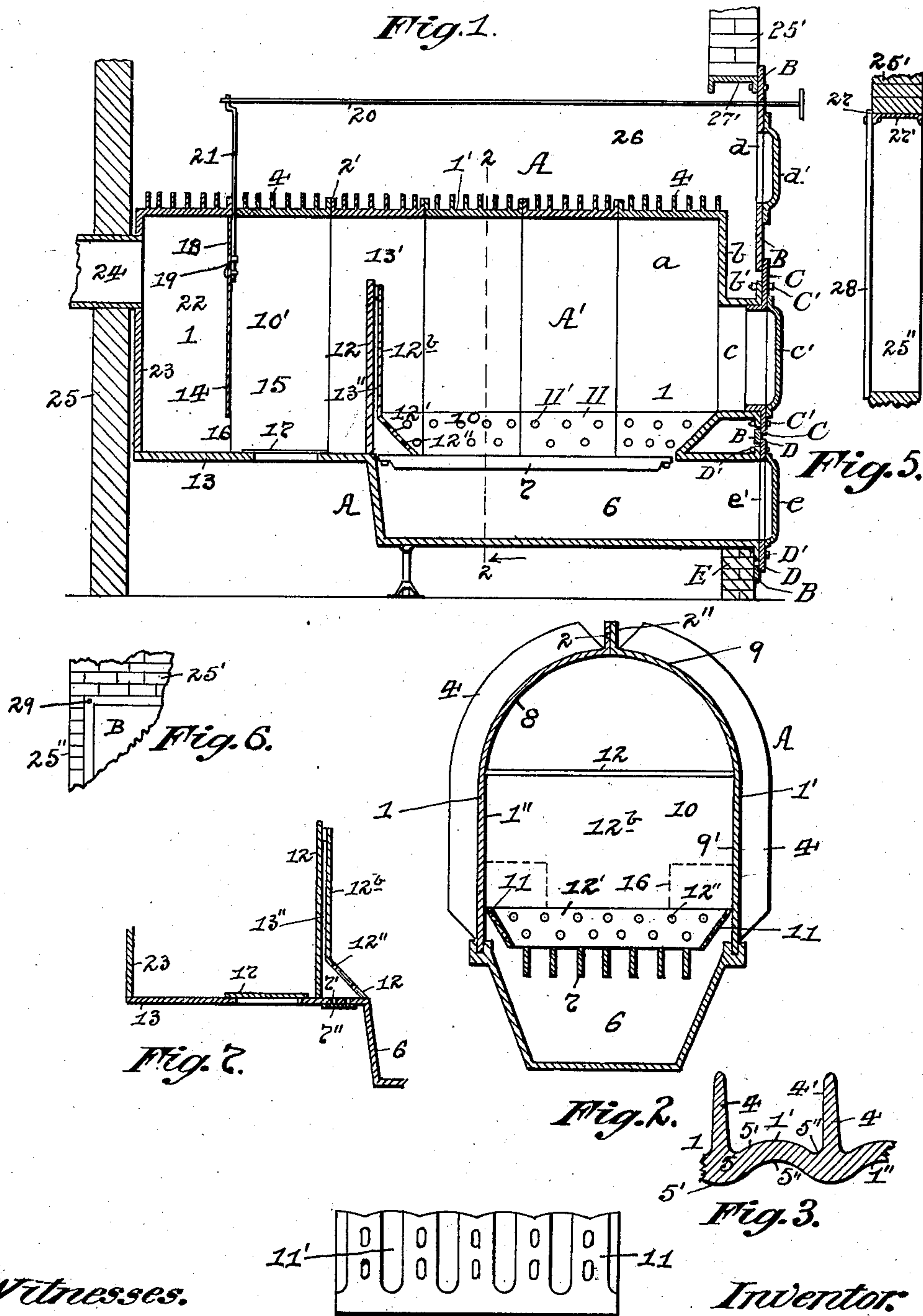


O. L. BADGER.
WARM AIR FURNACE.

APPLICATION FILED DEC. 6, 1902.

NO MODEL.



Witnesses.
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Fig. 4.

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UNITED STATES PATENT OFFICE.

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WARM-AIR FURNACE.

SPECIFICATION forming part of Letters Patent No. 742,147, dated October 27, 1903.

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To all whom it may concern:

Be it known that I, OLIVER L. BADGER, a resident of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Warm-Air Furnaces; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to warm-air furnaces, and has special reference to that class of furnaces such as are used for heating residences, school-houses, churches, court-houses, and many other like buildings by means of warm or hot air.

The main object of my invention is to do away with the back breeching in these horizontal furnaces and to cheapen and simplify the cost and construction of these furnaces, as well as provide such a furnace which will generate large quantities of warm air; and a further object of my invention is to form such a furnace which will more effectually convey the heat produced by the combustion of the fuel to the exterior of the furnace, and thereby more effectually utilize the fuel consumed, as well as one in which secondary combustion may be obtained.

My invention consists, generally stated, in the novel arrangement, construction, and combination of parts, as hereinafter more specifically set forth and described, and particularly pointed out in the claims.

To enable others skilled in the art to which my invention appertains to construct and use my improved warm-air furnace, I will describe the same more fully, referring to the accompanying drawings, in which—

Figure 1 is a longitudinal central section of my improved warm-air furnace. Fig. 2 is a cross-section of the same on the lines 2-2, Fig. 1. Fig. 3 is a cross-section of a portion of one of the plates used in forming the side walls of the furnace. Fig. 4 is a view showing a portion of the lining. Fig. 5 is a cross-section of the furnace through the plates for supporting the front wall. Fig. 6 is a detail view showing the manner of attaching the front wall, and Fig. 7 is a view of another form of my improved warm-air furnace.

Like symbols of reference herein indicate like parts in each of the figures of the drawings.

As illustrated in Fig. 1 of the drawings, the body A' of my improved warm-air furnace A is formed of a series of plates, which are joined together at their side edges 2' and top edge 2'' by means of the ordinary tongue-and-groove joint 2, which can, if desired, be held together by a series of bolts passing through the same. These plates 1 are provided on their exterior faces 1' with a series of flanges 4, which project out at right angles from the exterior faces 1', while the said plates 1 are preferably formed of a continuous or wavy corrugation in cross-section, as shown at 5 in Fig. 3, which form the convex portions 5' and the concave portions 5'' on the exterior faces 1' and the interior faces 1'' of said plates 1, while said flanges 4 are preferably adapted to taper inwardly, as at 4', from the exterior face 1' and are formed so as to extend outwardly from said face 1' at a point opposite the convex portion 5' on the interior face 1'' for the purpose of more quickly transmitting and increasing the heat units to the exterior of the furnace. The forward plate a is provided with the front plate b, formed as part thereof, and on which is formed the fuel-opening C, which extends through the front wall B of the furnace A, so as to form a space b' around the same, and such opening C is provided with a fuel-door c thereon. A man-hole d is formed in the front wall B, which is covered by the door d', and a draft-door e is placed on the wall B below the fuel-opening C, which door e covers the end of the opening e', leading to the ash-pan 6, formed below the plates, and with such pan 6 is the grate 7. The plates 1 are curved inwardly, as at 8, to form the arched top 9 over the fire-box 10, which is above the grate 7, and corrugated lining-plates 11, having perforations 11' therein, lead from the sides 9' of the plates 1 at an incline down to the grate 7.

In the rear of the fire-box 10 is the extension 10', formed of like plates joined together and provided with flanges like the body A', while within said extension 10' is the deflect-

ing or front baffle-plate 12, which extends up from the dead-plates 13, forming the bottom along the plates 1 in the rear of the ash-pan 6, and above said baffle-plate 12 is the draft-space 13'. Lining-plates 12', having perforations 12'' therein, also lead from the front of the baffle-plate 12 at an incline down to and rest upon the top of the grate 7, while vertical lining-plates 12^b extend up from the lining-plates 12' in front of the baffle-plate 12, so as to form a chamber or space 13'' between said baffle-plate 12 and the plates 12' and 12^b. A rear deflecting or baffle plate 14 is formed back of the front baffle-plate 12, which acts to form the space 15 between these plates 12 and 14, and leading from this space 15 are the draft-spaces 16, formed under the rear baffle-plate 14, such as is shown in dotted lines, Fig. 2. A clean-out door 17 is formed in the dead-plates 13, opposite the space 15, and a damper 18 is secured in the space 19 at the top of the rear baffle-plate 14, which is operated by means of a damper-rod 20, passing through the front wall B and connected by a bent rod 21 on the damper 18.

In the rear of the rear baffle-plate 14 is the space 22, formed by said plate 14, and the rear wall 23 on the rear plate a' of the side plate 1, forming the extension 10', and from the upper end of this wall 23 a smoke-flue 24 leads through the wall or casing 25 to the stack or chimney. The wall or casing 25 is generally formed of brickwork and surrounds the furnace A, so as to form the chamber 26 for the accumulation of warm air radiated from the furnace A, and from this chamber 26 hot-air pipes lead through the wall or casing 25 to the different rooms or apartments to be heated.

The front-wall plate B, carrying the doors c', d', and e, is preferably supported independently of the furnace-body A' and is connected by bolts 29 to a metal frame 27, formed of a lintel or plate 27', secured under the top wall 25' of the casing 25 and to posts or plates 28, extending down and secured to the side walls 25'' of said casing 25, so that said wall B can be easily and quickly attached and detached when desired and at the same time permit the expansion and contraction of such parts.

The use and operation of my improved warm-air furnace are as follows: The fuel is fed into the fire-box 10 through the fuel-opening C onto the grate 7, and fire being applied to such fuel in the fire-box will enable the products of combustion to pass therefrom through said fuel-box and strike the front baffle-plate 12, after which these products will pass through the draft-space 13', over the plate 12, down through the space 15, through the draft-space 16, under the rear baffle-plate 14, up through the space 22, and out through the smoke-flue 24 to the chimney or stack. The waste heat and products of combustion generated by the fuel in the fire-box 10 in thus passing through said fire-box to the chimney

or stack will come in contact with the body A' of the furnace A, formed by the said plates 1 and in striking the interior faces 1'' of said side plates will heat these plates, so that the heat therefrom will be radiated through them and the flanges 4 on the exterior faces 1' thereof and opposite the convex portions 5' on the interior faces 1'' thereof, so as to cause hot air to be generated thereby, which will accumulate in the chamber 26, formed by the furnace A and casing 25, so that the same can be carried off therefrom by hot-air pipes communicating with such chamber 26 and leading to the different rooms or apartments in the building to be heated. When the furnace A is thus in use, the cold air can enter the furnace from the outside through the ash-pit 6 and pass up into the chamber or space 13'' between the lining-plates 12^b and 12' and the front baffle-plate 12 through the grate 7 and out of said space 13'' into the space 13' above the baffle-plate 12, mixing in with the products of combustion passing through said space 13', and therefore protecting said plate 12 from burning out by the heat and also making secondary combustion in said furnace, or, if desired, air-ports 7' can be made in the dead-plates 13 to enable the cold air to enter directly into the space 13'' from the outside for the same purpose, such as is shown in Fig. 7, and the amount of cold air fed into such space 13'' through the air-ports 7' can be regulated by the cover or register 7'' over the same.

By the arrangement of baffle-plates 12 and 14 at the rear of the furnace A the heat is brought more effectually into contact with the side walls or plates of the furnace-body A' and a number of such baffle-plates used, if desired, so that more heat is radiated by said body portion A, and the flanges 4 are also more effectually heated, which adds very materially to the heat-radiating surface of the furnace. By the use of the inclined lining-plates 11 the mass of coked fuel can be moved over against the sides 9' of the plates 1 from the grate 7 and new fuel added to this coked fuel over the grate 7, so that the heat will strike against all points on the interior faces 1'' of the plates 1, and such inclined plates will tend to throw the ashes away from the side walls as well as admit air from the ash-pan 6 through the grate 7 and through the perforations 11' in said plates 11 to the fuel in the fire-box 10 at a higher point than the grate 7. It will thus be seen that my improved warm-air furnace provides a simpler construction and operation than the ordinary class of these furnaces and has less joints for the space occupied or size of furnace and amount of radiating-surface. It will also be seen that such a furnace provides more radiating-surface for the same grate-surface and size of furnace than the ordinary furnace of this kind, as well as better draft on account of the air moving through the furnace with less friction, and a greater temperature will be obtained to the radiating-sur-

face on the rear portion of said furnace on account of the air being allowed to impinge against the sides in passing through said furnace. It will further be obvious that such a
5 form of furnace can be easily repaired, since the front can be taken down independent of the body of the furnace and casing and room or space obtained to repair sides without tearing the whole casing and furnace to
10 pieces, while on account of such front being separate from the body there is less liability of cracking joints by expansion and contraction, as in the ordinary cases.

Various modifications in the construction,
15 design, and operation of my improved warm-air furnace may be resorted to without departing from the spirit of the invention or sacrificing any of its advantages.

What I claim as my invention, and desire
20 to secure by Letters Patent, is—

1. A warm-air furnace composed of a body portion, an extension on said body portion in the rear of the fire-box therein, front and rear
25 baffle-plates within said extension having draft-spaces through the same, said front baffle-plate being located adjacent to the said

fire-box, and a lining in front of said front baffle-plate and supported over the grate-bars in the fire-box, said lining being adapted to form a chamber between the same and plate
30 to permit the air from the ash box or pan to enter said chamber through the grate-bars.

2. A warm-air furnace composed of a body portion, an extension on said body portion in the rear of the fire-box therein, front and
35 rear baffle-plates within said extension having draft-spaces through the same, said front baffle-plate being located adjacent to said fire-box, a vertical lining in front of said front baffle-plate and adapted to form a cham-
40 ber between the same, and an inclined lining extending from said vertical lining to and supported over the grate-bars in said fire-box for permitting air to enter said chamber from
45 the ash box or pan through the grate-bars.

In testimony whereof I, the said OLIVER L. BADGER, have hereunto set my hand.

OLIVER L. BADGER.

Witnesses:

J. N. COOKE,

L. T. MARKS.