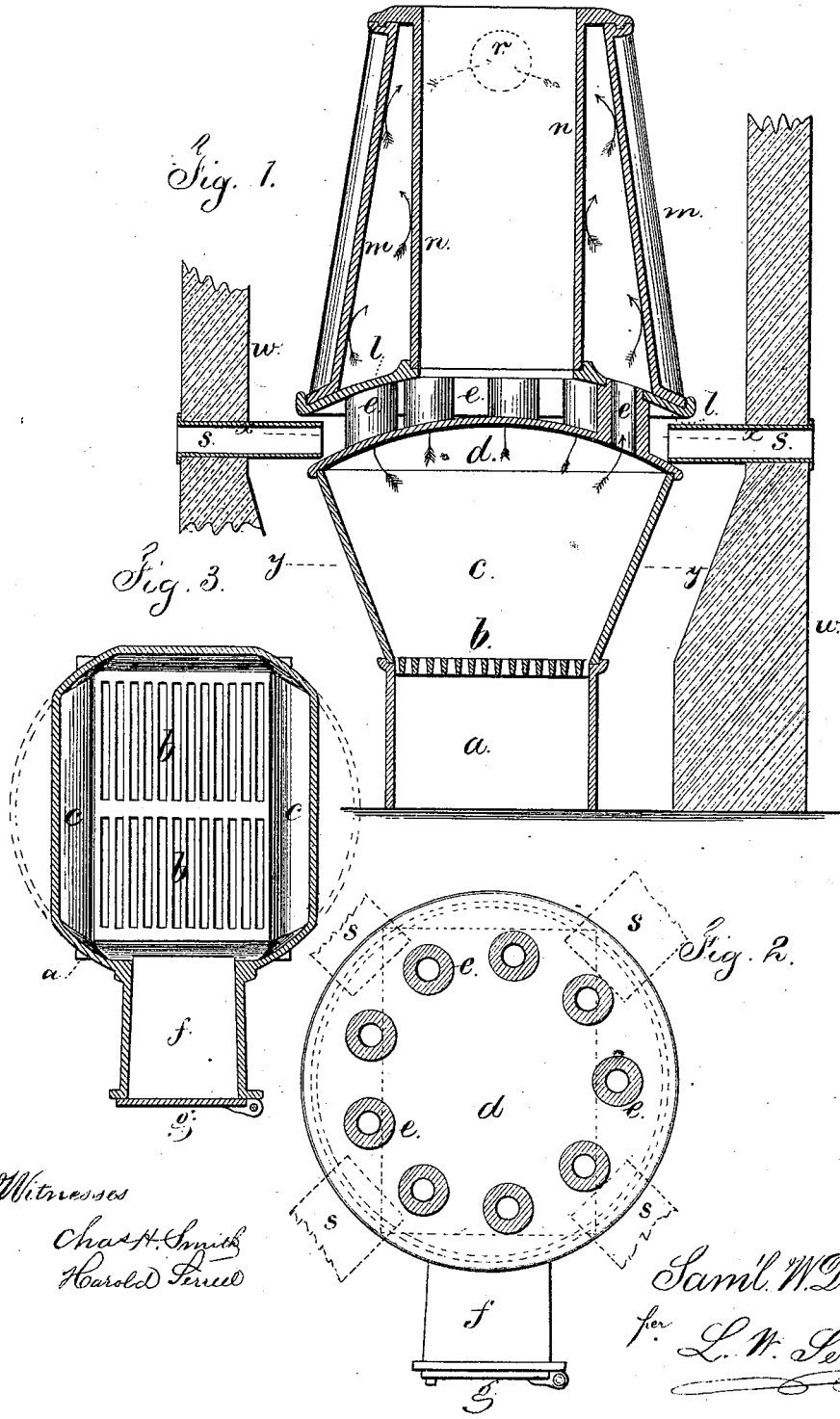


S. W. DAVENPORT.  
Air-Heating Furnace.

No. 163,978.

Patented June 1, 1875.



Witnesses  
 Chas. H. Smith  
 Harold D. Ferris

Inventor  
 Saml. W. Davenport.  
 per L. W. Sewell atty.

# UNITED STATES PATENT OFFICE.

SAMUEL W. DAVENPORT, OF SOMERVILLE, NEW JERSEY.

## IMPROVEMENT IN AIR-HEATING FURNACES.

Specification forming part of Letters Patent No. 163,978, dated June 1, 1875; application filed May 3, 1875.

*To all whom it may concern:*

Be it known that I, SAMUEL W. DAVENPORT, of Somerville, in the county of Somerset and State of New Jersey, have invented an Improvement in Hot-Air Furnaces, of which the following is a specification:

This heater is intended for warming air for any heating, drying, or ventilating purposes. It, however, is especially adapted to the Alden process for vaporizing the watery portions of vegetable substances.

I construct my furnace upon the generally-recognized principles governing the reception and transmission of heat.

The atmosphere is impinged upon the surface that is exposed to a high temperature from the direct action of the fire. The products of combustion are confined and forced to combine with the atmosphere under the intense heat. Those products pass through comparatively small tubes, and expand into a larger chamber, and impinge from side to side therein; and the external atmosphere is brought into the space around the tubes, and passes into a central air-shaft directly over the dome above the fire. Thereby rapidity of motion in the air-currents is insured, and they are highly heated, and the products of combustion are so directed as to maintain a high temperature in the metal of the heater, and a sufficient volume of air for heating or drying purposes is admitted, and its temperature raised by direct contact with that highly-heated surface.

In practice this heater can be easily regulated, so that the atmosphere passing through the same varies but little in temperature.

In the drawing, Figure 1 is a vertical section of the furnace complete. Fig. 2 is a plan at the line *x x*, and Fig. 3 is a plan at the line *y y*.

The ash-pit *a* is either of brick-work or of an oblong metal box, with a door at one end, and the grate *b* is of a corresponding shape. The fire-pot *c* is oblong at the bottom, to correspond with the grate, and its sides are flaring, and at the top form a circular rest for the dome *d*. At one end of the fire-pot *c* is the fuel-supply trunk *f* and its door *g*. The dome *d* is directly over the fire, and moderately close to the same, so as to promote a perfect

combustion by retaining and concentrating the heat; but such dome is not liable to crack or break, because of its arch shape, and from the rim being sufficiently thick and strong.

Pipes *e*, in a circular range, are cast upon the dome, and they are sufficiently heavy to withstand the action of the highly-heated products of combustion passing through them, and the area of the pipes is sufficiently small to detain the heat in the fire-pot, and prevent too rapid exit. The annular plate *l* rests upon and around the upper ends of these tubes *e*, and forms the base for the chamber, into which the products of combustion pass and expand. *m* is the outer casing of this chamber, which is corrugated vertically, and *n* is the inner case, forming a central air-heating shaft, and hanging from a flange at the upper end, resting upon a sand-joint at the upper end of the casing *m*.

The products of combustion, as they rise from the tubes *e*, impinge against the casing *m*, and thence deflect against the central air-shaft *u*, and so on until such heated gases pass away by the pipe *r* to an ascending flue or chimney. Such pipe, however, may be double, passing out at each side of the casing *m*, and descending, if desired, before it ascends.

There is no disadvantage in the joints between the ring *l* and upper ends of the tubes *e* being sufficiently loose to admit atmospheric air, as the perfect combustion is promoted, and gases will not escape, because their tendency is upward.

This furnace is adapted to wood, coal, or other fuel, and the atmospheric air that is admitted around the fire-pot is heated by the flaring sides thereof, and passes on, and is brought into contact with the outside of the corrugated casing *m*.

The furnace is to be inclosed in a casing of brick or other material, as usual. A portion of this casing is shown at *w*, and air is admitted at the bottom. Atmospheric air is also admitted, by pipes *s*, between the dome *d* and annular plate *l*, and thence it passes by the central air-shaft *n*, and the force of the current is proportioned to the temperature and height of this air-shaft *n*. As the atmosphere passes in above the dome *d* the heat is taken from the same and from the range of tubes *e*, so

that the parts are cooled, and the atmosphere highly heated, from contact with both the external and internal portions of the furnace.

I claim as my invention—

The fire-pot *c*, made circular at the upper end, and oblong contiguous to the grate-bars, in combination with the dome *d*, that covers the fire, the circular range of tubes *e*, the annular plate *l*, the central air-heating shaft *n*, and casing *m*, substantially as specified, where-

by the air to be heated is drawn in between the dome *d* and plate *l* by the ascending current in the shaft *n*, substantially as set forth.

Signed by me this 27th day of April, A. D. 1875.

SAMUEL W. DAVENPORT.

Witnesses:

GEO. T. PINCKNEY,  
CHAS. H. SMITH.