May 26, 1942. P. WINGERT 2,284,464

FURNACE AND STOVE CONSTRUCTION

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Fig. 1

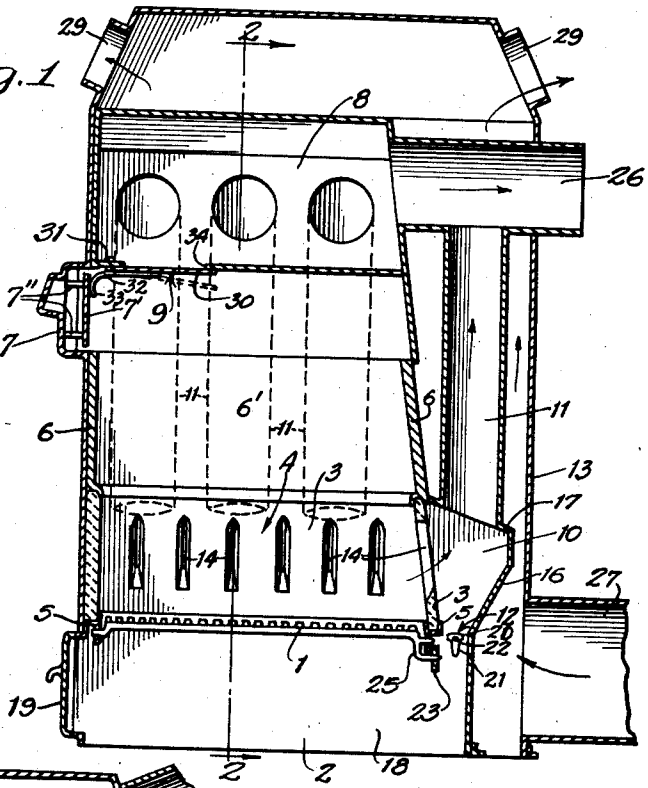


Fig. 4

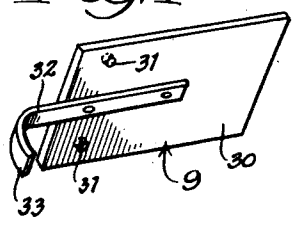


Fig. 2

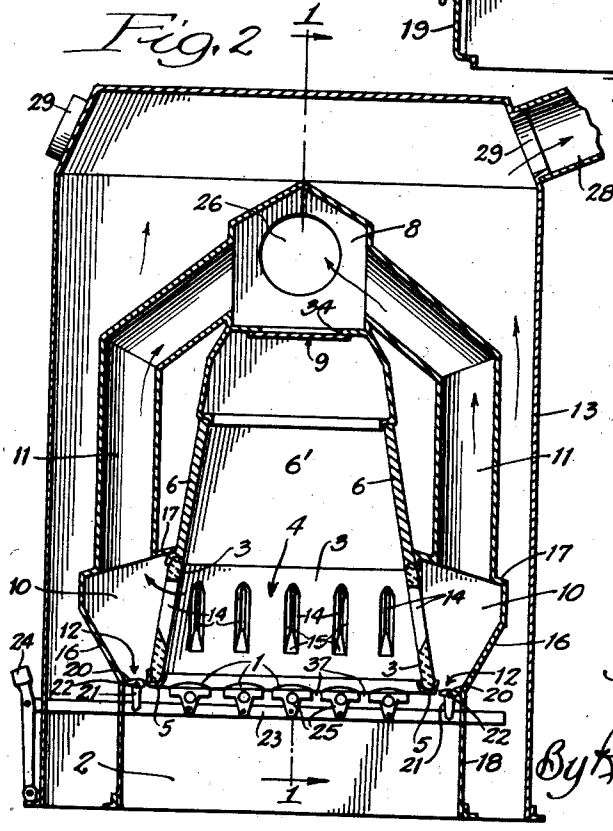
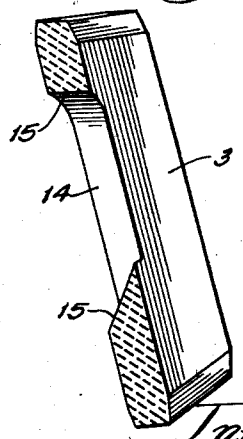


Fig. 3



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Fig. 5

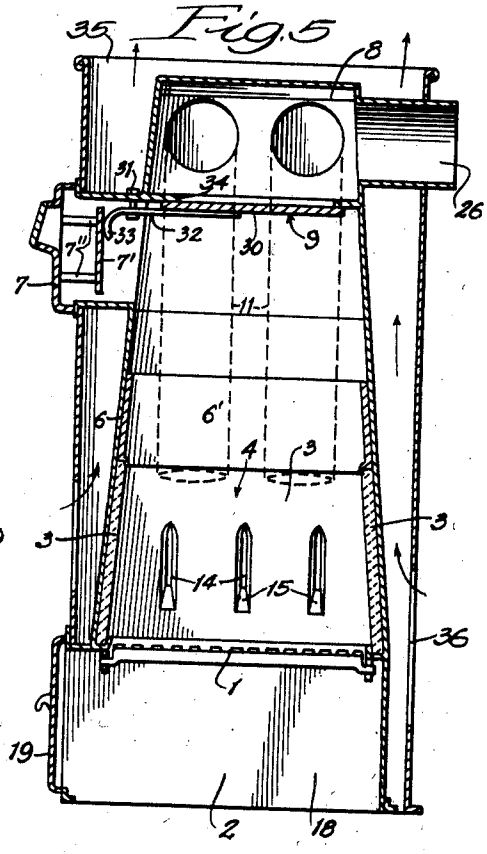
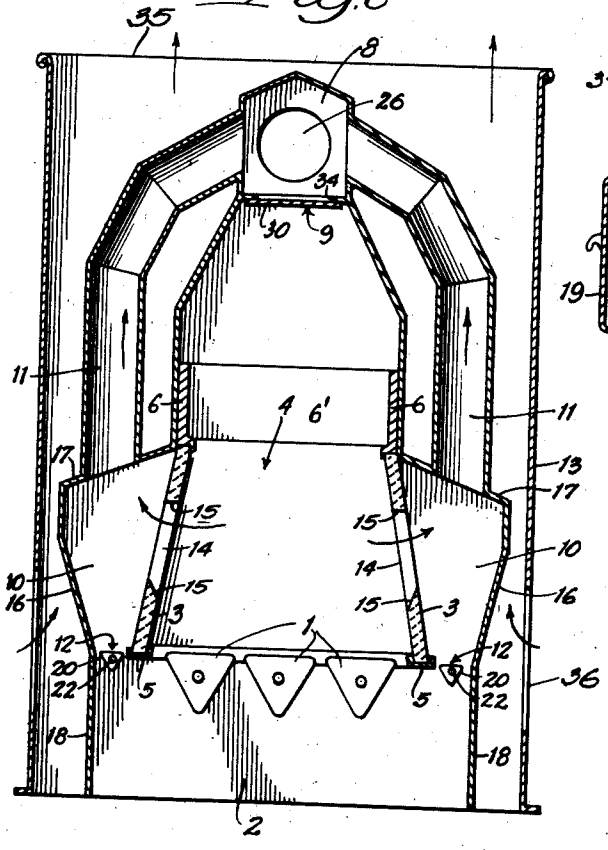


Fig. 6



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FURNACE AND STOVE CONSTRUCTION

Paul Wingert, Montpelier, Ohio

Application March 7, 1940, Serial No. 322,730

4 Claims. (Cl. 126—99)

This invention relates to improvements in furnaces and stoves of the self feeding or magazine type and is an improvement on my Patent No. 2,137,827, granted November 22, 1938.

The main objects of this invention are to provide an improved combustion chamber construction and arrangement for furnace and stoves; to provide an improved wall construction in a combustion chamber of the self-feeding or continuous supply type of stove and furnace; to provide a device of this kind having walls forming auxiliary grates; and to provide a device of this character which will be more efficient in its operation and heating action.

Specific embodiments of this invention are shown in the accompanying drawings in which:

Figure 1 is a vertical cross sectional view as taken on the line 1—1 of Fig. 2, illustrating a furnace embodying my improvements.

Fig. 2 is a vertical cross sectional view of the same taken on the line 2—2 of Fig. 1.

Fig. 3 is a perspective view, shown partly in section, of the fire brick combustion chamber wall shown in Figs. 1 and 2.

Fig. 4 is a perspective view of the safety by-pass door shown in Figs. 1 and 5.

Fig. 5 is a vertical cross sectional view taken centrally through a stove embodying the features of my invention, and

Fig. 6 is a cross sectional view of the same taken on the line 6—6 of Fig. 5.

As shown in the drawings, my improved furnace construction comprises a set of centrally disposed grates 1 spaced above an ash pit 2, a fire brick or other refractory lining 3 extending upwardly from the level of the margins of the grates 1 to define a fuel bowl, combustion chamber or fire pot 4, the fire brick lining 3 being supported on an angle iron member 5 and extending upwardly and inwardly, a shell 6 of cast iron or other suitable material bearing at its lower edges on the upper end of the fire brick lining 3 to define a fuel reservoir 6', a fuel feed door 7, a dome like portion 8 disposed at the top of the shell 6, a safety by-pass 9 leading from the combustion chamber 4 to the dome-like portion 8, a plenum chamber 10 disposed adjacent the fire brick lining 3 and surrounding the side and rear walls of the combustion chamber 4, a series of spaced radiators 11 each communicating with and connected between the plenum chamber 10 and the dome-like portion 8, a fly ash or other debris clean-out means 12 for the plenum chambers, and a surrounding furnace jacket or shell 13.

As shown the fire brick lining 3 is provided with spaced, elongated vertical slots 14 the lower ends of which are inclined as at 15 so as to prevent, as much as possible, the accumulation in the slot of fly ash or other debris from the combustion chamber.

The plenum chamber 10 is defined by an inwardly and downwardly inclined side wall 16 and outwardly and downwardly top wall 17. The side wall 16, as shown, is integrally formed with base 18 which is spaced away somewhat from the angle iron member 5 to provide a discharge opening leading from the plenum chamber 10 to the ash pit 2. It will be apparent that the products of combustion emanating from the combustion chamber 4 will carry fly ash and other debris into the plenum chamber where such material will collect; hence, I have provided a clean-out damper 12 which may be manually operated independent of the grates 1 or may be operable automatically therewith, as illustrated in the drawings. The damper shown comprises an arcuate shaped cast iron plate 20 extending the length of the plenum chamber having an integrally formed downwardly extending or depending arm 21, the plate 20 being pivoted at 22 where the bar is secured or mounted to the base 18. The lower end of the arm 21 is secured to the link 23 which in turn is connected to the shaker lever 24. The rear damper 12 is synchronously connected to the side dampers 12 by a series of links not shown, in any suitable manner and which is readily understood by those skilled in the art. The grates 1 likewise, each have pivotedly mounted ends and a depending link or arm member 25 having its free end pivotally connected to the link 23.

The top portion 17 of the plenum chamber is provided with a series of spaced apertures into each of which one end of the respective radiator 11 is arranged to seat. The other end of each of the radiators 11 is seated in a respective aperture in the dome-like portion 8. The dome portion or upper radiator 8 is connected with a duct or flue 26 at the rear side of the furnace casing, which leads to a smoke stack not shown.

As shown in Figs. 1 and 2, the furnace jacket or shell 13 is spaced well away from the sides, top and rear of the combustion chamber 4, fuel reservoir 6' and the radiators 8 and 11, but abuts against the front thereof, all arranged so as to completely enclose the furnace and at the same time provide an air space in which air entering through the cold air duct 27, and recirculation ducts, not shown, may be heated and then distributed by supply ducts 28 connected by suitable

collars 29 provided at the top portion of the furnace jacket or shell 13.

The fuel reservoir 6' is fed through the feed door 7 which is pivotally anchored to the jacket 13 and is provided with a bearing plate 7' secured to the door 7 by lugs 7''. In a like manner the ash pit 2 communicates with the outside of the jacket 13 and is closed by means of an ash pit door 19.

A safety by-pass 9 is provided between the fuel supply chamber 6' and the radiator 8 to carry off any coal gases that may collect above the fuel, this by-pass being operable only when the door 7 is opened. The by-pass comprises a flat plate 30 of suitable material secured adjacent its outermost end to the lower wall of the radiator 8 by any suitable means such as loosely arranged pivots 31 arranged to be engaged in suitable openings in the said lower wall. The plate 30 is provided with an arm 32 secured medially of the plate and having one end thereof projecting outwardly beyond the plate toward the fuel door 7. The distal end of the arm 32 is bent downwardly and inwardly to form an arcuate surface 33 which is arranged to abut against the bearing plate 7' when the door 7 is in closed position. In this position the by-pass closure plate 30 is held in a closed position.

When the door 7 is opened the arcuate end 33 of the arm 32 swings upwardly relative to the pivots 31 while the plate 30 swings downwardly to expose the discharge orifice 34 in the bottom of the radiator 8, thus providing an opening to allow any accumulated coal gases to flow out to the stack. When the door 7 is again closed the bearing plate 7' abuts against the arcuate arm portion 33 causing it to move in a downward direction, thereby shifting the plate 30 upwardly to abut against the bottom of the radiator 8 and close the orifice 34.

In the stove construction shown in Figs. 5 and 6, like numbers are applied for the identical parts as shown in the furnace construction of Figs. 1 to 4. The principal difference in the two constructions is that no distribution ducts are employed but rather the top 35 of the jacket or outer shell is provided with the usual grate to allow the warmed air to circulate through the jacket or shell 13. Also, no cold air duct is employed but in place thereof a cold air intake 36 is provided in the lower part of the jacket or shell 13.

It is, of course, apparent that the stove construction is proportionately smaller than the furnace construction illustrated in Figs. 1 and 2.

Thus, when the furnace or the stove is assembled, coal supplied through the feed door 7 to the combustion chamber will be supported by the grates 1 and if desired the entire interior of the furnace may be filled with coal. The upper portion 6' of the device provides a magazine of considerable capacity from which fuel is automatically fed gravitationally toward the grates 1 as combustion proceeds.

Air for combustion, which is supplied from the ash pit chamber 2, will pass upwardly through the openings 37 between the grates 1 and through the fuel bed in the general direction toward vertical fire brick side wall grates 3 and the plenum chamber 10. Thus, combustion once started over the grates 1 will tend to confine itself to the lower central portion of the fire box 4 and the immediate vicinity of slots 14 in the fire brick lining 3. A considerable part of the combustion will thus take place at the sides of the fire box and the burning fuel bed will be evenly distributed, the supply of additional fuel being uniform and regular as the burning fuel is burned to ashes over the grates 1.

The greatest part of the heat produced by combustion in my improved construction is transmitted to the furnace structure and will be concentrated adjacent the plenum chamber located at the lower part of the furnace and nearest the cold incoming air that is to be heated. The air will thus flow over and around the plenum chamber and along the radiator tubes 11 whereby to be directly exposed to a greater expanse of metal at the hottest part of the furnace. The result is an increased transfer of heat to the incoming air, lower stack temperatures and a greatly increased overall efficiency.

The efficiency of the improved stove or furnace is also materially enhanced by the arrangement and construction of the fire box or combustion chamber wherein the side walls slope upwardly and inwardly and comprise fire brick or refractory plates or sections which are in the nature of auxiliary grates serving to increase the area of the burning fuel bed and assuring most efficient combustion at the entrance to the side plenum chambers where the primary heat transfer takes place.

The spaced openings, in the fire brick combustion chamber side walls, are preferably vertically elongated slots, as shown in the drawings, having inwardly and downwardly sloping bottom portions. This arrangement not only increases the depth of the burning fuel bed at the sides of the stove or furnace, but also prevents the downwardly moving fuel from clogging or blocking the openings. Fresh fuel from the reservoir 6' moves continually downward and as it is consumed during its downward passage tends to make the side wall grates or auxiliary grates self cleaning. This latter effect being particularly enhanced by the sloping walls which also serve to keep the fuel supply to the center of the bottom grates constant and uniform and to minimize the formation of clinkers.

Another feature of my improved construction is the provision of an efficient and simple clean-out means for the removal of fly ash and other debris that will collect in the plenum chamber, thus assuring that the plenum chamber and the radiator tubes will not become clogged. This clean-out means is direct in its operation when associated with the bottom grates, however it will be understood that separate manually operated means may be employed.

Other advantages are found in the automatic by-pass which assures immediate discharge or removal of any coal gas that may collect above the reserve fuel in the magazine 6' whenever the fuel door 7 is opened, thereby adding a safety feature to my construction which obviates any possibility of explosion where fresh air enters the furnace through the fuel supply door, this by-pass being self operating and providing a most direct outlet to the stack with a maximum of draft to cause the gas removal.

Except for occasional filling of the reservoir with a supply of coal and occasionally shaking the grates to remove accumulated ashes, which is accomplished manually, my improved furnace or stove is automatic in its operation and will operate without care or attendance for long periods of time, delivering heat constantly at substantially any desired rate and with a maximum of efficiency in fuel consumption.

Although but two specific embodiments of this invention have been herein shown and described, it will be understood that numerous details of the construction shown may be altered or omitted without departing from the spirit of this invention as defined by the following claims.

I claim:

1. A device of the class described comprising a fuel bowl defined by upwardly and inwardly slanting refractory side walls having laterally spaced vertically elongated ports, a grate at the bottom of said fuel bowl, a fuel reservoir above said fuel bowl, a plenum chamber at each side of said fuel bowl communicating with the interior thereof through said ports, and radiating means opening into said plenum chamber and extending upwardly therefrom, said ports terminating well below the upper margin of said refractory side walls and having downwardly and inwardly slanting bottom faces.

2. A device of the class described comprising a combustion chamber defined by an upwardly and inwardly slanting refractory side wall lining having laterally spaced vertically elongated ports, a grate at the bottom of said combustion chamber, a plenum chamber on the outer side of said lining adjacent said combustion chamber and communicating therewith through said ports, a fuel reservoir above said combustion chamber having direct communication therewith, and a plurality of radiators communicating with and extending upwardly from said plenum chamber, said ports each terminating below the upper margin of said refractory lining and above the lower margin thereof, and each having outwardly converging side faces, and said ports each having a downwardly and inwardly slanting bottom face.

3. A device of the class described comprising a combustion chamber defined by a refractory side wall lining having laterally spaced vertically elongated ports, a grate at the bottom of said combustion chamber, and a plenum chamber on the outer side of said lining adjacent said combustion chamber and communicating therewith through said ports, said ports being each substantially in the form of a Gothic arch and being of a length substantially one-half the height of said side wall lining, and said ports having their side faces converging toward said plenum chamber and the bottom faces slanting downwardly toward said grate.

4. A furnace construction of the class described comprising a fuel reservoir and a combustion chamber defined by shiftable bottom grates and stationary upstanding grates, said upstanding grates being of a refractory material and having laterally spaced vertically elongated slots therethrough, and a plenum chamber surrounding said upstanding grates and communicating with said combustion chamber through said slots, said slots being located substantially midway of the top and bottom of said upstanding grates and each having its side faces converging toward said plenum chamber, and said slots each having its bottom face slanting downwardly and inwardly toward said bottom grates.

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