June 26, 1951 W. F. PFAU 2,558,626

MOVABLE GRATE STRUCTURE AND ASH REMOVER

Filed Dec. 29, 1945

Fig. 1

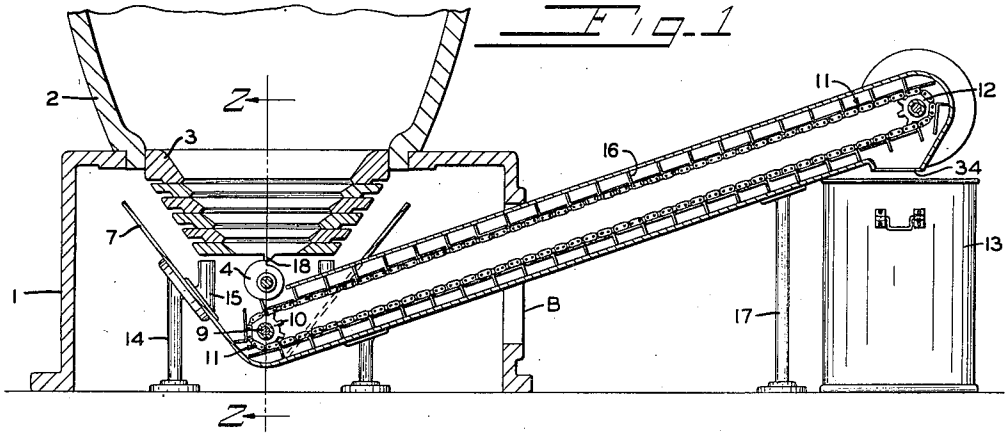



Fig. 2

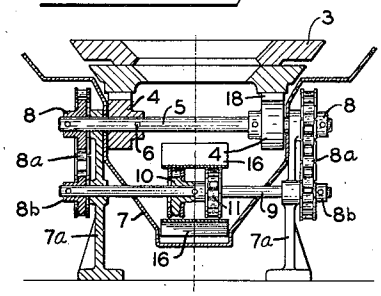



Fig. 4

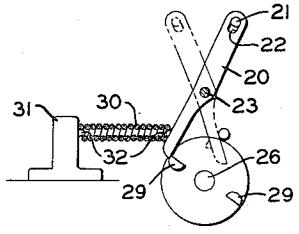
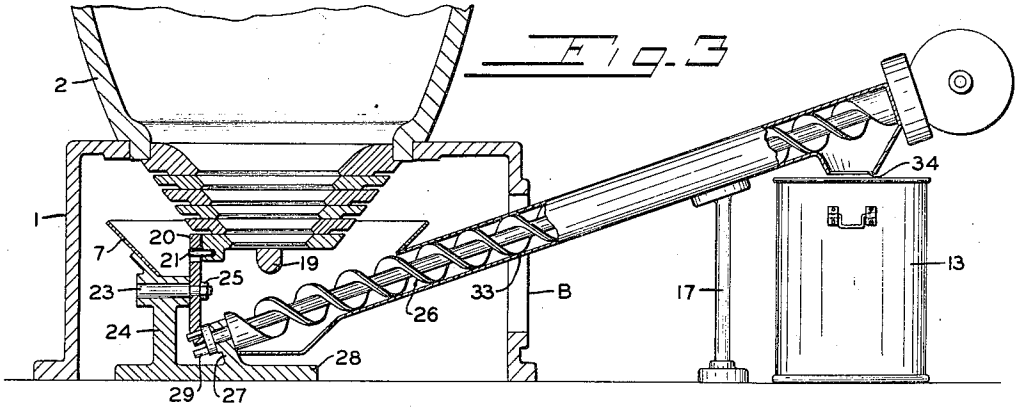



Fig. 3




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2,558,626

## MOVABLE GRATE STRUCTURE AND ASH REMOVER

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3 Claims. (Cl. 110—165)

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This invention relates to a heating device for burning solid fuel, and particularly pertains to means associated with the grate structure for moving same to agitate the fuel bed and remove the ash residue as it accumulates in the grate structure upon agitation of the fuel bed.

The device, generally described, comprises a grate structure composed of a series of grate rings superposed, with a portion spaced apart, to provide a fire bed of any desired depth. The rings are progressively of smaller diameter from the top to bottom so that the fire bed is of truncated conical formation, thereby permitting a larger supply of fuel in the top part of the fire bed and a smaller supply in the bottom part. The diameter of the top or uppermost grate ring is about the same or slightly less than that of the bottom of the furnace bowl, and the diameter of the bottom grate ring will be somewhat less than that of the top or uppermost grate ring to provide a discharge opening of substantial diameter to permit any pieces of slate or other non-combustible to pass through. The grate rings are movably supported, and means is provided for intermittently moving the rings. This means for moving the grate may advantageously be actuated by means associated with a conveyor, one end of which is disposed beneath the discharge opening of the grate to collect the ashes and remove them to some remote point to a container for accumulation and convenient removal without further handling.

For a better understanding of the invention, reference is made to the accompanying drawings in which:

Fig. 1 is a side elevation, partly in cross section, of a device embodying the invention;

Fig. 2 is a cross-sectional view on line 2—2 of Fig. 1;

Fig. 3 is a side elevation, partly in cross section, of a modified structure; and

Fig. 4 is a detailed view of the grate jolting connection between the end of the screw conveyor and the grate rings, partly in cross-section and with the link also shown in phantom.

Referring specifically to the drawings in which like numerals are used to designate like parts, numeral 1 is the lower base casting of a furnace on which is supported the bottom end of the furnace bowl 2. A grate composed of annular rings 3 in superposed relation is supported beneath the bowl on cams 4 which are spaced apart on rod 5 and fixed thereto by a set screw 6. The rod is rotatably journaled on oppositely disposed leg supports 7a, and the ash collecting unit 7 is

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depended from the rod 5. The rod 5 is advantageously driven by sprockets 8, one sprocket being mounted adjacent each end of the rod to be connected by sprocket chains 8a to sprockets 8b on rod 9. The rod 9 is journaled on the supports 7a and carries a sprocket or sprockets 10 over which one end of the conveyor 11 is revolved. The opposite end of the conveyor is revolved over sprocket or sprockets 12, this sprocket and the end of the conveyor being elevated to upwardly incline the conveyor for dumping into the receptacle 13 the ashes which are transported from the ash collecting unit 7.

The ash collecting unit 7 is preferably of conical construction with the concave side serving as a chamber in which the ashes are collected as they are shaken down from the grate. The ash collecting unit is supported by supports 7a and also legs 14 resting on the floor A and attached thereto if desired. That portion of the wall of the ash collecting unit which is in the path of the conveyor is cut away to accommodate the conveyor. For the same purpose, an opening B is provided in the base 1 of the furnace. Legs 14 are optional as supports 7a alone would be sufficient if desired.

In order to provide supplemental support for the grate and prevent same from tilting, oppositely disposed lugs 15 may be provided. Thus support is provided for the grate at the four separated points by reason of the two lugs and the two cam members.

The conveyor may advantageously have a series of pans 16 carried thereby open on top for reception of the ashes.

Any suitable source of power, such as an electric motor supported by legs 17 may be employed with suitable driving connections for actuating the conveyor to remove the ashes, and as it is moved the sprockets on the rods 5 and 9, connected by chains 8a, cause the cams to be rotated, thereby slightly elevating and then dropping the grate rings by the surfaces of the cams contacting the bearing surfaces 18 on the bottom ring of the grate as the cams are revolved until the high point on the cams reaches the high point of the bearing provided for them on the grate surface. The continuing revolution of the cams causes the grate to drop and start again at the low points respectively of the bearing surfaces. This intermittent elevating and jolting down of the grate agitates the fuel in the grate and causes same to gravitate through the grate while being burned with the ashes dropping into the collecting unit as the fuel is burned.

The modification in Figs. 3 and 4 differs in structure and operation from that in Figs. 1 and 2 but likewise shakes the grate, the grate in this modification being intermittently rotatably reciprocated. The bottom ring of the grate is supported on a rod 19 which is mounted on opposite walls of the ash receiving unit 7. A link 20, having one end loosely connected to the bottom ring by a pin 21 projecting into the elongated slot 22 in the link, is pivoted on a stub shaft 23 mounted in the base support 24. A nut 25 is on the end of the stub shaft 23 to hold the link against the hub of the base support in which the stub shaft is fixedly supported.

The bottom end of the screw conveyor 26 is rotatably mounted in lug 27 on the foot 28 of the base member, and has one or more knobs 29 disposed eccentric to the axis of the screw conveyor to engage the bottom end of the link as the knobs on the screw conveyor are rotated. After the end of the link is pushed from normal position by one of the knobs, it is released and snapped back into normal position by spring 30 interposed between the link and a lug 31 on the base member. Embossments 32 are provided on the lug and on the link to enter the ends of the spring for holding same in position. After the link is snapped back into normal position after being moved by one of the knobs, it is then in position to be again actuated by the same knob or one of a series as the conveyor is revolved.

The conveyor is surrounded by a casing 33 having an open end 34 disposed above the ash can 13 into which the ashes are discharged as they are conveyed from the ash collecting unit 7.

In each of the above described embodiments, the burning of the fuel may be regulated to some degree by varying the speed of the conveyor which in turn varies the time intervals for jolting the grate.

The devices are simple in construction and may be installed in conventional furnaces merely by fitting in a grate of the construction disclosed and installing with it the ash removing unit with means for moving the grate to shake down the ashes and unburned residue and regulate the burning of the fuel in the grate.

If desired, a conventional blower or fan may be associated and synchronized with the invention to more positively control the air feed and accelerate combustion beyond that which would be obtained by the natural air draft or flue pull. Use of the blower or fan is optional.

The fuel may be manually or mechanically fed into the fire bed of the grate. Any suitable feeding means may be employed.

While I have described in detail two embodiments typifying my invention, it will be understood that there may be various changes in details or construction without departing from the spirit of the invention.



I claim:

1. In a furnace device, a grate comprising a series of superposed rings having a central ash discharge opening, an ash collecting unit disposed beneath the discharge opening in the grate, common means for supporting said unit and said grate, an ash conveyor leading from the ash collecting unit, and means operated by said conveyor interposed between the lowermost grate ring and the conveyor whereby said grate rings can be shaken by operation of the conveyor.

2. In a furnace device, a grate in the form of an inverted truncated cone comprised of a series of superimposed rings, an ash collecting unit conforming generally to the shape of the grate and disposed therebeneath, a common means for supporting the grate and the ash collecting unit, a conveyor for removing ashes from the collecting unit, and a cam device interposed between the conveyor and the grate, operated by the conveyor, for moving the grate when the conveyor is actuated and also jolting said grate following a predetermined cycle of movement.

3. In a furnace device, a grate in the form of an inverted truncated cone comprised of a series of superimposed rings, an ash collecting unit conforming generally to the shape of the grate and disposed therebeneath, common means for supporting said ash collecting unit and said grate, a conveyor for removing ashes from the collecting unit, a revolvable member interposed between the lowermost ring of the grate and the conveyor for moving the grate when the conveyor is actuated, and means carried by the revolvable member for jolting the grate at intervals.

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