

W. ANDREW.
HEATING APPARATUS.
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1,018,472.

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Fig. 1.

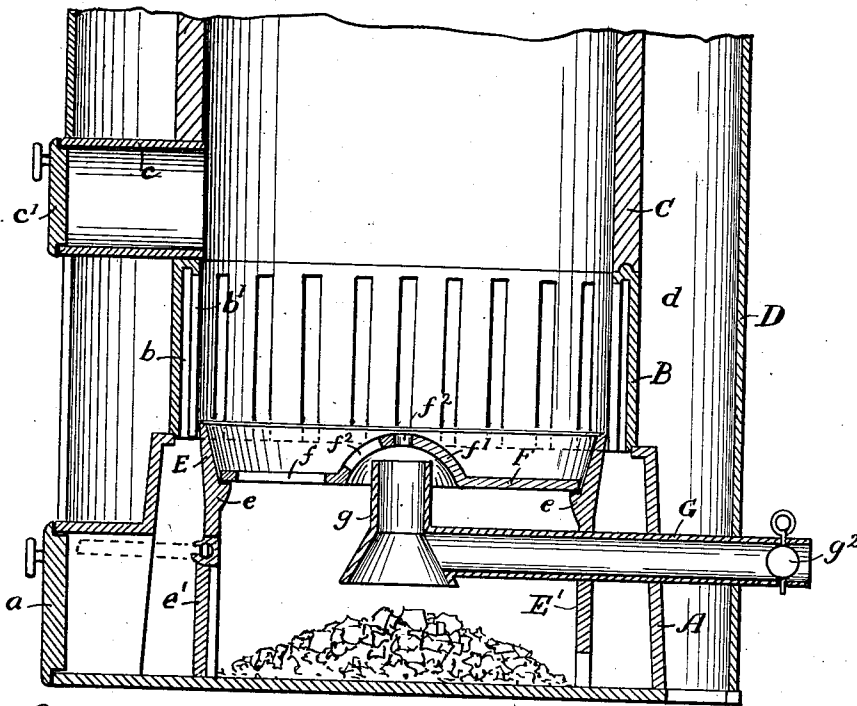


Fig. 2.

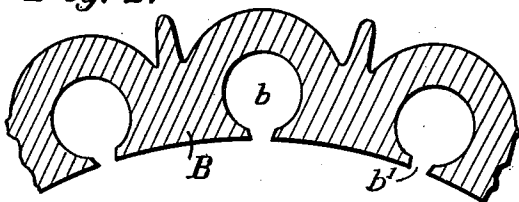


Fig. 3.

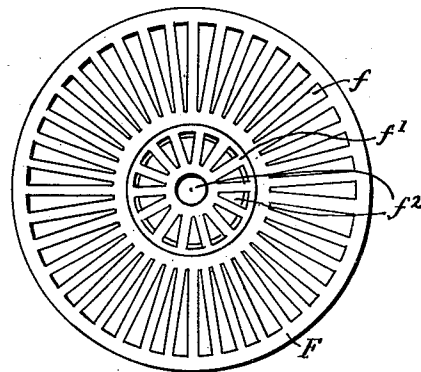
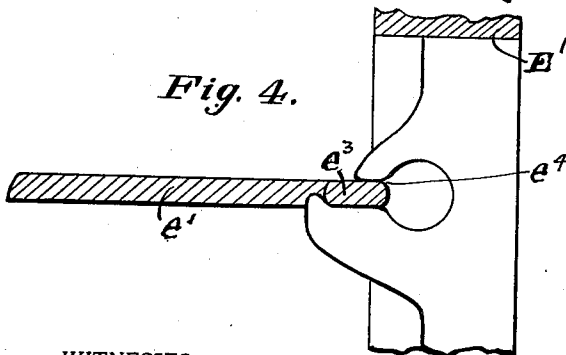


Fig. 4.



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HEATING APPARATUS.

1,018,472.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, WILLIAM ANDREW, a citizen of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented new and useful Improvements in Heating Apparatus, of which the following is a specification.

My invention relates to hot air furnaces and heating stoves, especially those designed to burn slack coal; its purpose being to provide more effective means for delivering and regulating the supply of air to the fuel while undergoing combustion. To this end, I provide a lower extension of the fire pot constituting an annular partition dividing the lower chamber, or ash pit, more or less completely, into two air-feed spaces,—the inner or central one receiving air from without through an independent tube or passage, and delivering air normally only through the grate to the bottom of the mass of fuel; while the outer or annular air-feed space, receives air normally from the inner space beneath the annular partition and delivers only through vertical air spaces, external to the fire pot proper and communicating therewith by narrow slits laterally to the mass of fuel at its side. These features, together with the means of regulation of the air supply, may be used with advantage in part, as hereinafter indicated, or, preferably, combined in one structure.

The particular embodiment of my invention selected for illustration, is a hot air furnace, in which,—

Figure 1, is an axial vertical section of the furnace with the upper portion broken away. Fig. 2, a detail, is a horizontal cross section of a portion of the fire pot in which are the vertical air channels and side slits; and Fig. 3, is a plan view of the grate. Fig. 4 is a detail vertical cross section through the opening in the annular partition at the front, opposite the ash pit door, showing the valve normally closing the same, in its raised or open position.

Referring now to the drawings, A is a furnace base or ash pit of usual construction, and *a* is the outer ash-pit door.

B is a cylindrical fire pot resting upon the base A, and having vertical air-passages, *b*,

formed therein, open underneath and closed at the top, with relatively narrow channels or slits *b*¹, connecting throughout their length with the interior of the fire pot, so as to allow coal dust and fine ashes to fall into the ash pit without danger of clogging the passages. Resting upon said fire pot B is a solid corresponding dome-member C of the usual type, provided with a laterally extended feed chute *c* with feed door *c*¹, and the usual smoke-exit-flues above (not shown). A casing D of the usual type forms the furnace exterior and the outer wall of the warm air chamber *d*.

The fire pot B, is extended below by a grate-section E, whose upper edge is preferably extended within and just above the lower edge of the fire-pot proper, B, and which is further extended downwardly to or approximately to the floor of the ash pit, constituting an annular partition E¹ therein. For furnaces this partition may terminate a few inches above the bottom of the ash-pit with extended legs for its resting support; but for stoves I prefer to carry the entire partition to the bottom of the ash pit and provide it with pivoted doors or register valve to regulate the admission of air.

The grate F, supported on lugs *e*, and having vent openings, *f*, is preferably formed with a central cone or dome, *f*¹, having suitable vents *f*². At the front side of the base A is the main ash-pit door, *a*, and, corresponding with this, is a similar enlarged opening in the annular partition, E¹, provided with a door or flap *e*¹ adapted to swing upward and outward. This and other doors when employed are arranged to be accessible from the opening of *e*¹. They may be provided with flattened pivot lugs *e*³, passed through narrow slots *e*⁴ in their supporting lugs or brackets upon the wall of the partition, so that when the door is raised to a horizontal position and partly drawn forward, the flattened pivot lugs engage in the slots and hold the door in a nearly horizontal position, as indicated in Fig. 4. While so held ashes can be readily removed, or the doors can be left up when it is desired that air should pass freely from the inner space of the ash pit to the outer

space and to the lower ends of the air passages *b*.

A pipe *G* extending through the casing *D*, base *A*, and fire pot base extension *E*¹ conveys fresh air from the exterior into the central space of the ash pit, where it is delivered through a vertical terminal section *g*, of the pipe *G*, directly beneath the grate cone *f*¹. This terminal section is open-ended above and below, and enlarged below so that ashes falling through the grate will pass directly through. A damper *g*², at the inlet mouth of pipe *G*, permits regulation of the flow of air through the same.

The general operation of my improved furnace will be sufficiently apparent. The series of air-channels *b* completely surrounding the body of fuel, supply hot air to the general exterior of the mass of fuel which greatly assists its complete combustion and the prevention of smoke; while the relatively independent means of supplying air directly to the interior bottom portion of the mass of fuel supplements the former provision with corresponding advantages. Both together, therefore, in connection with the means of regulation, form a complete system of air-supply tending to the thorough combustion of inferior and cheaper grades of fuel with maximum of heat production and minimum of smoke. When for example a charge of slack coal is added upon a more or less incandescent mass and retards or prevents the passage of the gaseous products of combustion directly upward, the side passages afford a means of exit for the same so that danger of choking out the fire is avoided; and to this result the direct central feed of air at a point in the cone above the level of the grate, contributes. There is in effect a combustion created at the underside of the mass of fresh fuel.

It will be seen from the construction that air passing through pipe *G* will be somewhat heated, and will naturally rise through the terminal *g* and feed combustion at the center of the mass of fuel most freely, while the feed elsewhere will be relatively less. The air channels at the sides of the mass of fuel will also draw from the same source of supply, but will feed more slowly because the air must first pass downward beneath the annular partition *E*¹ before reaching the bottom of the air channels *b*. The balance between these two drafts upon the total air supply in furnace construction is created and maintained by the fixed depth of the annular partition *E*¹, but in stoves I deem it preferable to carry the partition to the bottom of the ash-pit and provide a plurality of air openings with adjustable doors as valves, such as *e*¹.

By proper regulation, the air supply may be cut off more or less completely so that the intensity of the fire may be adjusted to

changes of atmospheric conditions; or, combustion may be so retarded as to carry fire over night, or through considerable periods without replenishing fuel.

It will be obvious also that by the use of the cone grate and the air feed pipe *G* and its vertical terminal *g*, arranged as shown, a special advantage may be derived in promoting combustion at and through the central axis of the fuel mass, independently of the system of air channels *b* at the outside of the fire pot; also that the device will be beneficially operative without the "cone" of the grate, and without the vertical terminal of the air supply pipe *G*.

I claim as my invention and desire to secure by Letters Patent of the United States:

1. A hot-air furnace or stove embodying a closed base, constituting the ash pit; a fire pot surmounting the same and provided with a circumferential plurality of vertical air-feed passages; a grate; a lower extension of the fire pot below the grate, constituting an annular partition within the ash pit and spaced from the walls thereof so as to form therewith an annular chamber with which chamber the said air feed passages communicate, and said extension having openings therein; and a regulated air conduit extending through said partition from the outside of the furnace or stove casing through the base wall and its annular partition and delivering the sole air supply for combustion into the inclosed central space beneath the grate.

2. A hot-air furnace or stove embodying a closed base, constituting the ash pit; a fire pot surmounting the same and provided with a circumferential plurality of vertical air-feed passages; a grate having a raised center; a lower extension of the fire pot below the grate, constituting an annular partition within the ash pit, and spaced from the walls thereof so as to form therewith an annular chamber with which chamber the said air feed passages communicate, and said extension having regulated openings therein; and a regulated air conduit extending through said partition from the outside of the furnace or stove casing; and provided with an open ended vertical terminal section delivering the sole air-supply for combustion centrally beneath the raised center of the grate.

3. In a hot air furnace or heating stove, the combination of an ash pit base having an inner annular partition spaced from the walls thereof to form an annular space and said partition having regulated openings therein; a fire pot resting upon said base and connected with said annular partition as an upward extension thereof, provided with exterior air channels communicating with the interior through vertical slits, and said channels open below to the annular space parti-

tioned in the base and a pipe connecting the inner inclosed space of the ash pit with the outer air for the sole supply of air for combustion directly to the grate, in the first instance, and thence, secondarily, through the
5 openings of the annular partition to the vertical air channels of the fire pot.

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

WILLIAM ANDREW.

Witnesses:

WALTER A. KNIGHT,
LEWIS M. HOSEA.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."