J. P. HAYES.

Hot Air Furnace.

No. 20,640. Patented June 22, 1858.

Fig. 1.

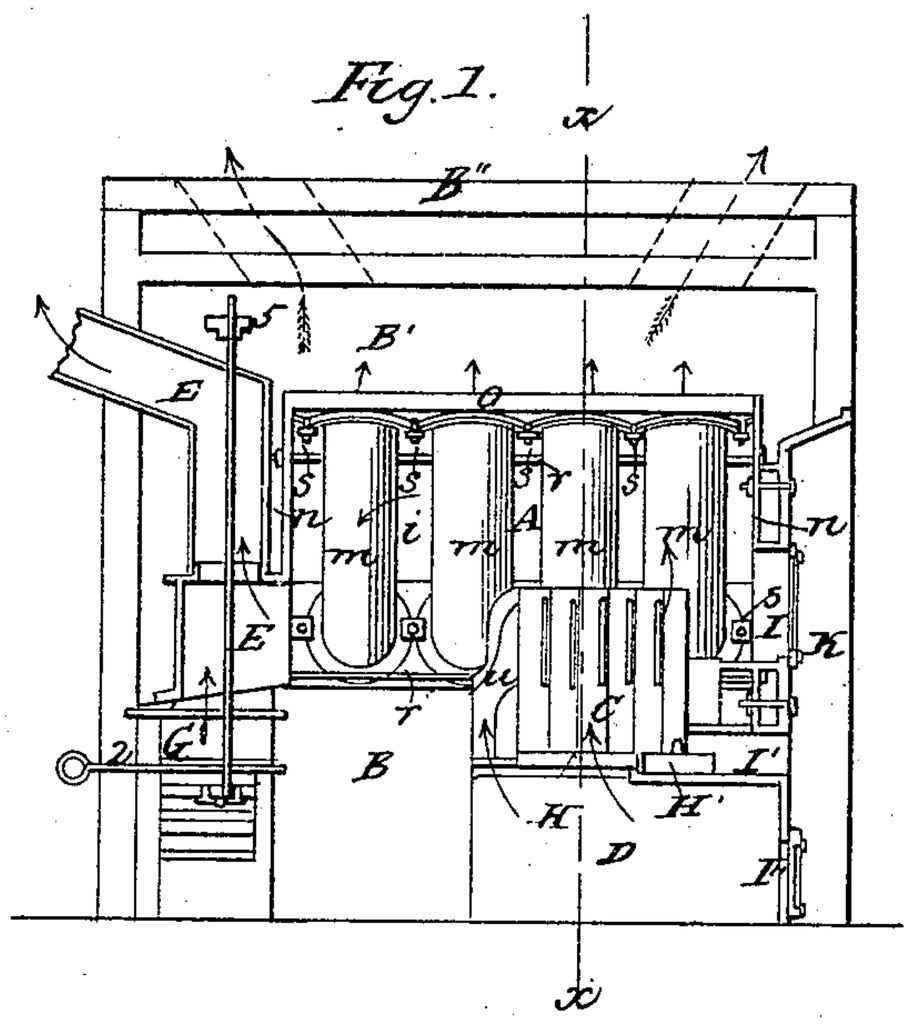
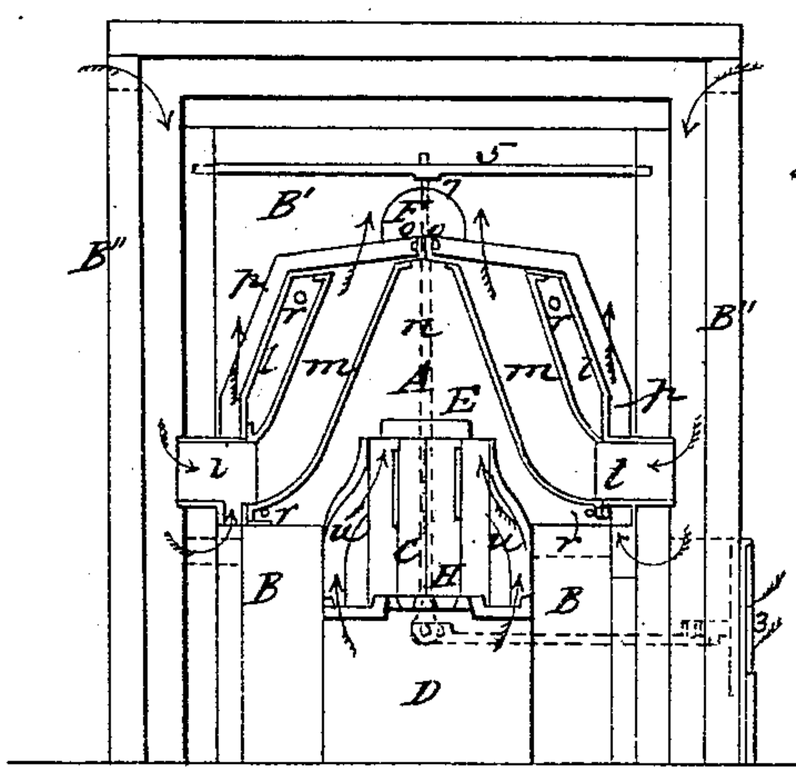


Fig. 2.



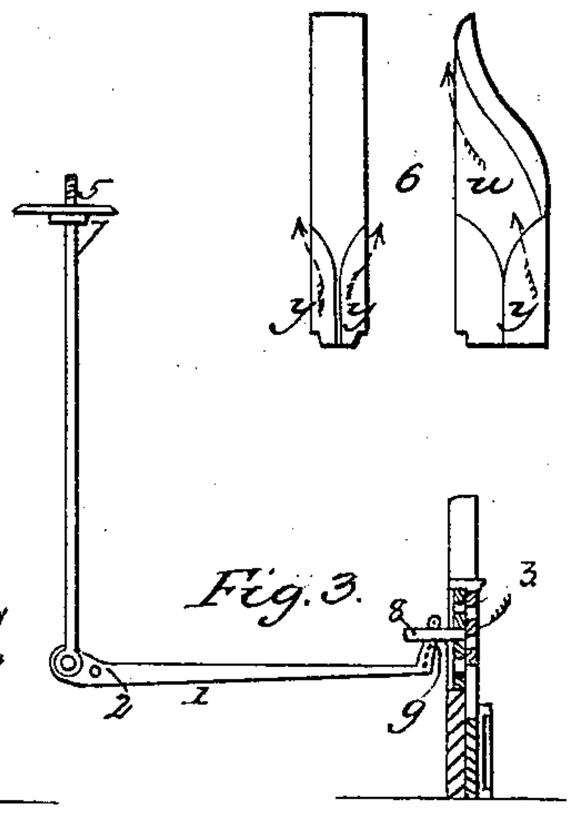


Fig. 3.

Fig. 5.

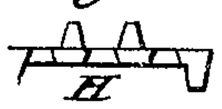
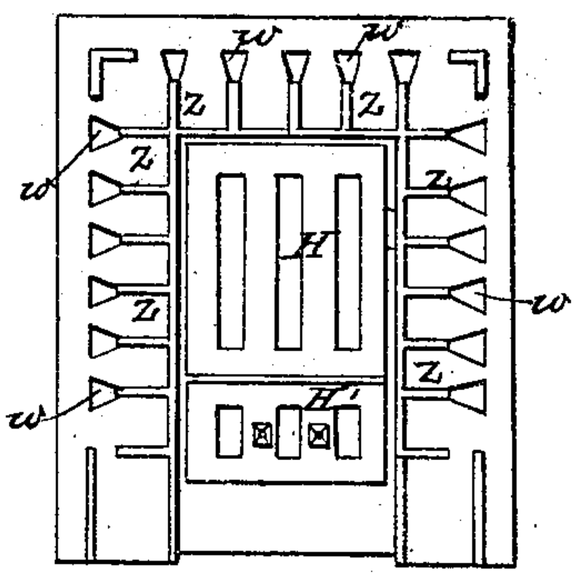


Fig. 4.



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UNITED STATES PATENT OFFICE.

JNO. P. HAYES, OF PHILADELPHIA, PENNSYLVANIA.

AIR-HEATING FURNACE.

Specification of Letters Patent No. 20,640, dated June 22, 1858.

To all whom it may concern:

Be it known that I, JOHN P. HAYES, of the city of Philadelphia, in the State of Pennsylvania, have invented a new and useful Improvement in Air-Heating Furnaces for Buildings; and I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the accompanying drawings, making a part of this specification, in which—

Figure 1, is a vertical longitudinal section through the middle of the furnace; Fig. 2, a vertical transverse section of the same, through the line *x*—*x*, of Fig. 1; Fig. 3, a separate side view of a horizontal lever in connection with a vertical temperature rod and a sliding valve, for automatically governing the draft; Fig. 4, an enlarged plan view of the foundation plate which supports the fire-tiles or linings and two horizontal grates; Fig. 5, a transverse section of the front grate of the same; and Fig. 6, enlarged side and outer edge views of the fire tiles; like letters in the different figures indicating the same parts.

My invention has for its objects the admission of air from the ash-pit, up through the fire-tiles or linings of the fire chamber, so that it shall become highly heated thereby and discharged in currents directly above the fuel, for the purpose of more effectually consuming or burning the gases arising from the fuel; and also for carrying up the light dust usually produced in raking the fire; in the mode of constructing the body of the furnace so as to better facilitate the separating, transporting, and putting together the same in the cellar; and also in the peculiar arrangement of hot-air flues with each of the two top-and-side plates of the said body of the furnace.

Referring to the drawings, A, is the body of the furnace made of cast iron and supported upon brick work, B, and also inclosed within a brick hot-air-chamber, B′, and outer walls, B″, in the usual manner; C, is the fire chamber; D, the ash pit; E, the outlet flue to the escape pipe, F; G, the draft regulating space; H and H′, the fire grates; and I, I′, and I″, the fuel and ash-pit openings through the front plate, K.

The body of the furnace, (A), consists of two top-and-side pieces or plates, *l* and *l′*, with air pipes *m*—*m*, attached to each; and two end pieces *n*—*n*. The two plates (*l* and *l′*) are adapted for being cast off of the same pattern—being exactly alike; and are each made with a flange, *o*, along their upper-side edge so that when fixed together thereat (as seen in Fig. 2) by means of nutted bolts through the said flanges, a cross section of the same will resemble an arch, in form, as seen in the figure. Each end of the plates (*l* and *l′*) have also a flange, *p*, formed at a right angle with the plane of the plate, and adapted to fit flatly against the end plates, *n*—*n*, which are held firmly thereto (the usual packing cement being between the two) by means of the four, long, nutted bolts, *r*—*r*, which pass through holes made in the said end plates for the purpose, and longitudinally along through the interior of the body, (A), of the furnace, as represented in Figs. 1 and 2. The plates *n*—*n*, may, if preferred, be as securely held to the top and side plates (*l* and *l′*), by means of short, nutted bolts through the flanges (*p*—*p*) and the said end-plates, instead of the long bolts *r*—*r*. The said plates (*l* and *l′*), are each cast also with a longitudinal row of large holes along near both their upper and lower edges so that, when the hot-air pipes (*m*—*m*), are fixed thereto (as will hereinafter be described) there shall be produced a row of hot-air flues (*m*—*m*) reaching, separately from each other, from the one row of holes to the other, of each plate (*l*—*l′*) as seen in Figs. 1 and 2. The air pipes (*m*—*m*) are flanged at each end, and held in close connection with their respective plates (*l* or *l′*) by means of a bolt and nut, *s*—*s*, on two opposite sides of each end flange, so as to clamp the flanges to the said plates and allow a sufficient sliding motion of the lower ends of the said pipes upon the plates, to prevent their breaking the latter as the former become elongated, or varied by changes in the temperature of the furnace. This mode of forming each of the two sides of the body of the furnace, and fixing thereto their respective row of hot-air flues (*m*—*m*) as described, enables me to transport, put up, or take down the same without separating the said flues from their respective plates, and therefore to preserve that accuracy and perfection in their fittings which can always be best and most economically produced in the factory. A continuation of the lower ends of these flues (*m*—*m*) is made through the side walls of the hot-air chamber, by inserting short sections of

sheet-iron pipe, *t—t*. The outlet flue (E) is attached to the back-end plate, and supports the escape pipe (F), and its bottom opens into the space, G.

The fire lining is made in vertical sections shaped as shown in Fig. 6,—a shallow depression, *u—u*, being made diagonally across on one side of each so as to form an air passage from the outer side of the lower end, to the inner side of the upper end, between each two sections when placed together side by side, as shown in the drawings, the said air passages being quite narrow (say one eighth of an inch) at their place of opening into the fire chamber, and gradually enlarged from thence to the lower ends so as to allow any dirt that may pass into them from the fire-chamber, to fall freely down into the ash-pit; the plate, Fig. 4, which supports the linings and grates, being perforated with triangular holes, *w—w*, and the tiles also formed at their outer lower sides with the corresponding depressions, *y—y*, for the purpose. The two sides and back of the fire chamber are formed by ranging those tiles together side by side, between the ribs, *z—z*, on the perforated plate, and supporting them against the brick work in a vertical position, as seen in the drawing. The front tile, *q*, is in one piece, supported so as to leave an opening beneath it for raking the fire and operating the sliding grates (H, and H′); and the fire-chamber (C) being rectangular, in this case, the said front piece (*q*) is made without the depressions or flues (*u* and *y*) of the others; but the fire-chamber may be made circular, if so required—in which case the vertical sections of the lining should be beveled at their edges so as to fit together around in the circle, with the air flues (*u—y*) between.

The grates are made to slide back and forth, on the plate which supports them, so that a space or opening can be formed both behind and between them (the grates), by drawing them partially forward, as occasion may require for removing large stones, slate or cinders, without letting fall the whole mass of burning fuel.

The apparatus for automatically regulating the draft consists of a lever, 1, which has its fulcrum pin, 2, fixed in the brick work, or otherwise independently of the heater; and so as to connect the sliding valve, 3, with the lower end of the temperature rod, 4, which is supported vertically through the outlet flue and escape pipe by means of the fixed bars, 5 and 6; and is adjusted by means of the screw nut, 7,—the slide of the valve, 3, resting upon the one end of the lever (1) by means of the projections, 8, thereon, and the cross pin, 9, in the end of the lever, as seen in the drawings.

Operation: The fire is made in the fire chamber so that the fuel may not reach higher than the lower ends of the air vents, and consequently, air passes up freely from the ash chamber through these vents in the direction of the arrows marked thereon, becomes highly heated therein on its passage, and supports the combustion of the gases which arise from the fuel, and which, with the incandescent fuel, warms up the body of the furnace (A) and its air pipes (*m—m*), on their way to the outlet flue (E) and escape pipe (F), in the direction of the arrows marked thereon. The temperature rod (4) becomes elongated, when the heat is too great, sufficiently to act upon the lever (1) to cause it to lift the slide, and thus to admit the cold air through the space (G) to the flue (E) and pipe (F), and so to diminish the draft; and consequently the rod, lever and valve can be so adjusted together as to regulate the draft automatically, to any required degree. When the fire needs "raking," a poker is introduced through the grate opening (I″) for the purpose, and also in like manner, for the purpose of separating, or otherwise producing a sufficient opening between and at the rear of the grates (H, and H′,), to let down the cinders, slate or stones that may at any time be found in the fire; while any light ashes which may have been agitated into dust by the operation, will pass up through the air flues (*u—u*) in the tiles. The cold air admitted through the usual openings in the external walls (B″), passes downwardly in the spaces on each side, between them and the hot-air-chamber walls (B′), becoming partially heated thereby, and thence passes through the heating pipes (*m—m*), and on each side of the exterior of the body of the furnace (A) into the hot-air chamber (B′), from whence, sufficiently heated, it is conducted by pipes of any suitable kind to the various parts of the building, in the usual manner.

The advantages of constructing a furnace in the manner and form described, are so obvious as not to require any further remarks than, that the mode specified of constructing the body (A) of the heater, enables me to make any size of heater, by simply shortening, or lengthening the one pattern of the plates (*l* or *l′*) so as to adapt it for a greater or lesser number of the hot-air flues (*m—m*), by dividing the pattern directly across, between its flue-hole core-points, into several parts, and doweling them together, adjustably, so that one or more of the parts intermediate between the two end ones, may be separated and removed from, or added to the pattern, as the said plates of a smaller or larger furnace may require to be cast—thus avoiding, by a simple adjustment of the one pattern, the expense of having a full pattern made for each of the several sizes of heaters that may be required.

Having thus fully described the construction and operation of my invention, I proceed to state that what I claim as may invention and desire to secure by Letters Patent, is embraced in the following divisions, viz;

1. I claim admitting hot-air to the upper surface of the fire for the combustion of the gases arising therefrom, by making the fire tiles or lining of the fire chamber, in numerous vertical sections with the depressions (*u*—*y*) in the adjoining sides of the same, so that when the said sections are placed together side by side in the fire chamber, air spaces or flues (*u*—*y*) will be produced between so as to heat and discharge currents of air into the upper part of the fire chamber in the manner described, the said sections being constructed end arranged together substantially as set forth.

2. I claim making a direct communication between the said air-flues (*u*—*y*), and the ash-pit (D), by means of the openings (*w*—*w*), or their equivalents, in the foundation plate upon which they rest, substantially as described.

3. I also claim forming the top-and-side plates of the furnace body (A) so that each of its said two top-and-side plates (*l* and *l'*) may be combined with a row of pipes (*m*—*m*) opening at each of their ends upon the same side of the plate, as described, and produce hot air flues (*m*—*m*) through the body (A) of the furnace when the said plates are united together at their upper edges; all substantially as and for the purposes herein set forth and described.

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Witnesses:

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