J. H. MILLS.

Indirect Steam Radiators.

No. 145,961. Patented Dec. 30, 1873.

Fig. 1.

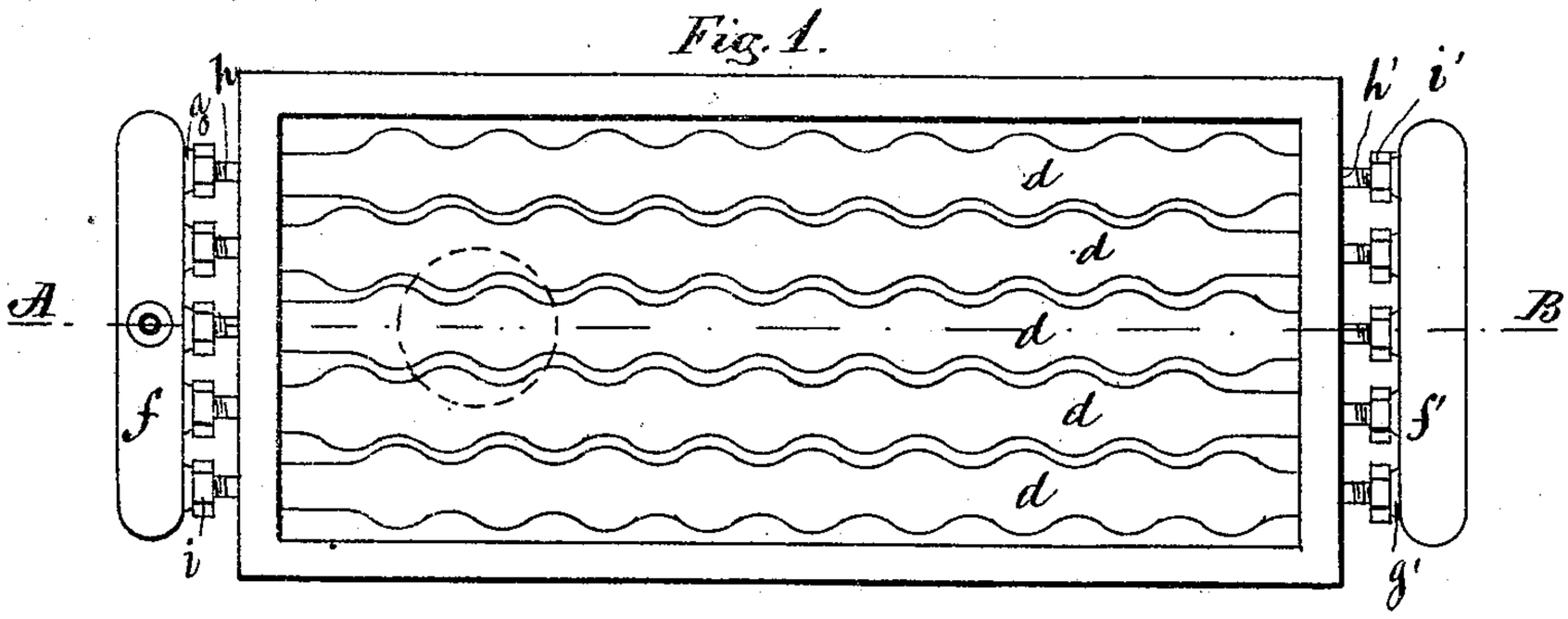

Fig. 2.

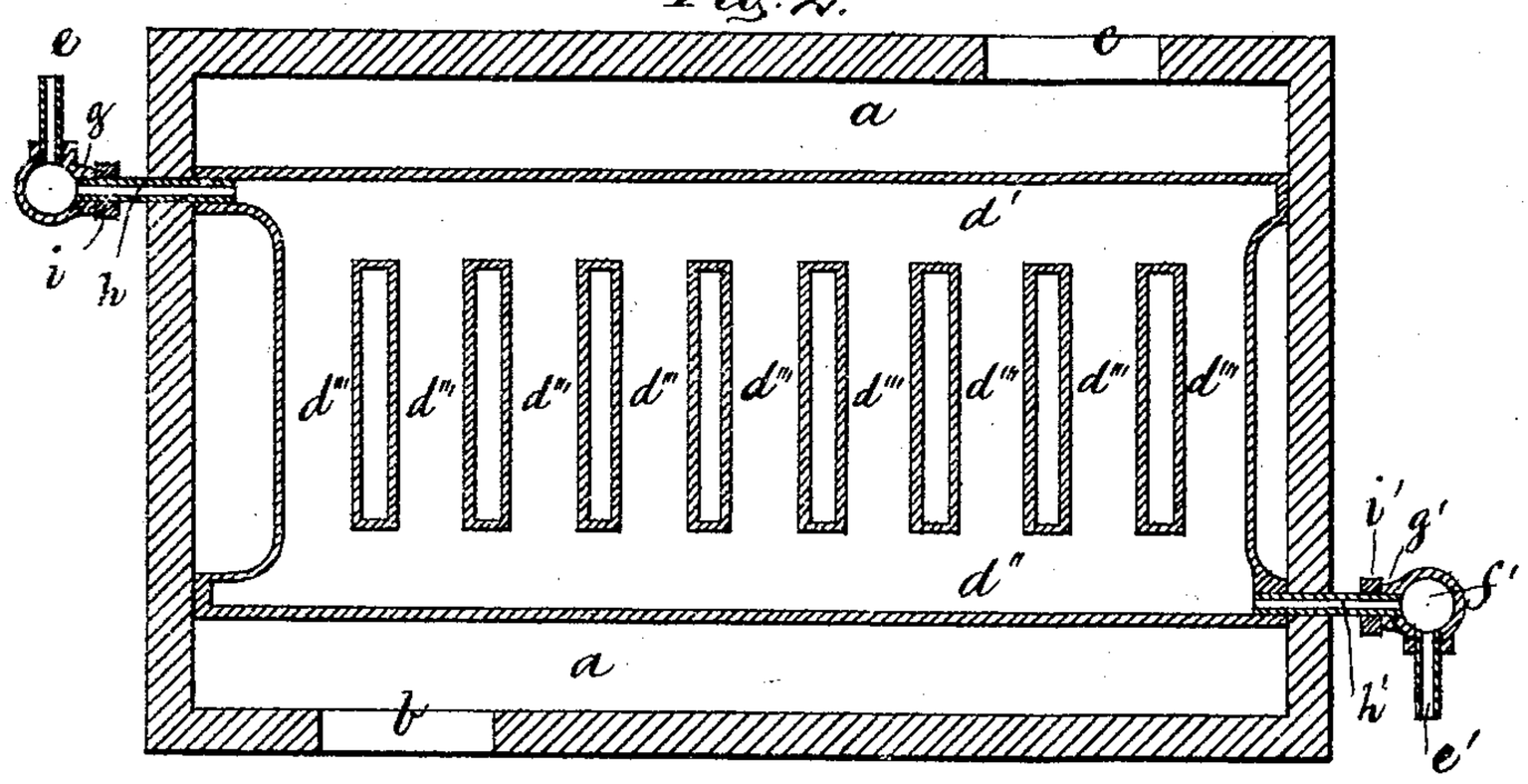

Fig. 3.

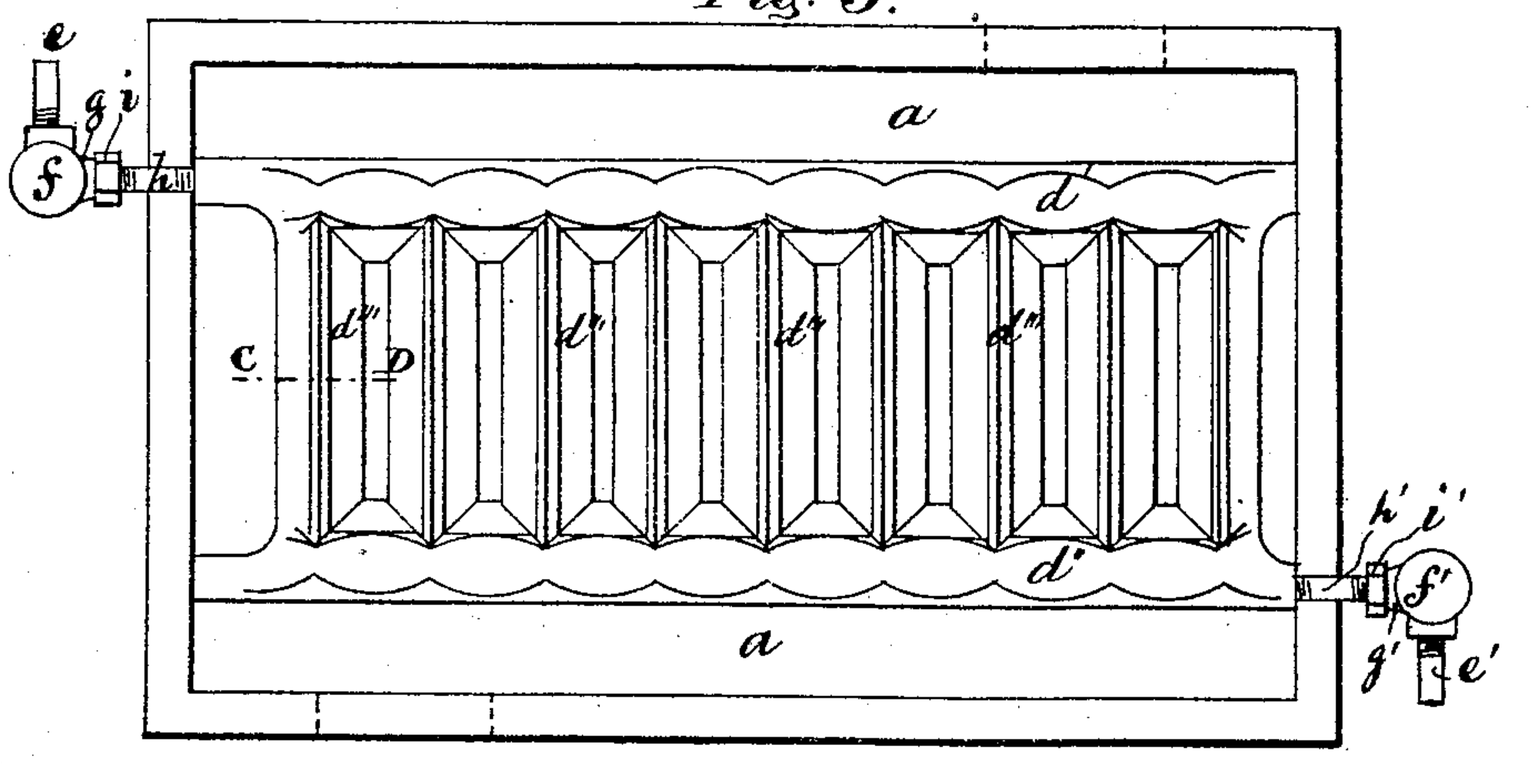

Fig. 4.

Witnesses:
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UNITED STATES PATENT OFFICE.

JOHN H. MILLS, OF BOSTON, MASSACHUSETTS.

IMPROVEMENT IN INDIRECT STEAM-RADIATORS.

Specification forming part of Letters Patent No. **145,961**, dated December 30, 1873; application filed October 1, 1873.

To all whom it may concern:

Be it known that I, JOHN H. MILLS, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Indirect Steam-Radiators; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification.

My invention relates to that class of heating apparatus, for private residences or other buildings, in which the heating-surfaces are placed in chambers or boxes outside the room that is to be warmed, and generally located in the basement, to which the air from outside the building is conducted, and, after being raised to the required temperature by passing over coils of pipe or radiators filled with steam, is admitted to the different apartments, as desired; and my invention consists, first, in the peculiar form of tube, which I have styled a "compound gothic tube," formed by describing four gothic members at equal distances around a circle.

The casting or radiator in this case is arranged differently from the direct radiator described, as the work to be done and the conditions are unlike.

In indirect heating, instead of single, or at most double, radiators, it is often desired to mass large quantities of surface in the least possible room consistent with the passage of air through them to the registers; and to insure successful operation, such surface must be placed so that the air is free to ascend without passing too rapidly or in a semi-heated condition.

To accomplish this, together with other desirable results, I have arranged my heating-surface, formed of the gothic tube mentioned, in vertical rows, but with change of position and connection, to enable such tubes to interlock each other, so that the air-space in and around them shall be reduced to a minimum, while the steam or heating surface is increased. To further simplify the connections, or rather the supply of steam and discharge of condensed water, I make this radiator, like the direct, in one homogeneous casting, supplied with steam at the top and discharging the condensed water and air at the bottom. These castings or radiators, when aggregated or placed side by side, and supplied with steam from outside the chamber, and the drip delivered to a separate pipe, form a "stack" of heating-surface, which is complete without any joints within the chamber.

On the drawing, Figure 1 represents a ground plan of my invention. Fig. 2 represents a longitudinal section on the line A B, shown in Fig. 1. Fig. 3 represents a side elevation, and Fig. 4 represents a cross-section, on the line C D, shown in Fig. 3.

Similar letters refer to similar parts wherever they occur on the different parts of the drawings.

a represents the air-chamber, having an opening, *b*, at the bottom for the admission of the air that is to be heated, and another opening, *c*, at the top for the delivery of the heated air to any part of a building that is to be warmed. The radiators *d d d d d* are each made in one entire piece without any joints or connections whatever, except where they are connected to the steam and drip pipes. The said radiators consist each of two horizontal tubes, *d' d''*, one at the top and one at the bottom of the radiator, which are cast in one piece with a number of vertical compound gothic tubes, *d''' d''' d'''*, of a section shown in Fig. 4. The horizontal tubes *d' d''* are cast with a series of swells located centrally with the vertical gothic tubes *d''' d'''*, and one radiator is placed in the air-chamber *a* in a relative position to the next one, as shown in Fig. 1, so that the swells on one radiator come in the hollows between the swells of the next radiator. A small space, is however, left for the air to pass between horizontal tubes *d' d''*, as shown.

As the vertical compound gothic tubes *d''' d'''* are arranged centrally with the swells on the horizontal tubes *d' d''*, it follows that the said vertical tubes of one radiator come in the spaces between the vertical tubes of the next radiator, and so on through the whole series of radiators that are used. In this manner I am able to obtain the largest possible heating-surface in a very small and compact chamber;

and as the air that is to be heated is brought in very intimate contact with the radiators, as above arranged, I am able to heat a large volume of air in a very short time, as compared with the ordinary radiators now generally employed.

The steam is conducted to the radiators through the pipe *e* that is screwed in a cast-iron drum, *f*, provided with a number of branches, *g g g g g*, one for each radiator *d d d*, as shown in Fig. 1. The drum *f* is connected to the radiators *d d d* by means of the pipes *h h h* screwed in the radiators and the branches *g g g*, and provided with the check-nuts *i i i*, as shown. A similar drum, *f'*, with its branches *g' g' g'*, pipes *h' h' h'*, and check-nuts *i' i' i'* is arranged at the lower ends of the radiators for the purpose of allowing the condensed water and air to escape through the drip-pipe *e'*, shown in Figs. 2 and 3.

Having thus fully described the nature, construction, and operation of my invention, I wish to secure by Letters Patent, and claim—

The combination of a series of independent radiators, each receiving its own supply of steam and discharging its water of condensation independently of the others, with an inclosing air-chamber, and water and steam drums arranged outside of said chamber and communicating through separate and distinct connections with each independent radiator, substantially as herein shown and described.

In testimony that I claim the foregoing I have hereunto set my hand this 1st day of September, 1873.

JOHN H. MILLS.

Witnesses:
ALBAN ANDRÉN,
GEORGE E. PHELPS.