(No Model.) 2 Sheets—Sheet 1.

C. S. HOOD.

HOT AIR FURNACE.

No. 350,590. Patented Oct. 12, 1886.

Fig. 1.

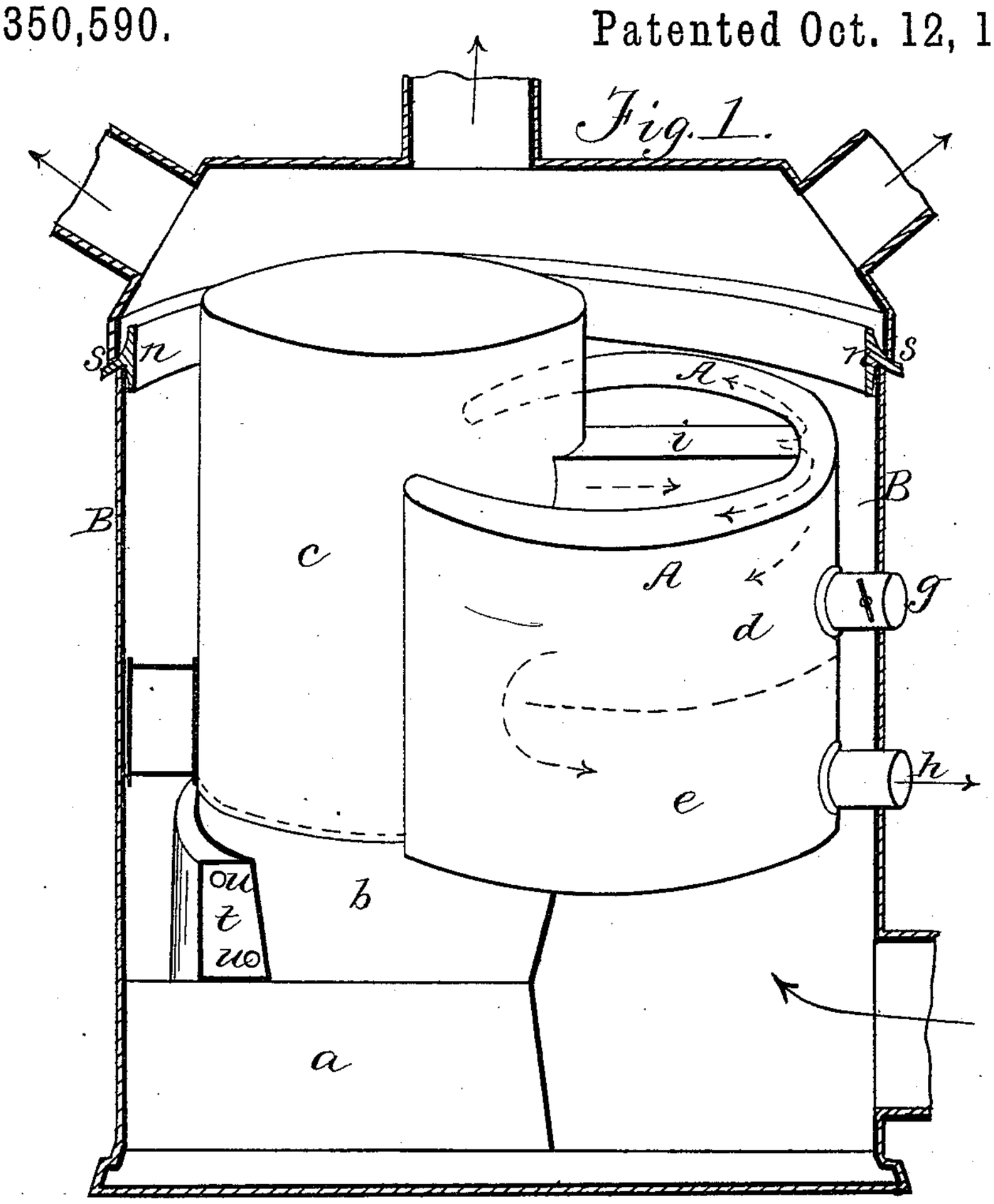
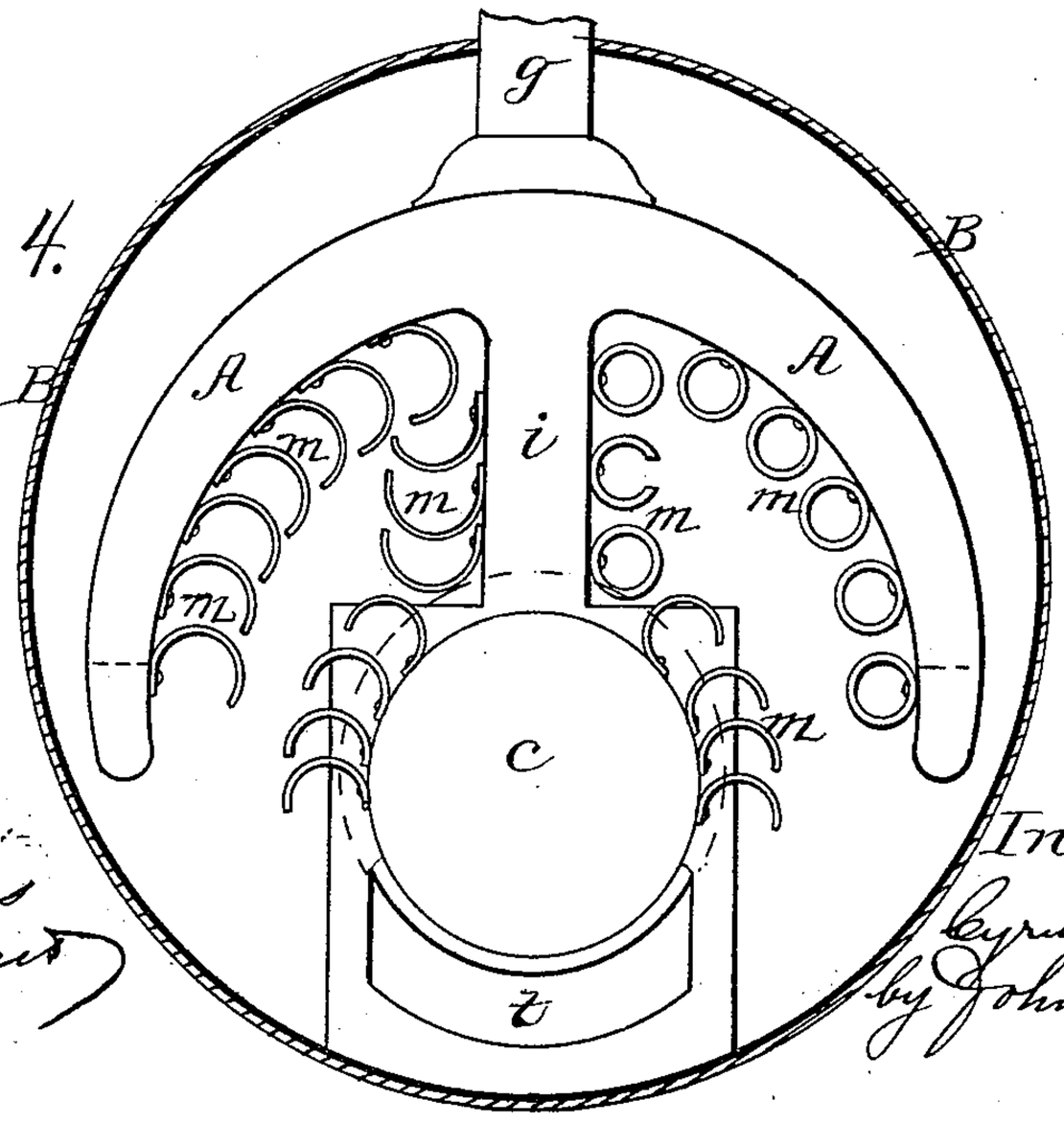


Fig. 4.



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(No Model.) 2 Sheets—Sheet 2.

C. S. HOOD.

HOT AIR FURNACE.

No. 350,590. Patented Oct. 12, 1886.

Fig. 2.

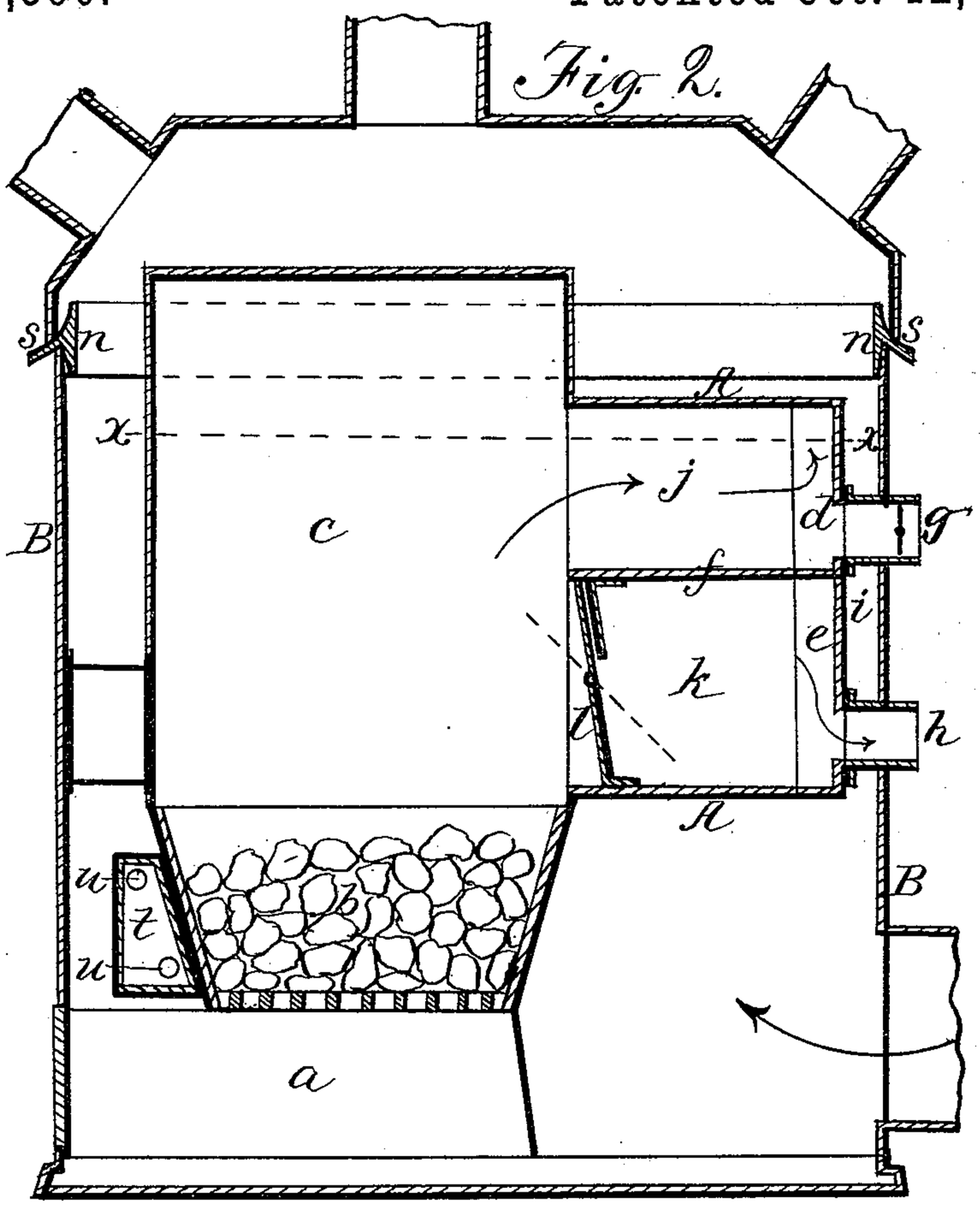
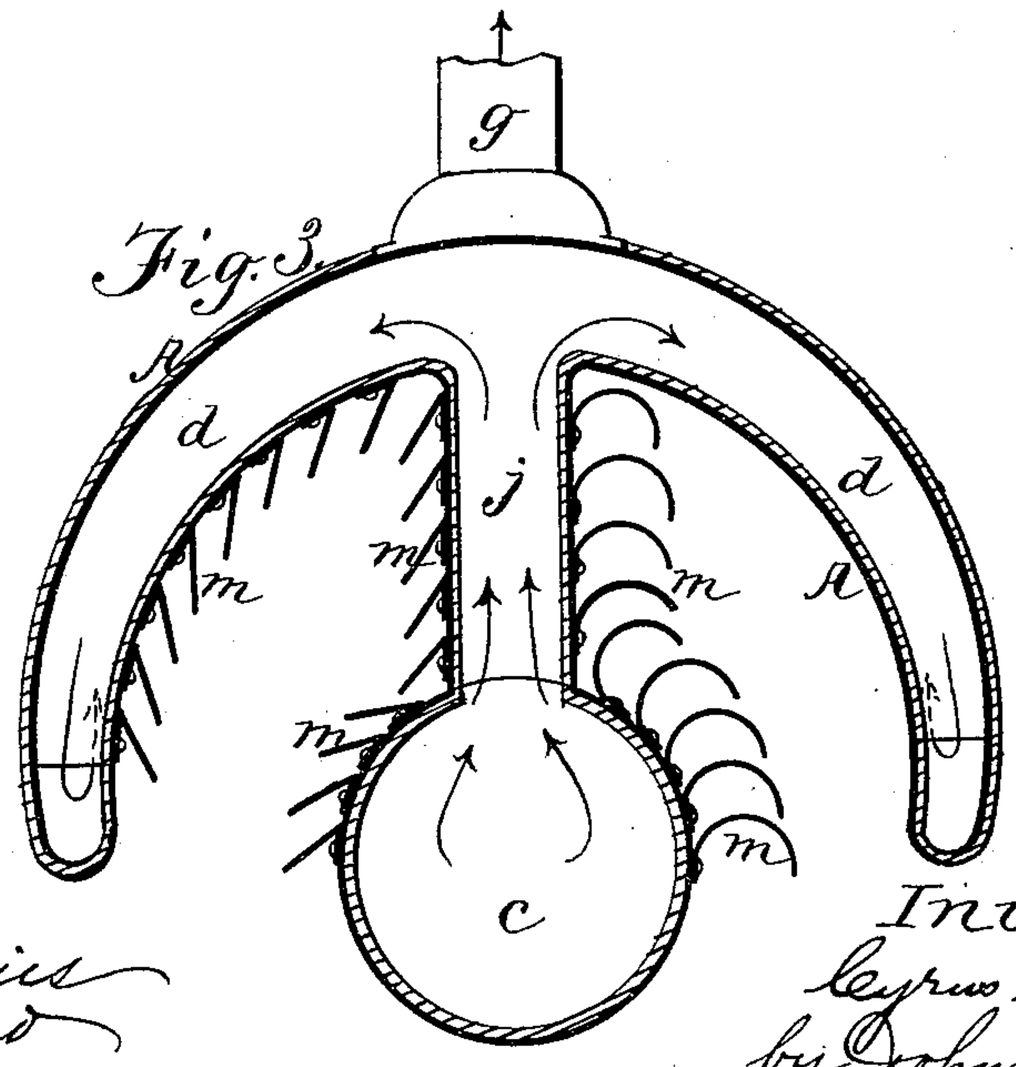


Fig. 3.



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Inventor:
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UNITED STATES PATENT OFFICE.

CYRUS S. HOOD, OF CORNING, NEW YORK.

HOT-AIR FURNACE.

SPECIFICATION forming part of Letters Patent No. 350,590, dated October 12, 1886.

Application filed February 17, 1886. Serial No. 192,229. (No model.)

To all whom it may concern:

Be it known that I, CYRUS S. HOOD, a citizen of the United States, residing at Corning, in the county of Steuben and State of New York, have invented new and useful Improvements in Hot-Air Furnaces, of which the following is a specification.

My invention relates to improvements in hot-air furnaces for heating dwellings, in which the products of combustion are conveyed through a supplemental radiator placed on the exterior of the combustion-chamber.

My improvements embrace particulars of construction and of combinations in the supplemental exterior radiator, whereby the capacity of the furnace to heat the air is greatly increased, as I will now describe in connection with the drawings, in which—

Figure 1 represents in perspective the furnace proper, showing the inclosing-case in section; Fig. 2, a vertical section of the same; Fig. 3, a horizontal section taken through the line *x x* of Fig. 2; and Fig. 4, a top view of the furnace, showing the inclosing-case in section.

The furnace structure, including the ash-pit *a*, fire-pot *b*, and combustion-chamber *c*, may be made in any suitable manner. The supplemental radiator A, I prefer to make of a segmental flue-forming case placed around the rear portion of the combustion-dome *c*, which forms the combustion-chamber, and between it and the furnace-case B. I prefer to arrange the combustion-dome *c* and the supplemental radiator eccentric to each other, and both eccentric to the inclosing-case, to allow the radiator to be placed as far as possible from the combustion-dome to give the widest air-heating space between them within the inclosing-case.

The supplemental radiator is divided horizontally into two flues, *d* and *e*, by a partition, *f*, so as to form an upper flue, *d*, having a direct draft, and a lower flue, *e*, having an indirect draft, both communicating by separate pipes *g* and *h* with the chimney-flue. The supplemental radiator is connected with and opens direct into the combustion-dome by a cross-flue, *i*, which extends from the back of the combustion-dome to the inner wall of said radiator at a point midway between its ends. The dividing flue-plate *f* extends into and also divides the cross-flue *i* into an upper flue, *j*, which opens into the direct-draft pipe *g*, and a lower flue, *k*, which opens into the indirect-draft pipe *h*. By this construction the products of combustion pass out of the dome into the top rear cross-flue, into the radiator at the middle of its length, and out at the direct draft *g*, if the damper therein be open; or if said damper be closed, then the products of combustion pass around to both ends of the radiator and descend at the ends of the partition *f* into the lower flue, *e*, as in Fig. 3, and out at the indirect-draft pipe *h*, which has no damper.

The supplemental radiator gives the best draft when made in the form of a crescent, so as to give a larger flue-space at its junction with the cross-flue, and the latter for this purpose may also be flaring to such junction. The supplemental radiator by this construction has three points of support—by the cross-flue at the rear side of the combustion-chamber and by the direct and indirect pipe-connections with the inclosing-case. The lower cross-flue, *k*, as stated, is in direct communication with the non-dampered indirect-draft pipe *h*, and I provide for the direct communication of this cross-flue with the combustion-dome by a damper, *l*, hung at the junction of said flue with the said dome, so as to close by its gravity, and to be opened by the pressure of the gas within the combustion-chamber, when such pressure is great enough, and thereby relieve the combustion-dome of undue pressure of the gases. This damper is pivoted at one side of its center, so that it will remain closed except when turned by an overcharge of gas in the combustion-chamber, closing again as soon as the pressure is relieved; but such damper has no draft-regulating function, and need not be accessible from the outside. The eccentric relation of the combustion-dome and its communicating supplemental radiator, while giving the advantage of increased air-heating space, gives also the advantage of arranging between these heating-bodies a series of vertical separate open heaters, *m*, preferably attached to the outer wall of the combustion-dome, on each side of the cross-flue, for the purpose of increasing the radiating-surface of the combustion-dome. These separate heaters are

formed of wings or fins curved or bent so as to lap each other and form partial space-closures to receive and hold the radiated heat from the combustion-dome, particularly in the space between the latter and the supplemental radiator. These partial space-closures may stand out in curved or oblique relation to and from the wall of the combustion-dome, and being made of sheet-iron they become as highly heated as the dome, and the cold air rising from the bottom of the furnace within the inclosing-case passes up between and within the spaces formed by the wings or fins in contact with them and with the dome-walls, and has its heat thereby greatly increased. The walls of the supplemental radiator and its cross-flue may also be provided with these wing-heaters, so as to increase the air-heating surface within the inclosing-case. I prefer to arrange these wing heaters in vertical position, lapping each other to form the partial space-closures to form a series of open heaters heated by radiation direct from the combustion-dome or from its supplemental radiator, or from both combined. These open separate heating-wings may be of equal or unequal projection, to suit the form of the space within which they are arranged, and to obtain the greatest area of heating-surface, and they may be made of tubular form, so that they will each form tubes attached to the walls or otherwise supported in contact with the heating-walls.

My improved radiator is adapted for use with furnaces, heating-drums, and stoves, and is designed to utilize the heat of any given quantity of fuel. The furnace and supplemental radiator are inclosed by a case, which also incloses the fire-pot and ash-pit, and confines and supplies the air to be heated to the pipes leading to the rooms to be warmed. The cold air is supplied at the bottom of the inclosing-case in any suitable manner, and the warming-pipes connect with the top of the case to conduct the hot air into the rooms.

For convenience of construction, the inclosing-case is made in top and bottom sections, which are usually joined by horizontal bolted flanges, which is not only expensive, but does not make the joint dust-tight. The exclusion of dust from the air-heating space within the inclosing-case, and to allow the sections to be easily and quickly joined, and to be as easily and readily separated, is very important. To effect these advantages I make the joining of the case-sections by a beveled ring, *n*, placed to form a narrow section of the case, preferably against the inner case-walls, lapping the joint on the inner side, and having on its outer side a beveled or inclined seat, *s*, which stands downward and rests upon the top edge of the lower section, and upon which the edge of the upper section rests in a manner to form a close joint, rendered self-closing by the beveled or inclined form of the ring-joint. This ring-joining requires no flanges and no bolting, and if one of the case-sections should be larger than the other their tight seating must be effective, and the case-sections will be held together in horizontal relation as firmly as if bolted, making a perfectly dust-tight joint.

Provision is made for hot-water heating by a water-front, *t*, placed on the fire-pot above the ash-pan, either cast with the fire-pot or made separate from it, and having suitable pipe-connections at *u*, as shown in Fig. 1, for the heating-water, so that the furnace can heat rooms by hot water and by hot air separately or together.

Referring to the heating-wings in the hot-air space, it is important that the air to be heated should pass through said space in the largest volume in unobstructed flow to meet the requirements of heating rooms by pipe-connections with said air-heating space, and it is for this purpose that I prefer to place the wings in vertical position lapping each other, so as not to retard the upward flow of the air to be heated. To further promote this object I place the fire-pot and the radiator eccentric to each other, so as to give the largest possible space for the arrangement of the heating-wings in vertical groups lapping each other upon the walls of the combustion-dome, the radiator, and its cross-flue within the space formed by the eccentric relation of these parts, so that this space will be quite filled with wings which form partial closures, offering little hinderance to the free flow of the cold air upward between them into the top of said space, while giving out to the air the heat from the three connected parts containing the greatest heat—the dome, the radiator, and the cross-flue.

Referring to the case-joint-forming ring, it has a beveled or curved surface and a V-shaped groove, so that while one of its sides forms a seat for one of the case-sections the wedge-groove forms a seat for the other case-section, and the effect of both these seatings will be to make the joints tight under all conditions of expansion of the case-sections, or of the ring, for as the upper case-section will rest upon a sloping surface its tendency will be to constantly tighten the joint upon said surface, while the joint of the lower section will in like manner constantly tend to a closer joining upon the wedge-walls of or in the apex of the wedge-groove.

I claim—

1. In combination, in an air-heating furnace, the inclosing-case, the fire-pot, and combustion-dome, the latter being arranged eccentrically to said case, and the radiator arranged eccentric to said fire-pot, the wings arranged in groups in vertical relation, lapping each other upon the wall of the combustion-dome within the space formed by the eccentric relation of said radiator and combustion-dome, whereby to obtain partial wall-heating closures with an unobstructed cold-air draft, as shown and described.

2. In combination, in an air-heating furnace, the combustion-chamber dome, the supple-

mental radiator and its connecting cross-flues, the walls of the dome, the radiator, and their connecting cross-flue, supplemented by vertically-arranged plates lapping each other, as shown, and for the purpose specified.

3. The combination of the furnace-inclosing case, the fire-pot, and the combustion-dome with a radiator partially surrounding the latter, increasing in area from its ends to its middle, and having a cross draft-flue, *j*, flaring to its connection with said radiator, substantially as described, for the purpose specified.

4. The combination of the furnace-inclosing case, the fire-pot, and the combustion-dome with the radiator A, having the flues *d e j k*, arranged as shown, the latter flue, *k*, having a self-acting pivoted weighted damper, *l*, as shown, and for the purpose described.

5. The combination of the furnace-inclosing case, the fire-pot, and the combustion-dome *c* with the radiator having the direct top draft-flue, *j*, the lower cross-flue, *k*, and the crescent flues *d e*, having separate exit-pipes *g h*, the said lower cross-flue, *k*, having the self-closing damper *l*, and the top exit pipe, *g*, having a damper whereby to direct the draft into the lower crescent flue, *e*, substantially as described.

6. The combination, with a radiator divided into an upper and a lower flue provided with a direct and an indirect draft, and a combustion-dome opening into said divided flues, of a pivoted damper arranged within the lower flue at its opening into the combustion-dome, automatically closed by its weight, substantially as described, for the purpose specified.

7. In combination with a heating-furnace, the supplemental radiator, of semicircular form, divided into an upper and a lower chamber having a cross-flue, a direct and an indirect draft, and having a greater area at the middle draft-connections than at its ends, substantially as described, for the purpose specified.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

CYRUS S. HOOD.

Witnesses:
I. A. STARN,
ED. HOOD.