

Sept. 9, 1941.

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2,255,373

FURNACE GRATE

Filed Feb. 14, 1940

2 Sheets-Sheet 1

Fig. 1

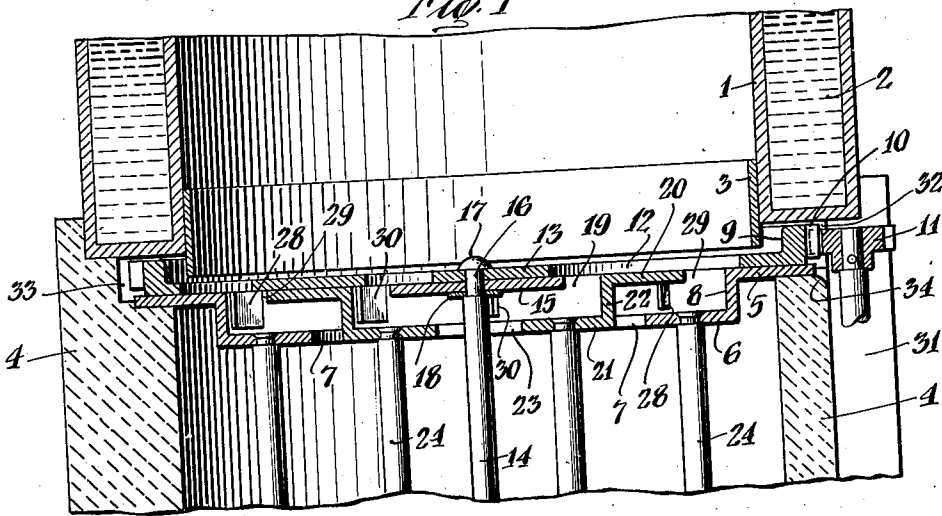
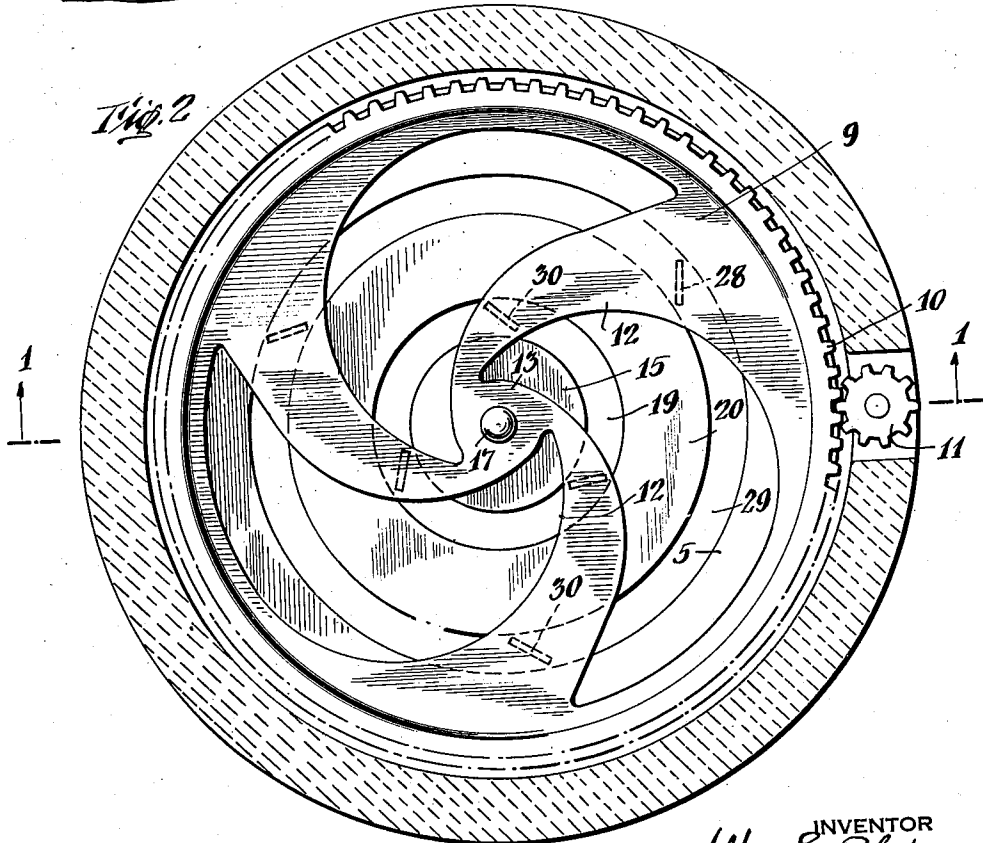


Fig. 2



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Fig. 3

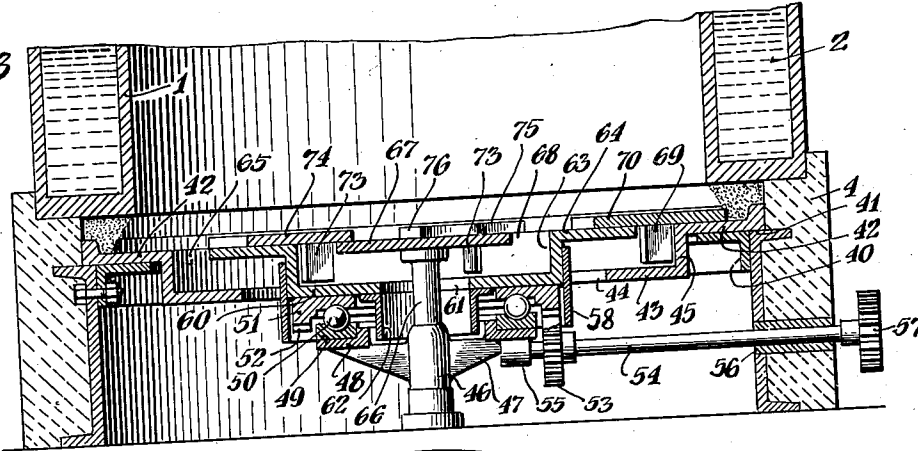
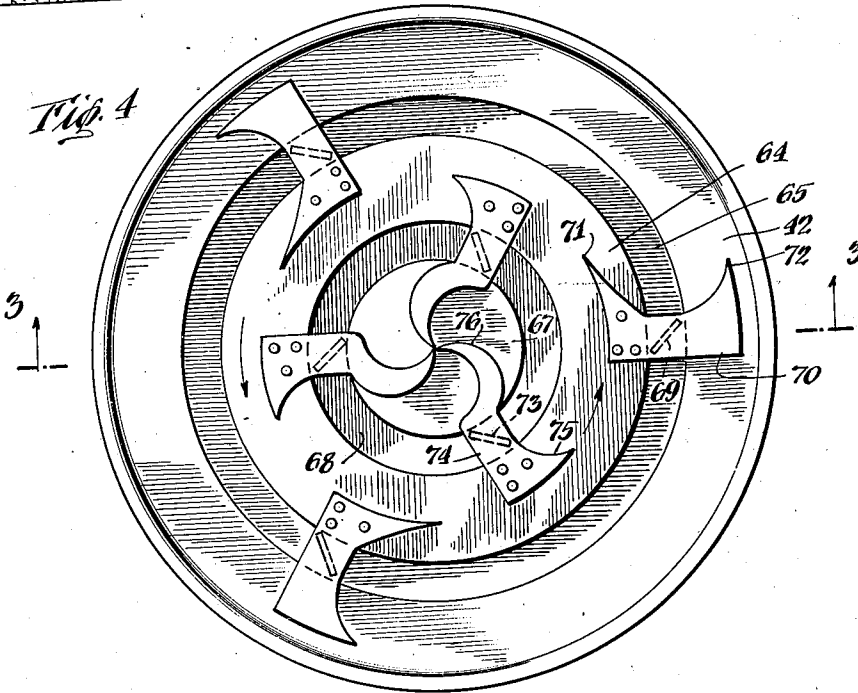


Fig. 4



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FURNACE GRATE

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2 Claims. (Cl. 126—182)

This invention relates to grates that are particularly suitable for supporting coal or coke while the same is undergoing combustion for such purposes as generating producer gas, producing steam or heating air, for example.

By this invention grates are provided by means of which the ashes can be readily removed from below the combustion zone, the depth of the ashes on the grate can be readily controlled and regulated, clinker can be broken up and removed and at the same time access of air to the combustion zone is facilitated.

In carrying out this invention, spaced metallic horizontally-disposed supporting surfaces for ashes and fuel are provided at one level and other similar surfaces are provided at a lower level and staggered with respect to the first ones so that ashes passing through the spaces between the upper supporting surfaces are stopped by the lower supporting surfaces. Provision is also made by means of which ashes can be removed whenever desired and in a controlled manner from the supporting surfaces through the spaces between them, thus making it possible to provide any desired depth of ashes beneath the combustion zone in accordance with the nature of the combustion material or character of combustion it may be undergoing.

One of the very important features of this invention is in having the supporting surfaces for the ashes so constructed and arranged that, while the ashes can be readily and easily removed therefrom, accidental escape of ashes and waste of fuel mixed therewith is avoided. The lower supporting surfaces for the ashes are of such dimensions and are so located with respect to the spaces between the upper supporting surfaces that a continuous stream of ashes cannot flow through the upper and lower openings or spaces which are offset horizontally with respect to each other. Even if ashes passing through the upper spaces pile up on the lower supporting surfaces until the piles reach the upper surfaces, there is no danger of the fuel bed drifting down too far automatically. This safety factor is due to the fact that the lower supporting surfaces are wide enough to prevent the ashes from automatically pouring off of them because of the angle of repose of the ashes even when the depth of ashes on the lower supporting surfaces exceeds the distance between the lower and upper supporting surfaces and cause ashes to pile up above the space between the upper supporting surfaces.

The invention will be understood from the de-

scription in connection with the accompanying drawings, in which:

Fig. 1 is a vertical section partly broken away taken along the line 1—1 of Fig. 2, showing an embodiment of the invention;

Fig. 2 is a plan view;

Fig. 3 is a section along the line 3—3 of Fig. 4, showing a modification; and

Fig. 4 is a plan view of the modification.

Reference character 1 indicates a furnace that is circular in cross section and is provided with a water jacket 2. An ash guard 3 is shown along the inside of the bottom edge of the furnace.

The wall 4 of the ash pit below the furnace is circular in cross section, and the furnace 1 is supported on this wall. An annular plate or ash support 5 has its outer edge resting on the wall 4. The offset portion 6 is also annular in shape and is provided with a circular opening 7 at its middle. The outer edge of the portion 6 is connected to the inner edge of the plate 5 by a vertical cylindrical wall 8.

A revoluble toothed spider 9 having teeth 10 along its outer periphery is driven by a spur gear 11 which may receive its power from any convenient source. Arms 12 of the spider 9 connect its outer rim to a central portion 13. A stationary support 14 has a bearing plate 15 upon which the central portion 13 of the spider bears.

The reduced portion 16 of the support 14 serves as a shaft for the spider 9, this shaft 16 passing through a hole in the center of a circular plate 15 and a hole in the center of portion 13 of the spider 9, and terminates in a headed portion 17. A wear plate 18 is provided between the plate 15 and a shoulder on the support 14. An annular space 19 is left between the outer edge of the plate 15 and the inner edge of an annular plate 20 that is concentric with the plate 5 and is on a level with it. An annular plate 21 is offset from the plate 20 on the same level with the offset portion 6, and is smaller than the opening 7. A vertical cylindrical wall 22 connects the outer edge of the offset portion 21 to the inner edge of the annular plate 20. A central opening 23 is provided in the portion 21 around the shaft 14 for ashes. Supports 24 are also provided for the portions 6 and 21.

Rakes or ploughs 25 are attached to the arms 12 of the spider 9, and extend downwardly through the space 26 between the outer edge of the plate 20 and the wall 8. These ploughs or rakes are so shaped and located that when they are moved in a circumferential path they push ashes from the surface of the portion 6 and the

corner formed by the wall 8 and portion 6, causing the same to fall through the opening 7. Rakes or ploughs 30 similar to the rakes 28 are connected to the lower side of the arms 12 of the spider 9 in position to remove ashes in like manner from the surface of the portion 21 through the opening 23.

A recess 31 is shown in the outer surface of the wall 4 to accommodate the shaft of the pinion 11. An opening 32 is provided at the upper portion of the wall 4 to accommodate an edge of the gear 11 so that it can mesh with the gear 10. An annular recess 33 is provided along the inside of the wall 4 to accommodate the edges of the plate 5, the spider 9 and the teeth 10. The wall 4 may be slightly rounded off, as indicated at 34, to permit ashes and dust to escape that might otherwise collect around the teeth of the gear 10.

In the embodiment of the invention shown in Figs. 3 and 4, a circular support 40, L-shaped in cross section, is attached to the inside of the wall of the ash pit 4. A ledge 41 is provided in the wall 4 on a level with the top of the support 40, and an annular plate 42 is supported on the support 40 and ledge 41. The offset portion 43 of the plate 42 is provided with a central circular opening 44, and the outer edge of this plate 43 is connected to the inner edge of the plate 42 by a vertical cylindrical wall 45.

A support 46 rests upon the bottom of the ash pit. This support is provided with arms 47 which carry an annular support 48 for the lower race 49 of a ball bearing 50. The upper race 51 of this ball bearing is provided with a circular rack 52, which meshes with a gear 53 mounted upon a shaft 54 that revolves in a bearing 55 on the support 48 and a bearing 56 in the wall 4. This shaft carries a gear 57 that may be driven in any convenient way.

A revoluble circular plate 60 is attached to and carried by the upper race 51 of the ball bearing on a level with the plate 43. It has a central opening 61 with a cylindrical shield 62 extending downwardly from the edge of this opening. A vertical cylindrical wall 63 connects the outer edge of the plate 60 with the inner edge of an annular plate 64 which is on a level with the plate 42. The plate 64 is of such a size that an annular space 65 for passage of ashes is left between the outer edge of the plate 64 and the inner edge of the plate 42.

An extension 66 of the support 46 carries a circular plate 67 at its upper end on a level with the plates 42 and 64. The plate 67 is of such a size that an annular space 68 for ashes is left between its outer edge and the inner edge of the plate 64.

Ploughs or rakes 69 are carried by outwardly extending horizontally disposed members 70 attached to the revoluble plate 64. These rakes 69 extend through the space 65 and are so shaped and located as to remove ashes from the portion or plate 43 through the opening 44. The front edges 71 and 72 of the members 70

are so shaped that ashes are pushed off of the surface 42 and the outer portion of the surface 64 through the space 65.

Ploughs or rakes 75 are carried by inwardly extending horizontally disposed members 74, that are attached to the revoluble plate 64. The ploughs 73 extend through the opening 68 and remove ashes from the surface of the plate 60 through the opening 61. The front edges 75 and 76 of the members 74 are so shaped as to remove ashes from the inner portion of the plate 64 and from the whole upper surface of the plate 67, respectively.

In both embodiments of the invention, the lower ash-supporting surfaces are so located with respect to the ash openings thereabove that the passage of ashes through these upper openings onto these lower plates or supports is stopped because of the angle of repose of the ashes before the ashes pass through the second or lower set of openings. The depth of ashes in the furnace or on the grate is easily regulated by controlling the speed at which the rakes or ploughs remove the ashes from the surfaces of the grate.

Upwardly extending knobs or projections may be provided upon any of the moving surfaces upon which the ashes rest, so that as they are moved they help to break up or wear away by attrition any clinker or hard obstructions so that the pieces can readily pass through the spaces provided for the ashes.

The operation of the grates will be obvious from the above description as it will be seen that as soon as enough ashes pass through the upper series of openings, such as the spaces 19 and 29 in Fig. 1, to prevent more ashes from reaching the lower set of surfaces, such as the surfaces of plates 6 and 21 in Fig. 1, the flow of ashes will stop due to the angle of repose of the ashes on the lower surfaces. When the depth of ashes on the upper surfaces, such as the plates 5 and 20 in Fig. 1, is sufficient to cause the zone of combustion in the furnace to be at the correct position, the movable members are started and driven at a speed that removes ashes through the openings 7, 23, 19 and 29 in accordance with the rate of combustion of the fuel.

What is claimed is:

1. A grate, comprising members having horizontally disposed supporting surfaces at different levels connected by vertically disposed walls, said surfaces and connecting walls being annular, and scrapers for removing ashes from adjacent said walls over the edges of the lower surfaces that are remote from said walls, the upper supporting surfaces being staggered with respect to lower ones and so disposed with respect thereto that the angle of repose of ashes keeps the ashes from automatically flowing off of the grate.

2. A grate in accordance with claim 1, in which the scrapers move in circular paths.

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