S. D. TILLMAN.

Heating-Stoves.

No. 130,605. Patented Aug. 20, 1872.

Fig. 1.

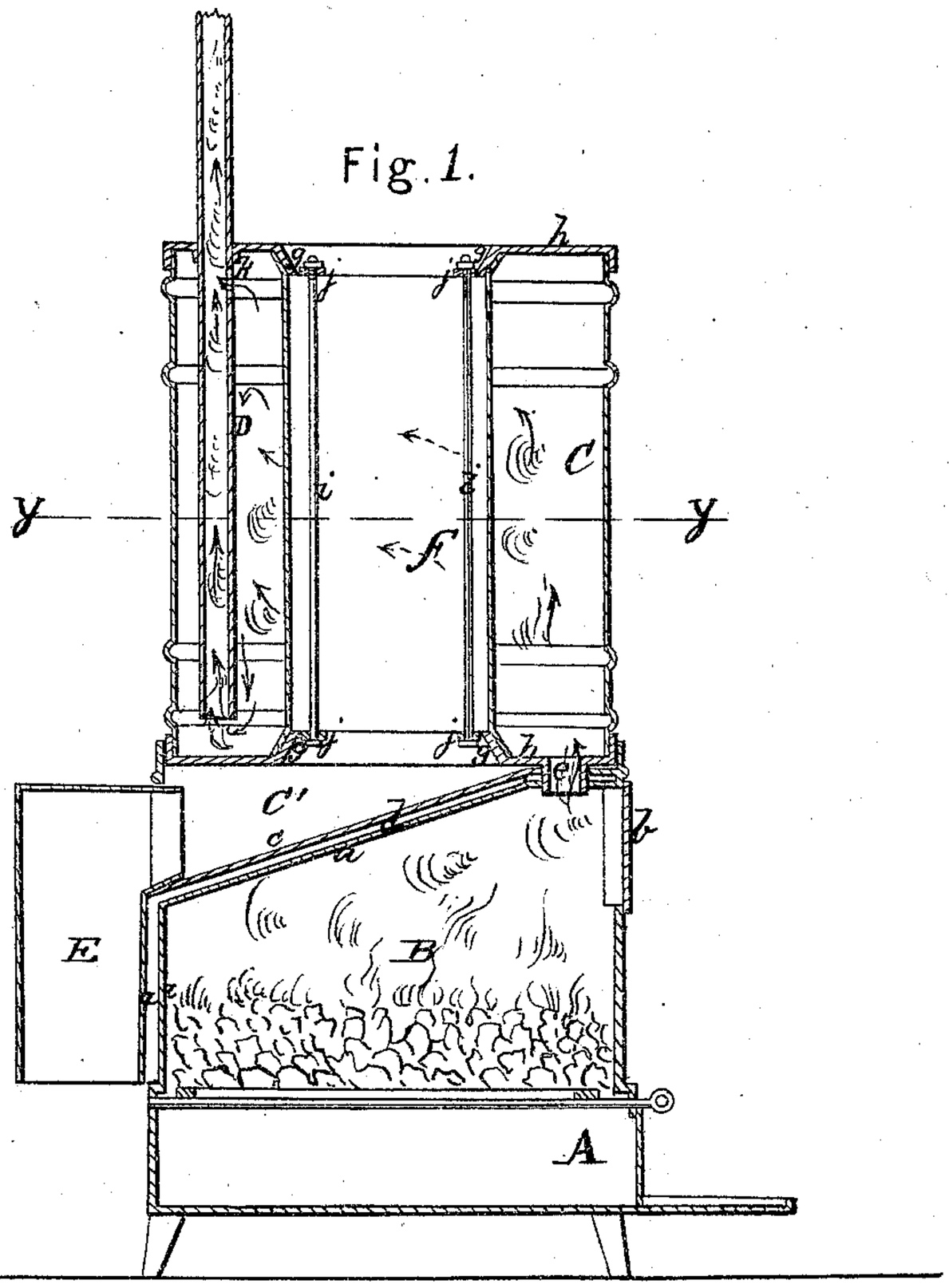
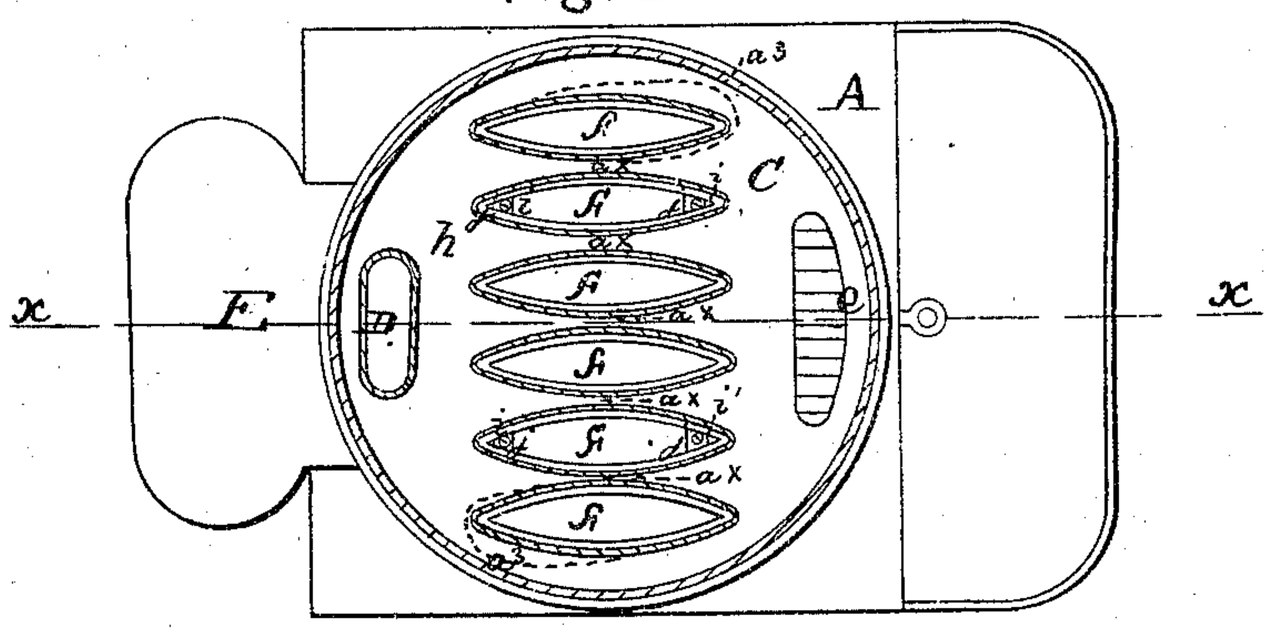


Fig. 2.



UNITED STATES PATENT OFFICE.

SAMUEL D. TILLMAN, OF JERSEY CITY, NEW JERSEY.

IMPROVEMENT IN HEATING-STOVES.

Specification forming part of Letters Patent No. **130,605**, dated August 20, 1872.

To all whom it may concern:

Be it known that I, SAMUEL D. TILLMAN, of Jersey City, county of Hudson, and State of New Jersey, have invented a new and Improved Air-Heating and Radiating Stove; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the annexed drawing, making a part of this specification, in which—

Figure 1 is a vertical section of my improvement—*x x*, Fig. 1, showing the plane of section. Fig. 2 is a horizontal section of my improvement—*y y*, Fig. 1, showing the plane of section.

Similar letters of reference indicate corresponding parts in the two figures.

My invention consists in the arrangement of a series of elliptical-shaped air-tubes parallel to each other across the diameter of the radiating-chamber, for the purposes hereafter set forth. Also in the arrangement of an air-heating chamber between the said tubes and the fire-box.

To enable those skilled in the art to fully understand and construct my invention, I will proceed to describe it:

A represents the base of the stove made in the usual form, and B is the fire-chamber, which may be of cylindrical form, the top-plate *a* of the fire-chamber being inclined upward from its back to its front side, as shown clearly in Fig. 1. The door *b* of the fire-chamber is near its upper end. C represents the radiator, which may be of cylindrical or other form. This radiator is placed above the fire-chamber B, and is supported perpendicularly over the fire-chamber by the side of a cold-air chamber, C^1, the bottom of the radiator forming the top of the cold-air chamber. The bottom-plate *c* of the cold-air chamber is inclined at an angle corresponding with that of the top plate *a* of the fire-chamber, a space, *d*, being allowed between them.

The radiator C communicates with the fire-chamber B by means of a pipe, *e*, which is placed near the door *b* of the fire-chamber. The radiating-chamber C has a series of vertical air-heating tubes, *f*, placed vertically through it. The tubes are transversely of eliptical form, and are placed side by side within the radiator, the spaces between them at their widest parts being quite narrow, as shown clearly in Fig. 2. The upper and lower ends of the tubes *f* are made "flaring," or are somewhat expanded, and fit over beveled flanches *g*, on the inner sides of the upper and lower heads *h h*, the flanches *g* being at the edges of eliptical openings made in the heads. The two heads *h h* are connected and secured firmly to the ends of the radiator by rods *i*, the ends of which are secured in lips *j* at the ends of the openings in the heads, the rods *i* passing through the tubes *f*, as clearly shown in Fig. 1. The tubes *f* are placed side by side within the radiating-chamber, in such a manner as virtually to divide the chamber into two compartments—the front compartment, with which the fire-pot communicates, being the hot-smoke chamber, and the rear compartment being the cold-smoke chamber. The formation of the tubes being elliptical is the most favorable for the easy passage of the products of combustion between them. The hot smoke and air are passed between the tubes in thin sheets, owing to the small space between the tubes, so that the loss of caloric from non-contact with the tubes is quite trifling. This arrangement of the air-tubes so as to divide the radiating-chamber has other important advantages. All of the tubes are heated simultaneously and to the same degree. The heat of the fire cannot be more fully concentrated upon one tube than upon the others. The heat is thus properly distributed among the tubes, whose durability is thereby increased. In other stoves the tubes nearest the center of the fire are generally so exposed to the heat as to be soon destroyed or rendered worthless. Another advantage of my arrangement of the tubes is, that the radiating-chamber can never become filled with soot or ashes, for a rod may be at all times passed up through the open door and smoke-hole *e* between the several tubes, whereby they may be cleaned expeditiously without taking the apparatus apart or even allowing the fire to go down. This arrangement, therefore, permits the use of wood or bituminous coal for fuel equally as well as anthracite coal, which is a point of great importance. In other tubular stoves, owing to the impossibility or inconvenience of cleaning them, hard coal only can be employed. D represents the smoke-pipe, the lower end of which extends downward to within a short

distance of the bottom of the radiator C. This pipe is open at its lower end, and an opening, *k*, provided with a damper may be made in the pipe just below the upper head *h* of the radiator. E represents a cold-air pipe, which is connected with the cold-air chamber C^1 at the back part of the fire-chamber B, the pipe E being entirely disconnected from the fire-chamber, as shown clearly in Fig. 1, a space, a^2, being allowed between them. The pipe E, which in the drawing, Fig. 1, is represented as receiving the cold air from the lowest part of the room, may, if desired, be inverted so as to receive the cold air from a chamber above, or it may extend beneath the floor and be made to communicate with the external air by passing it through the side of the building. The heads *h h* of the radiator are constructed of cast-iron. The base A may also be of the same material. The other parts are constructed of sheet metal. The smoke, heat, and gases from the fire-chamber pass upward from the fire-chamber through the pipe *e*, and act simultaneously against the tubes *f*, and pass between these tubes, which, on account of their form, offer the least possible resistance to their passage, the tubes dividing the smoke and hot gases into thin or narrow currents at the points indicated by $a^\times$, and from these points, as the tubes are gradually contracted, the spaces are correspondingly enlarged, and a free exit is allowed the smoke and gases from between the tubes, the smoke and gases passing into the smoke-pipe D at its lower end, or into the pipe through the opening *k*. The smoke and gases being divided into thin currents between the tubes *f*, the heat is quickly absorbed by the tubes, and the cold air which passes upward through the tubes *f* from the cold-air chamber C^1 and pipe E is quickly heated, and the largest possible volume of cold air is heated within the least possible time. The plates *h h* of the radiating-chamber are furnished with shoulders or flanches *g*, which receive the ends of the air-tubes *f*. The flanches are made flaring, and the rods *i i* which hold the plates *h h* and tubes *f* together pass through the tubes *f*. The rods *i i*, by passing through the air-pipes, are kept comparatively cool; but the pipes *f* being heated more than the rods expand further in length, and are crowded as they expand upon the lips *g*. The lips *g* have a wider flare in their middle than at their ends. This is requisite in order to keep the joints between the lips and the mouths of the tubes tight, for the elliptical tubes expand just twice as far at their centers as they do at their ends. Different provision is therefore required against the expansion and contraction of the elliptical tubes than if they were merely round. Another advantage of passing the rods *i i* through the tubes *f* is, that no apertures require to be made in the bottom plate of the radiating-chamber. Said plate thus serves as a cup to catch the acids which condense when using wood as a fuel, and prevents its exudation into the apartment. Wood may thus be used as the fuel in my stove with the utmost facility. The rods, by passing through the tubes *f*, also serve to prevent the central parts of the head-plates *h* from bulging by expansion, as they would do if the rods were placed near the edges of the plates.

It will be seen that in this heater a perfect combustion of the fuel is first obtained, and that the heat is then applied to the air in the most rapid and effective manner, while the whole apparatus is simple in formation, easily made and put together, cheap, and durable.

I do not claim the broad use of air-tubes in stoves or heaters for warming air. Neither do I claim elliptical-shaped tubes, for an example is seen in John Winer's heater, rejected in 1853. Neither do I claim, broadly, radiating-chambers in heaters. Neither do I claim, broadly, to be the inventor of any peculiar formation of the fire-pot. Neither do I claim, broadly, introducing the products of combustion into a radiating-chamber. Neither do I claim, broadly, the use of flaring lips for accommodating the expansion of metallic pipes, for an example is seen in W. B. Moore's rejected application, and it is common in other stoves. Neither do I claim, broadly, separating the cold-air box from the fire-pot or other portions of the heater by means of partition-plates. Examples of such separation are seen in Alpheus Cooper's patent, October 25, 1843. and in Abner Burnaham's Patent, February 19, 1856. I distinctly disclaim every part and feature of my device which is seen in any other heater, stove, or analogous apparatus.

I confine myself exclusively to the arrangement herein described, which to the best of my knowledge and belief is new, no heater ever having been made in which a series of elliptical tubes were arranged side by side or parallel to each other across the diameter of the radiating-chamber.

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

1. The arrangement of the elliptical air-tubes parallel to each other across the diameter of the radiating-chamber C, in the manner and for the purposes herein specified.

2. Also, the air-chamber C′ interposed between the fire-box B and the vertical elliptical air-tubes, as and for the purpose specified.

SAMUEL D. TILLMAN.

Witnesses:

JAMES F. BUCKLEY,

WILLIAM TUSCH.