(No Model.) 2 Sheets—Sheet 1.

F. E. ADAM.

HOT AIR FURNACE.

No. 371,020. Patented Oct. 4, 1887.

Fig. 1.

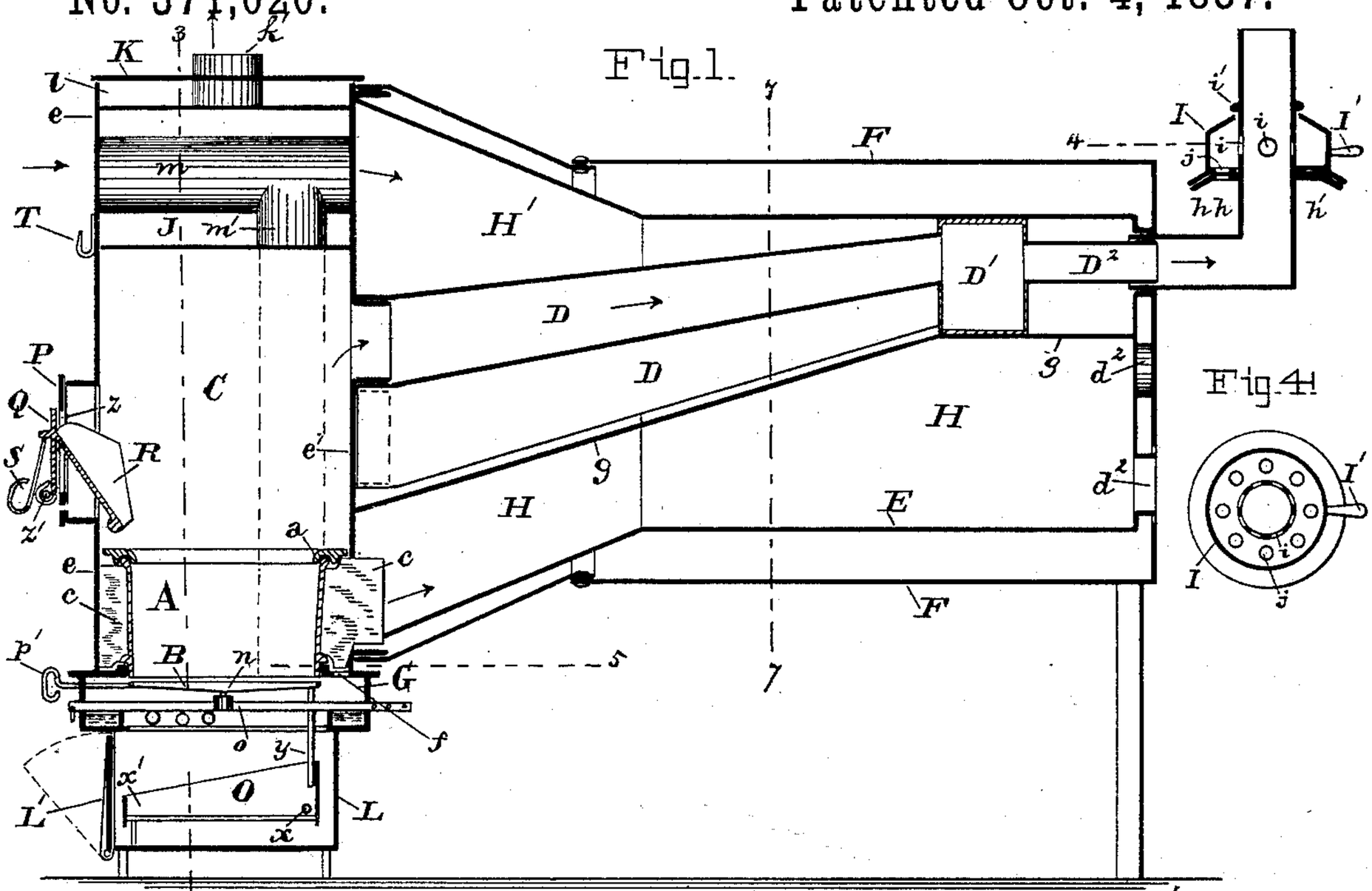


Fig. 4.

Fig. 2.

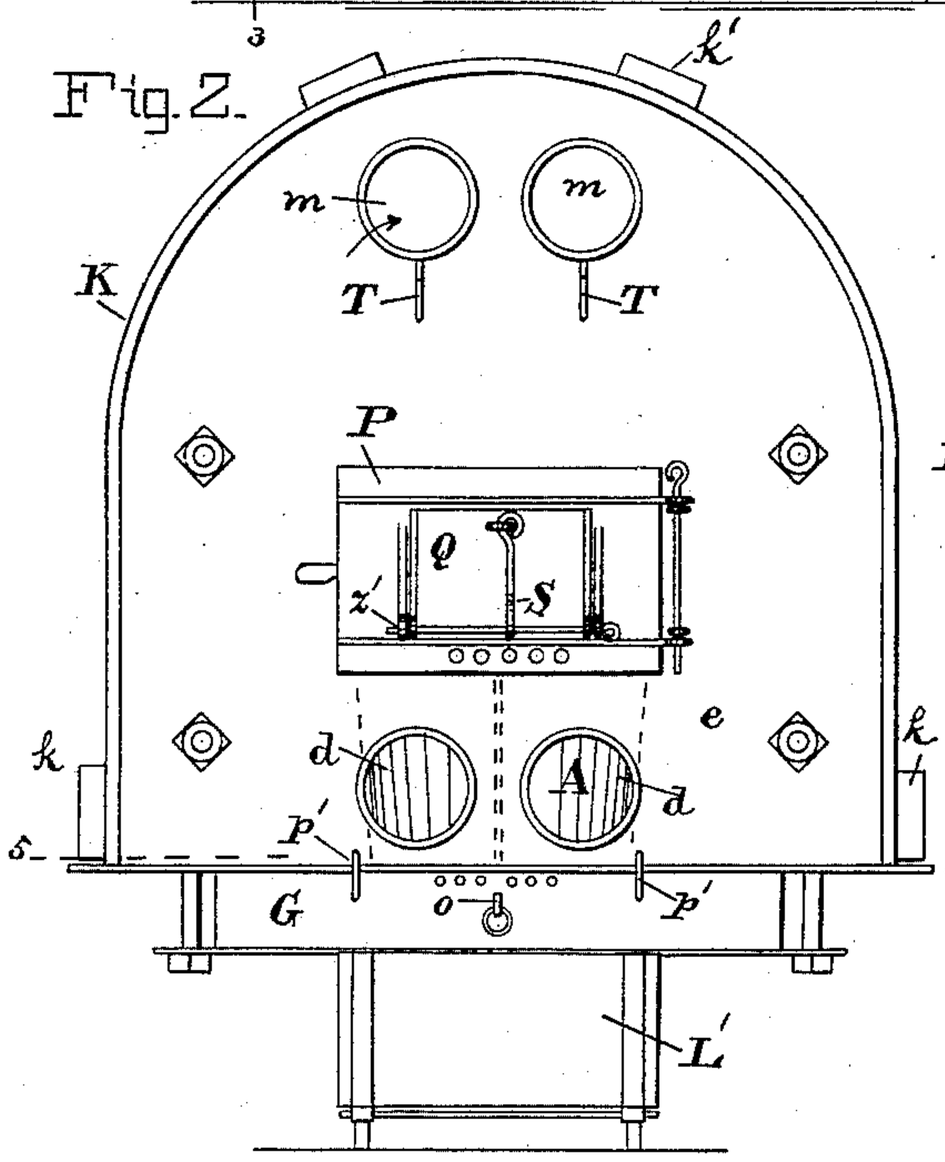
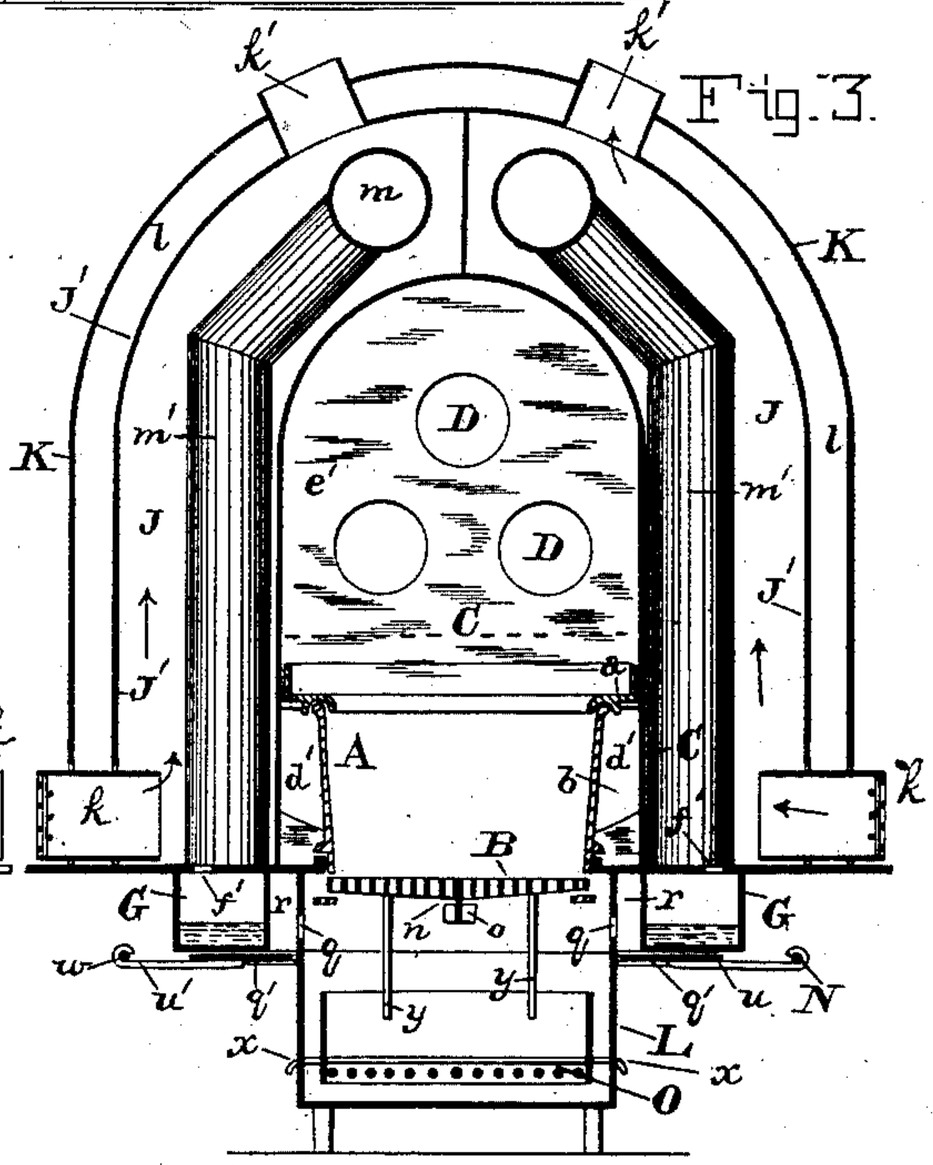


Fig. 3.



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(No Model.) 2 Sheets—Sheet 2.

F. E. ADAM.

HOT AIR FURNACE.

No. 371,020. Patented Oct. 4, 1887.

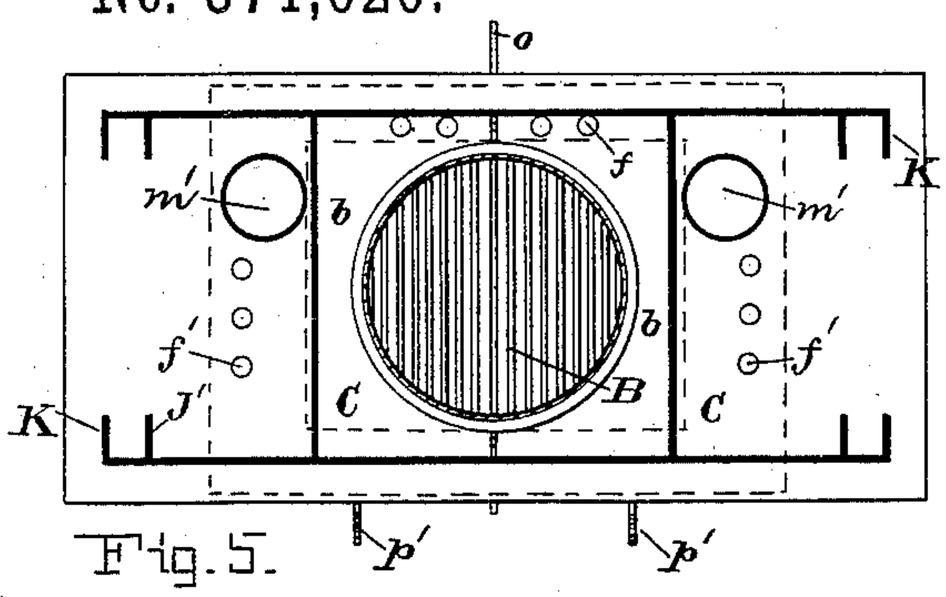


Fig. 5.

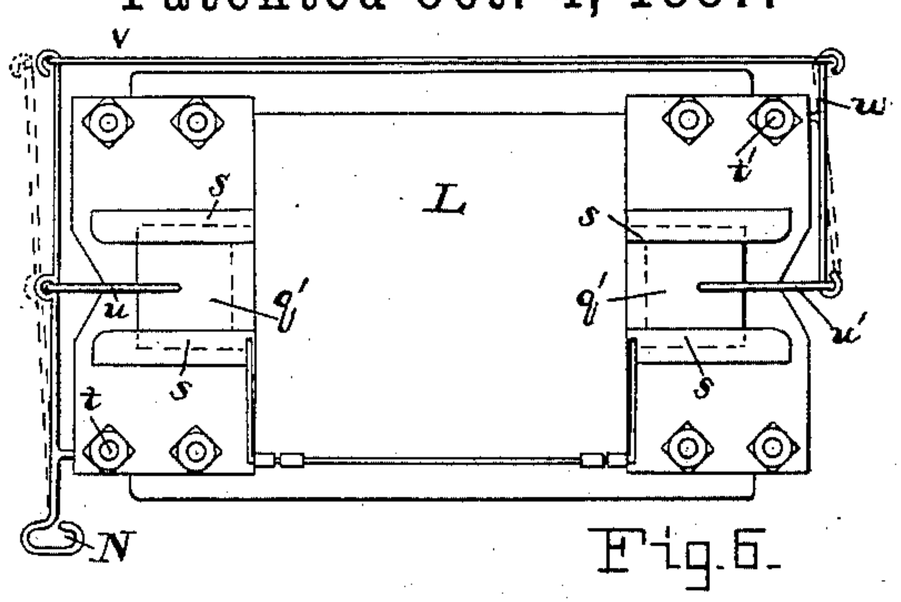
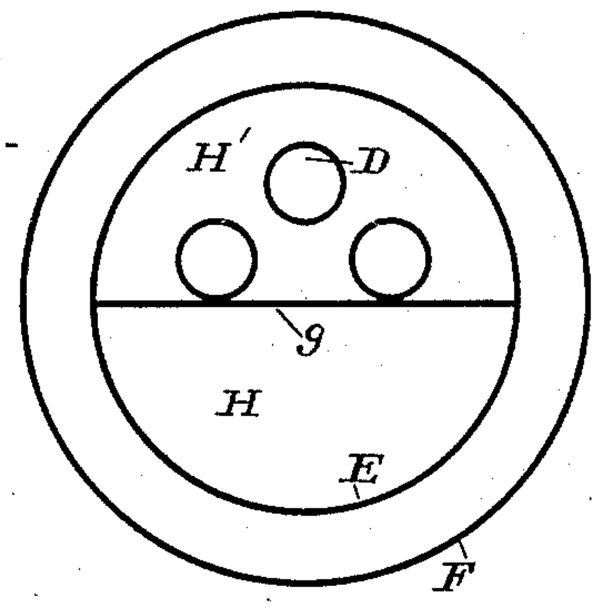


Fig. 6.

Fig. 7.



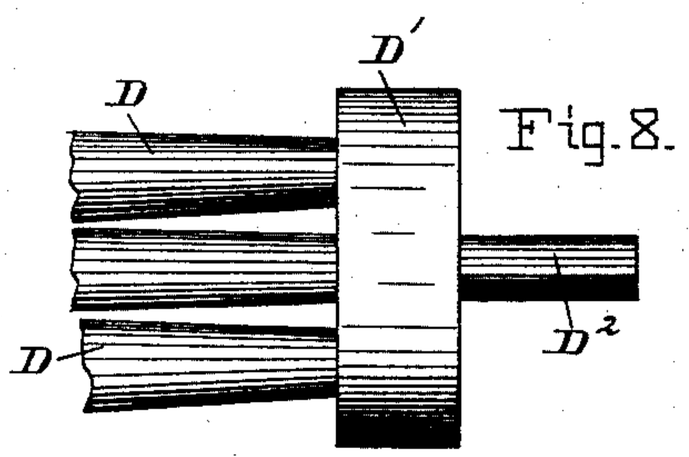


Fig. 8.

Fig. 9.

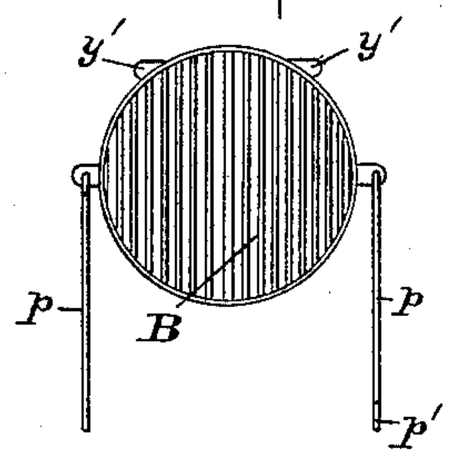


Fig. 10.

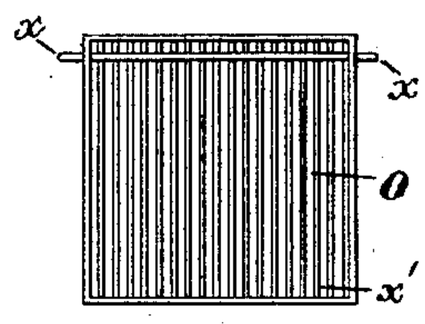


Fig. 11.

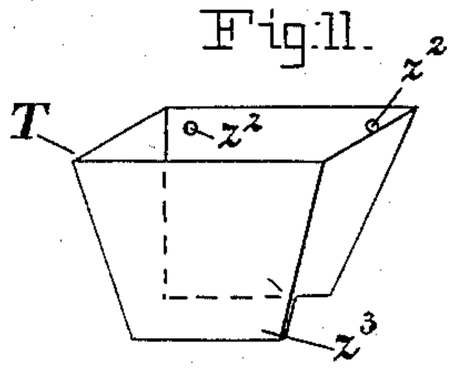


Fig. 12.

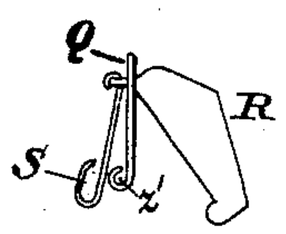


Fig. 14.

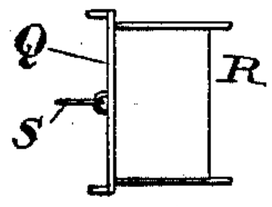
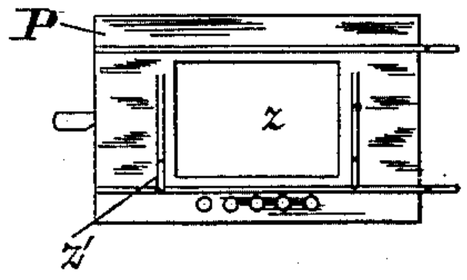


Fig. 13.



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UNITED STATES PATENT OFFICE.

FREDERICK E. ADAM, OF BALTIMORE, MARYLAND.

HOT-AIR FURNACE.

SPECIFICATION forming part of Letters Patent No. 371,020, dated October 4, 1887.

Application filed March 21, 1887. Serial No. 231,653. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK E. ADAM, a citizen of the United States, residing at Baltimore, in the State of Maryland, have invented certain new and useful Improvements in Hot-Air Furnaces, of which the following is a specification.

My invention relates to certain improvements in furnaces for producing hot air for heating houses.

The invention is fully illustrated in the accompanying drawings, in which—

Figure 1 is a vertical longitudinal section of the furnace. Fig. 2 is a front elevation. Fig. 3 is a vertical section through the front part on the line 3 3. Fig. 4 is a horizontal section of the draft-regulator on line 4 4. Fig. 5 is a plan of the base of the furnace, taken on the horizontal line 5 5. Fig. 6 is a bottom view or an inverted plan of the base. Fig. 7 is a vertical cross section of the hot-air chambers and smoke-flues on the line 7. Fig. 8 is a top view, detail, of the smoke-flues. Fig. 9 is a view of the shaking-grate. Fig. 10 is a plan of the shaking ash-screen. Fig. 11 is a view of the detachable coke-hopper. Figs. 12, 13, and 14 are views of the fuel-feed door.

The letter A designates the fire-cylinder; B, the grate; C, the combustion-chamber; D, smoke-flues; E, cylindric hot-air casing surrounding the smoke-flues, and F an exterior jacket inclosing the whole to prevent radiation of heat. I provide the base of the furnace with a water-chamber, G, which in vertical cross-section is a square box, as seen in Fig. 3. The horizontal plan of this water-box is rectangular, like a hollow square, which shape is indicated by broken lines in Fig. 5. The open center of the hollow square water-box is occupied by the grate B. Thus the heat will evaporate the water in the box G. A suitable plate, *a*, surrounds the top of the fire-cylinder A and fits within the walls C of the combustion-chamber and makes a tight joint with said walls, thereby preventing smoke or gases from passing below said plate. An air-heating space, *b*, is thus formed around the fire-cylinder A and between it and the walls C. This air-heating space is centrally divided on a line from front to rear by a partition, *c*, at diametrically-opposite sides of the cylinder. Two lower air-inlets, *d*, are in the front wall, *e*, one inlet being at each side of the said partition, so that cold air entering one of these inlets will pass around one side of the fire-cylinder to the rear, and thence through the opening *d'* into the rear lower hot-air chamber, H, and cold air entering the other inlet will in like manner pass around the other side of the cylinder. It will thus be seen that air entering the lower front inlets, *d*, is heated in the space *b* around the fire-cylinder, and as said air passes from the heating-space *b* it imbibes moisture emanating from the water-chamber G through the rear holes, *f*.

The rear cylindric casing, E, has a horizontal partition, *g*, extending from end to end, which forms two hot-air chambers, H and H', one below and the other above said partition. Outlets d^2 at the rear end of this lower chamber are for the attachment of ordinary pipes to convey the hot air to any desired part of the building. From the rear wall, *e'*, of the combustion-chamber and above the horizontal partition *g* three smoke-flues, D, lead. These flues have an upward inclination, and all enter a smoke-box, D', from which a single pipe, D^2, leads. This smoke-pipe has, in lieu of a damper, a draft-regulator, I. This device consists of a horizontal plate, *h*, secured entirely around the outside of the pipe, and provided with holes *h'*. The smoke-pipe at a point above the plate has holes *i* and a collar, *i'*. The annular-shaped box I surrounds the smoke-pipe between the horizontal plate *h* and collar *i'*, and incloses that part of the pipe where the holes *i* are. The bottom of this annular box is provided with holes *j*, spaced apart like the holes *h'* in the plate. The annular box has a handle, I', and may be turned freely about the smoke-pipe. It will be seen, by turning the box I, the holes *j* in its bottom may be brought to a position coincident with the holes *h'* in the horizontal plate, and thus form an inlet by way of the holes *h'*, *j*, and *i* for air to enter the smoke-pipe. When an air-draft is thus established, obviously the smoke-draft will be correspondingly checked, but the smoke-pipe inside will be unobstructed, thereby affording an outlet for gases, instead of stopping their escape, as an ordinary damper would.

An air-heating chamber, J, is formed in the vertical sides and top of the combustion-chamber C by a wall, J'. An exterior jacket, K, in-

closes this air-heating chamber J and prevents radiation of heat. Cold air is supplied to this chamber J by the side grated inlets, *k*, which conduct the cold air in and prevent it entering the dead-air space *l*. Outlets *k'* at the top are for the attachment of ordinary pipes to convey the hot air away. The air heated in the chamber J has moisture imparted to it through the side holes, *f'*.

The rear upper hot-air chamber, H', incloses the three smoke-flues D. Fresh air is supplied to this chamber through two upper air-inlet pipes, *m*, which pass from the front wall, *e*, horizontally through the top of air-heating chamber J. Two upright pipes, *m'*, have their lower ends communicating with the water-chamber G, and each pipe passes up a different side of the air-heating chamber J, and its upper end connects with one of the said upper air-inlet pipes, *m*. Thus moisture is supplied to the air which passes through the said inlet-pipes *m*. It will be seen that three sets of air-inlets have been described—to wit, the two lower front air-inlets, *d*, the side grated inlets *k*, and the upper front air-inlet pipes, *m*. The air supplied by all of these inlets is both heated and moistened, and when it is delivered into the room or apartment it produces a pleasant and agreeable atmosphere.

The grate B has a central pivot, *n*, which bears on a bar, *o*, extending across the base of the furnace. Two shake-rods, *p*, are jointed to the grate, one being at a side diametrically opposite the other. These rods project through the front part of the base, and each rod has at its end a loop or hand-grasp, *p'*. To shake the grate B, a person will grasp by each of his hands a different loop *p'*, and then push and pull on both rods.

The air-drafts for the fire, to promote combustion, are shown in Figs. 1, 3, and 6. The two side walls of the ash-chamber L have air-draft holes *q*, and the two slide-plates *q'*—one at each side of the ash-chamber—serve to close a passage, *r*, leading to said holes. I provide a lever, N, which operates both slide-plates *q'*. The slide-plates (see Fig. 6) move in guides *s*. The lever N is pivoted at *t* at one side of the furnace-base, and a rod, *u*, connects it with one slide-plate *q'*. To one end of the said lever is attached a rod, *v*, which connects with a lever, *w*, pivoted at *t'*, and having a rod, *u'*, connected with the other slide-plate *q'*. It will be seen that by shifting the end of lever N the two slide-plates will be moved alike, either to open or close the passage *r* to the air-draft holes.

A tilting ash-screen, O, is sustained in the ash-chamber L by pivots *x*, located near the back of the screen, whereby the said screen O may be tilted or oscillated up and down in a vertical plane. This oscillating ash-screen is set in motion by two downward-pointing rods or studs, *y*, which are rigidly attached to bosses *y'* on the grate B. Figs. 1 and 3 show the downward-pointing studs *y* in contact with the rear wall of the said ash-screen O. It will now be understood that upon turning the pivoted grate B back and forth, first one and then the other of the said studs will press against the rear wall of the screen. When pressure is applied to the rear wall, the latter is forced back, and the screen tilts on its pivots *x*, thereby elevating the front part, *x'*, of the screen. The moment pressure is released from the back wall, the front part, *x'*, will fall or drop by its own gravity. This operation of the front part, *x'*, of the screen being first elevated and then dropping, is repeated in quick succession whenever the grate B is turned back and forth. The front of the ash-chamber is closed by a door, L'.

A feed-door, P, is in the front wall of the furnace. This door has hinges at one end and turns in a horizontal plane. (See Figs. 1, 2, 12, 13, and 14.) The door has a central opening, *z*, which is closed by a supplemental door, Q, hinged by its lower edge, *z'*, to the feed-door, whereby it turns in a vertical plane. This supplemental door carries on its inner side an inclined chute, R, and on its outer side has a hook, S, for the attachment of a suitable counterpoise-weight. (Not shown.) Without a counterpoise-weight the gravity of the chute R, projecting from the inner side of this supplemental door, is sufficient to keep said door closed.

This device is conveniently operated as follows: When it is desired to supply the furnace with fuel, a suitable weight should be suspended from the outer hook, S, to tilt back the supplemental door Q on its hinge *z'* and to tilt up the lower edge of the chute R. The coal or other fuel is then passed through the door-opening *z* into the furnace, and when the fire-cylinder is full said fuel may be banked up on the chute and the counterpoise-weight taken from the outer hook, S, whereupon the supplemental door Q will close.

For supplying the furnace with coke-fuel I have provided a detachable hopper, T, (see Fig. 11,) which may be hung against the front wall, *e*. To this end two hooks, T', are fixed to the front wall above the furnace-door P, and the coke-hopper T tapers from the open top downward, and one side has near the top two holes, z^2, which take on the said hooks T'. The front side has at its lower edge a depending flange, z^3.

The operation of the coke-hopper is as follows: The furnace may first be properly filled with coke and then the hopper suspended on the hooks. The lower depending flange, z^3, at the front side of the hopper, will have position in front of the upper edge of the supplemental door Q. Said door may then be tilted back (opened) until its upper edge comes in contact with the depending flange z^3, and held in that position while the hopper T is filled with coke. It will be seen that the coke will pass from the bottom of the hopper on to the chute R and will bank up thereon. As fast as the coke in the fire-cylinder A is consumed, that which is in the hopper and chute will feed downward, and as long as any coke remains in said hop-

per the supplemental door Q will remain open, (tilted back;) but when the coke-hopper becomes empty, then the supplemental door will close automatically.

Having described my invention, I claim and desire to secure by Letters Patent of the United States—

1. In a furnace, the combination of a fire-cylinder, A, inclosing-walls around said cylinder, forming an air-heating space, *b*, and said wall provided at the front with two air-inlets, *d*, a rear hot-air chamber, H, communicating with said air-heating space, and a partition, *c*, dividing the said air-heating space between the said two front air-inlets, as set forth.

2. In a furnace, the combination of a closed water-chamber, G, having an open center like a hollow square, and provided in its top and at the rear with holes *f*, and at the side with holes *f'*, for the emanation of moisture, and a fire-cylinder, A, having a grate, B, which occupies the open center of the water-chamber, inclosing-walls forming air-heating spaces and having lower front air-inlets, *d*, and side air-inlets, *k*, upper air-inlet pipes, *m*, and upright pipes *m'*, connecting the water-chamber and said upper air-inlet pipes.

3. In a furnace, the combination of a fire-cylinder, A, and a combustion-chamber, air-heating chambers, a rear casing, E, having a horizontal partition, *g*, forming two hot-air chambers, H H', one above and the other below, smoke-flues D, leading from the combustion-chamber through the said upper hot-air chamber, and a front wall having air-inlet pipes *m* to supply the upper hot-air chamber, and also provided with air-inlets *d* to supply the lower hot-air chamber, as set forth.

4. In a furnace, the combination of a fire-cylinder, walls C, surrounding the fire-cylinder and forming a vertical combustion-chamber, a horizontal cylindric casing, E, having one end at the rear of the combustion-chamber and forming a hot-air chamber, horizontal air-inlet pipes *m*, connecting with the said hot-air chamber, two or more smoke-flues leading from the combustion-chamber into the said hot-air chamber, and all entering a smoke-box, D', located in said hot-air chamber, and a pipe, D^2, leading from the smoke-box outward, as set forth.

5. In a furnace, the combination of a fire-cylinder, A, and a combustion-chamber, air-heating chambers, a rear casing, E, having a horizontal partition, *g*, forming a hot-air chamber, air-inlet pipes *m* to supply the said hot-air chamber, a water-chamber, G, in the base to evaporate water, and upright pipes *m'*, connecting the water-chamber with the said air-inlet pipes, for the purpose set forth.

6. In a hot-air furnace, the combination of a grate, B, centrally pivoted and provided with two downward-pointing studs, *y*, and an oscillating ash-screen, O, having a wall against which first one and then the other of said studs will press when the grate is turned back and forth, as set forth.

7. In a hot-air furnace, the combination of a feed-door, P, turning in a horizontal plane and having an opening, *z*, and a supplemental door, Q, hinged by its lower edge and turning in a vertical plane, and provided on its inner side with an inclined chute R, as set forth.

8. In a hot-air furnace, the combination of a coke-hopper, T, supported against the front wall of the furnace, and a door, Q, hinged by its lower edge and turning in a vertical plane, and provided on its inner side with an inclined chute, R, whereby as long as coke remains in the hopper the said door will remain open, but when the hopper becomes empty said door will close automatically.

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

FREDERICK E. ADAM.

Witnesses:
JOHN E. MORRIS,
CHAS. B. MANN.