire being confined within the circle of these tubes, the water which fills the tubes and the steam and water dome to a certain level is given a vigorous circulation, by which large quantities of steam are constantly generated with the greatest possible economy of fuel. The circulation in the tubes is in the direction of the arrows shown therein, being downward in each tube on the side of the diaphragm opposite to the fire and upward on the hotter side next the fire.

The peculiar elliptical shape of the tube here shown, with flat diaphragm along its greater diameter or through the major axis of the ellipse, is most useful for many reasons. The broad rounded surface exposed to the fire constantly brings the water in thin broad masses in immediate contact with the direct action of the fire, so that a large quantity of steam is generated in a very short time, and a straight upward passage is provided for the free and unhindered escape of the steam into the steam-dome as fast as it is produced. Furthermore, by reason of the elliptical shape, a less number of the tubes, when placed broadside, as shown, may be employed to surround the fire-pot, and more surface exposed directly to the fire than when circular tubes are employed.

In addition to the long tubes C immediately surrounding the fire, I employ shorter drop-tubes N, reaching down for some distance from the plate B. These tubes N are similar in shape and construction to the long tubes just described, and are similarly screwed into the plate B, but hang therefrom over the fire, and serve to greatly increase the heating-surface.

At the rear of the boiler are placed a number of back tubes P, of oblong or elliptical form, constructed preferably like the inner

tubes C, but larger and placed close together, edge to edge, to form practically a wall. These back tubes P may or may not be provided with central diaphragms, as desired. The arrows outside the tubes show the direction of the heat and draft. The heat and products of combustion passing outward from the fire-pot between the elliptical circulatory tubes C, as indicated by the arrows, coming in contact with the back wall, formed by the large tubes P, and being unable to pass between the same, are constrained to pass directly upward and over the shouldered portions *m* of said tubes and downward on the back of the same, thence outward through the smoke-pipe M to the chimney.

The damper F regulates the amount of air which, entering the ash-pit by the draft-door K, passes up through the grate to supply the combustion in the fire-pot. To this end the damper is so constructed that when the passage *n* to the smoke-pipe above the level of the grate is nearly closed by the damper, as shown in Figs. 1 and 5, a free direct passage through *l* from the ash-pipe to the smoke-pipe is secured, so that a comparatively small amount of air passes up through the fuel. When, however, the heater is in full blast, the damper nearly closes the passage *l* from the ash-pit to the chimney, while it is open in the passage *n* above the level of the grate, so that the air from the ash-pit passes upward through the fuel, circulates around the tubes with the gases of combustion, and out through the passage *n*. By reason of the fact that the circulation in the back tubes P is less vigorous than in the tubes nearer the fire, whatever sediment there is in the boiler is deposited at the bottom of the said tubes P. These back tubes, therefore, have at the bottom openings P, communicating with pipes provided with blow-off cocks, whereby any sediment or foreign substances which collect therein may be readily drawn off. The feed-water is preferably introduced into the steam and water space above the plate B through the central back tube P, and the steam passes upward through the pipes I I to the apartments to be heated.

The grate G is shaken in any desired manner, as by the lever *h*, pivoted on the outside of the casing Q, and the connecting-rod *h'*, which is attached to the grate inside the ash-pit.

Set into the base-plate C' and preferably flush with its upper surface rests the dust-ring D, movable therein. This ring is provided with holes *g*, preferably oblong and inclined, as shown in Fig. 2, the plate C being provided with similarly-shaped but oppositely-inclined holes *g'*. This perforated ring D is connected with the grate G, so that when the latter is shaken the perforated ring slides within the base-plate C', and the dust and soot, which are carried by the flames between the tubes, are sifted through into the ash-pit

below, the peculiarly-shaped holes *g g'* oppositely inclined in the ring and base-plate serving to more readily force through clinkers and larger dirt particles. The ring D may, if desired, be separately attached to a lever or handle, whereby it may be shaken independently of the grate.

Aside from its use as a dust-sifter the ring D has an important use in acting as a cold-air check, for by turning the ring in such a position that the holes *g* and *g'* are in communication a draft of cold air may thus be introduced at any time around the fire-pot. This draft also serves to carry up the chimney any of the light dust particles that fly about in the ash-pit and between the tubes.

By having the walls of the fire-pot formed by the water-tubes with spaces left between the said tubes, as shown, we do away with all necessity for a fire-brick lining, since by the construction of the fire-pot the draft has a chance to escape through the fire toward the edge and thus pass out of the fire-pot at the side through the said spaces between the tubes. In this manner the fire is hottest at

I claim—

1. In a steam-generator, elliptical circulatory tubes closed at the bottom and open at the top and provided with diaphragms integral therewith passing through the greatest diameter of the tube, constructed and arranged substantially as and for the purposes described.

2. In a steam-generator, elliptical circulatory tubes C, provided with diaphragms E integral therewith, extending up and down lengthwise through the greatest diameter of the same, the said tubes being provided with cylindrical tops having screw-threads *a*, whereby they may be secured to the steam-dome, substantially as described.

3. In a steam-generator, a fire-pot surrounded by a series of elliptical circulatory water-tubes disposed broadside around the same, the said tubes being provided with diaphragms passing through the greatest diameter thereof, substantially as and for the purposes described.

4. In a steam-generator, a fire-pot the sides of which are formed of a series of elliptical circulatory water-tubes C, having diaphragms through their greatest diameter, the said tubes being disposed broadside around the fire-pot supported on the base-plate C' of the furnace and screwed into the top plate B, in combination with elliptical drop-tubes N, similarly provided with diaphragms screwed into said top plate and depending therefrom over the fire, substantially as and for the purposes described.

5. In a steam-generator provided with an outlet to the chimney both above and below the grate, a pivoted damper provided with two flaps or valves at an angle with each other and rotatively operated by the same

stem, whereby when the upper outlet is closed by one of said flaps the lower outlet is open, and vice versa, substantially as and for the purposes described.

5 6. In a steam-generator, a dust-ring D, provided with a series of inclined oblong holes *g*, sliding in the base-plate C', provided with a series of oppositely-inclined holes *g'*, sub-

stantially as and for the purposes described.

In witness whereof I have hereunto set my hand. 10

FREDRIC J. FURMAN.

Witnesses:

EDGAR PARKER,
G. W. NICHOLAS.