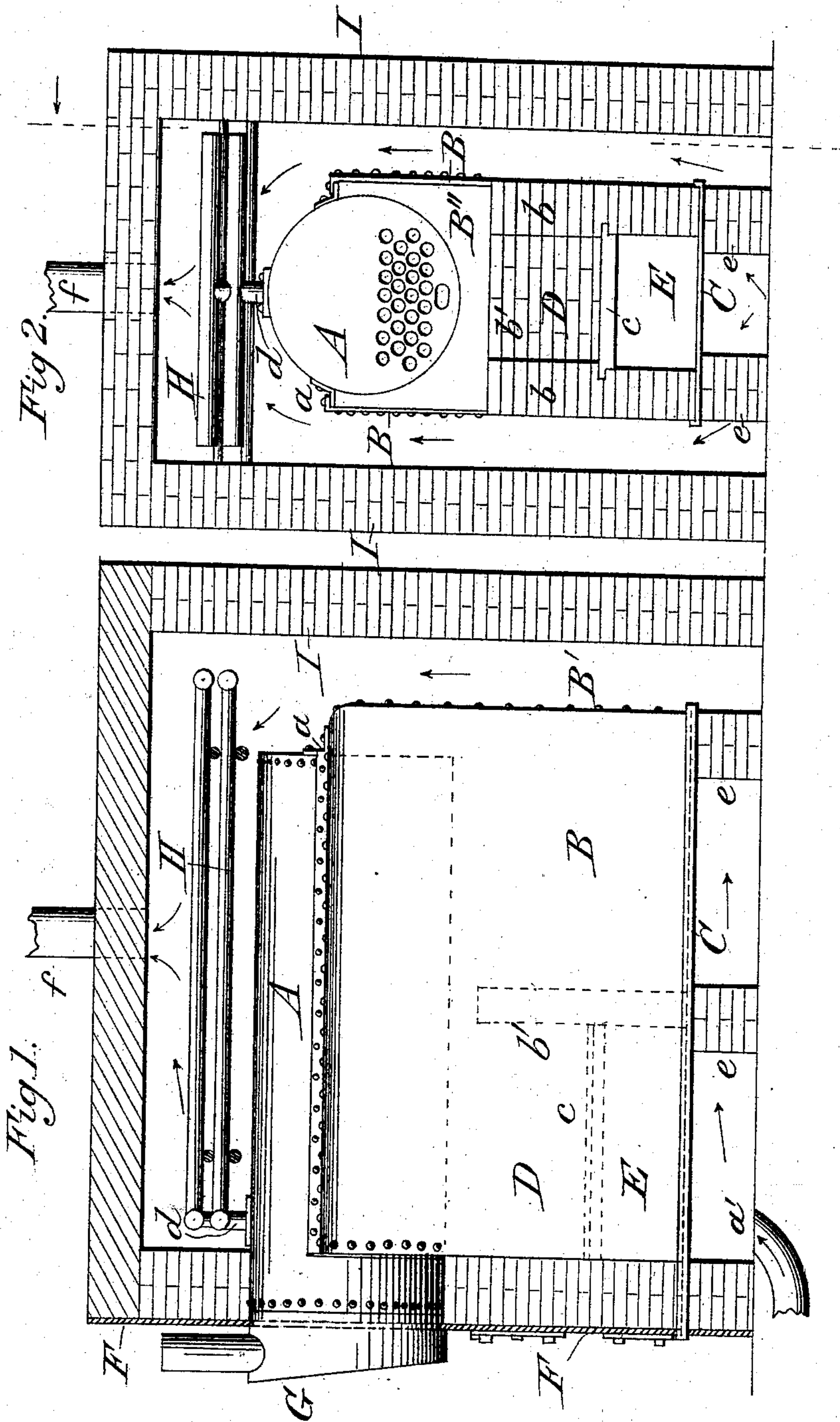


(No Model.)

L. GOULD.
Hot Air Furnace.

No. 235,945.

Patented Dec. 28, 1880.



Attest:

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UNITED STATES PATENT OFFICE.

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HOT-AIR FURNACE.

SPECIFICATION forming part of Letters Patent No. 235,945, dated December 28, 1880.

Application filed October 19, 1880. (No model.)

To all whom it may concern:

Be it known that I, LYMAN GOULD, a citizen of the United States, residing at Norwich, in the county of New London and State of Connecticut, have invented certain new and useful Improvements in Furnaces for Warming Dwellings; 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 appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

This invention relates to that class of furnaces used for warming dwelling-houses and other buildings in which the heated air employed for that purpose is subjected, during the process of warming, first, to direct contact with the outer sides of metallic plates, the opposite sides of which are exposed to the action of the fire; and, secondly, exposing the same air to contact with steam-heated radiating-surfaces before it is allowed to pass into the pipes by which it is conducted to the rooms to be warmed. The object is to produce a heating apparatus in which, as nearly as possible, the full heating effect of the fuel is secured, and which will prevent the danger of fires arising from air heated above the point of ignition passing into the distributing-pipes; and the invention consists in the manner of constructing and arranging the different parts of the furnace, as will be hereinafter fully set forth, and then specifically pointed out in the claims.

In the drawings, Figure 1 shows a vertical longitudinal section through the brick-work of the furnace, with a side view of the boiler and fire-box, the grate-bars and bridge-wall being indicated in dotted lines. Fig. 2 is an end view of the boiler, inclosing brick-work, and fire-box, the metallic front plate being removed, so as to give a view of the above-named parts.

The boiler A is of that class usually known as "tubular cylinders," consisting of a plain cylindrical shell of suitable length, provided with heads which are pierced to receive any desired number of tubes, through which the products of combustion pass on their way to the chimney. Upon each side and across one

end of this boiler, near its water-line, are secured, by rivets, the angle-irons *a*, and depending from and secured to these angle-irons, by rivets or other suitable means, are the side plates, B, and end plate, B', preferably formed of cast-iron, although wrought-iron plates may be used; but their liability to warp under the exposure to sudden variations of temperature renders them, in some respects, less desirable. These plates B and B' form three sides of the combustion-chamber beneath the boiler, the bottom of said chamber being formed by the cast-iron plate C, provided with an upwardly-projecting flange, or having a groove around its edge, which receives and holds in position the lower edges of the plates B and B'. In one end of this combustion-chamber is placed the fire-box D, its sides being formed by the brick walls *b b* lining the inner sides of the plates B at that point, while its rear is formed by the bridge-wall *b'* connecting the rear ends of the walls *b b*. This fire-box is supplied with a grate, *c*, of any approved construction, beneath which is the ash-pit E. Both fire-box and ash-pit are supplied with suitable doors formed in the front plate, F, which covers the whole front of the furnace except the necessary openings for the introduction of fuel, removal of ashes, and exit of smoke and gases.

A plate, B'', may, if desired, be placed upon the brick-work over the door to the fire-box, with its upper edge concaved to fit the lower side of the boiler; or its place may be filled by a wall of brick fitting snugly and assisting to support the front end of the boiler.

A smoke box or jacket, G, is also attached to the front plate, F, and covers an orifice in said plate corresponding to the end of the boiler next it, for the purpose of receiving and carrying to the chimney the products of combustion upon their exit from the boiler-tubes.

Rising from the top of the boiler is a steam-pipe, *d*, which conveys the steam produced to the radiator H. This radiator may be composed of a series of tubes arranged in the manner shown, or it may be formed in any of the well-known methods now in use for constructing such an apparatus, the point desired being to furnish such an amount of radiating-surface as shall enable the air to take up enough of

the steam-heat to reconvert the steam into water, which flows back into the boiler, thus requiring but a small quantity of water to keep the latter supplied, it being necessary to simply
5 supply the loss from unavoidable leakage.

The apparatus hereinbefore described is all supported upon the piers *e*, which are placed beneath the bottom plate, *C*, thus raising the latter sufficiently to admit of a free circulation
10 of air beneath it. The cold air being preferably introduced at the point *a'*, beneath the ash-pit, passes along beneath the warmed plate *C* and out and upward at its sides and ends, as indicated by the arrows.

15 It will be seen that the devices for producing heat and imparting it to the air are all inclosed within a chamber formed by the walls *I*, which surround it upon all sides, while the top of the chamber is formed by a ceiling of
20 brick or other non-conductor of heat, arched or otherwise supported, and only pierced by the openings *f* for the exit of heated air.

The operation of the apparatus is as follows: A fire having been started upon the grate, the
25 products of combustion pass over the bridge-wall into the large combustion-chamber in its rear, where the smoke and gases are thoroughly mixed and their perfect combustion insured by the introduction of more air, if neces-
30 sary. From this point they pass through the tubes of the boiler to the smoke-box and chimney, by which time their useful heat will have been imparted to the plates of the combustion-chamber and water of the boiler, which water,
35 when converted into steam, rises up and fills the radiator placed above the boiler. The cold air entering beneath the bottom plate receives its first installment of heat from that source. As it then passes upward between the side and
40 end plates which form the walls of the combustion-chamber and the outer walls, *I*, inclosing the air-chamber, it becomes still further heated, and in its course toward the exit-pipe or pipes *f*, through the steam coil or

radiator, it receives, if below, the heat of steam, 45 an addition to its temperature; but if it be already above that point, a portion or the whole of this excess will be abstracted by the steam-coil, reducing the heat of the air before it enters the exit-pipes to a point below that of 50 ignition, thus preventing danger of fire from over-heated air. Another advantage gained by the use of this apparatus is that the great amount of heat stored in the water of the boiler will keep up the supply of heated air for some 55 time after the fire has become low or gone out entirely—a result which is of great value where wood or peat is used as fuel, it being unnecessary to keep up the fires during the night, as the apparatus will continue to give out a fair 60 supply of heat for some hours after the fire has been completely extinguished.

Having thus described my invention, I claim, and desire to secure by Letters Patent, the following: 65

1. In an apparatus for heating air, the combination, with a combustion-chamber the sides of which are formed by the union of vertical radiating-plates, and the top by a steam-boiler to which said plates are united by means of 70 angle-irons, of a steam-radiator attached above the boiler, the whole being supported on suitable piers and surrounded by an inclosing air-chamber provided with inlet and outlet tubes, substantially as and for the purpose specified. 75

2. In an apparatus for heating air, the combination of the boiler *A*, radiator *H*, vertical plates *B B B'*, united to the boiler by angle-irons *a*, bottom plate, *C*, supported on piers *e*, lining-walls *b b*, bridge-wall *b'*, grate *c*, and inclosing-wall *I*, all constructed and arranged 80 substantially as and for the purpose set forth.

In testimony whereof I affix my signature in presence of two witnesses.

LYMAN GOULD.

Witnesses:

JAMES A. HOVEY,
CHAS. F. THAYER.