May 6, 1941. H. J. KING 2,240,702

ASH REMOVING APPARATUS FOR INCINERATORS OR THE LIKE

Filed June 28, 1940 2 Sheets-Sheet 1

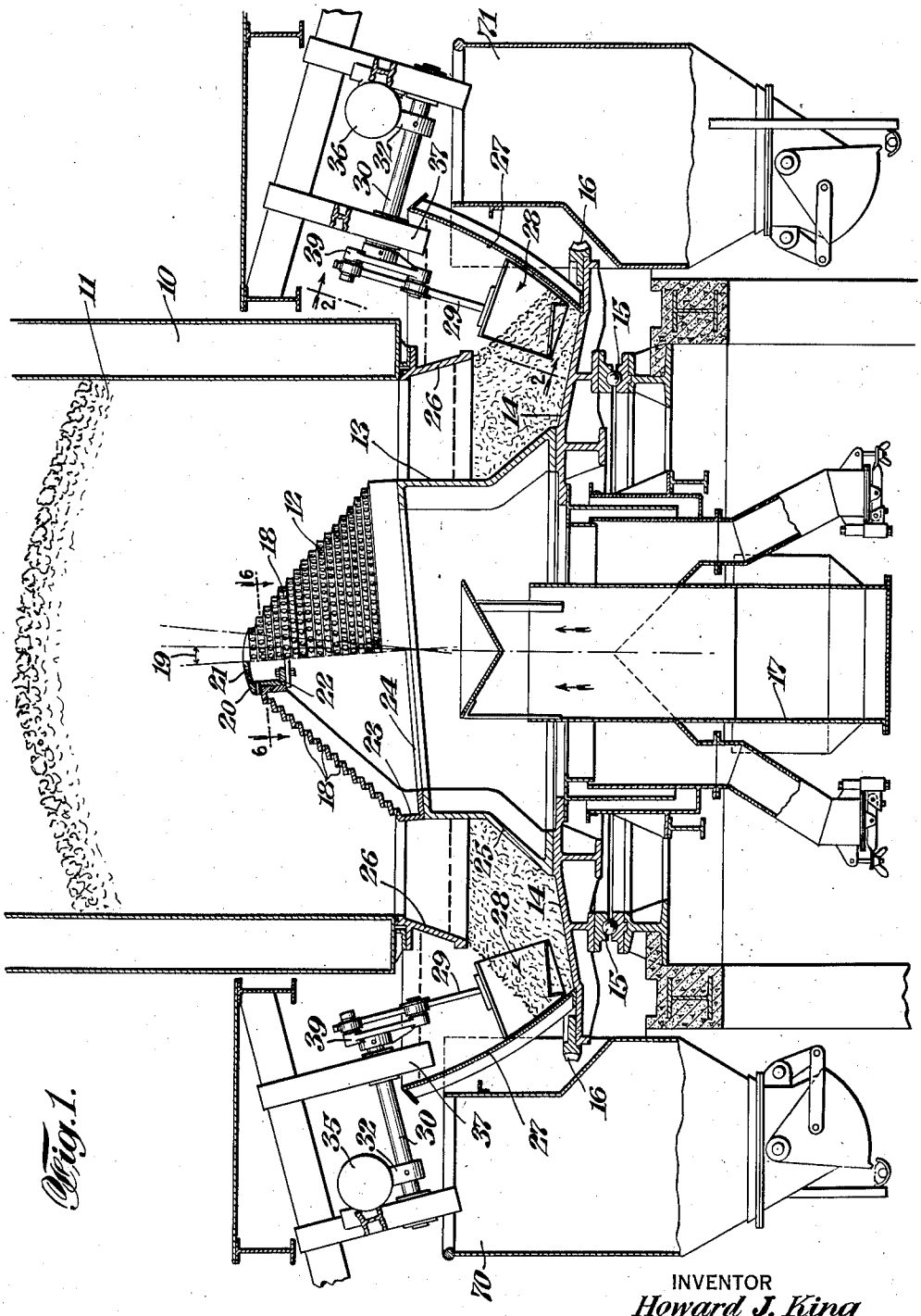


Fig. 1.

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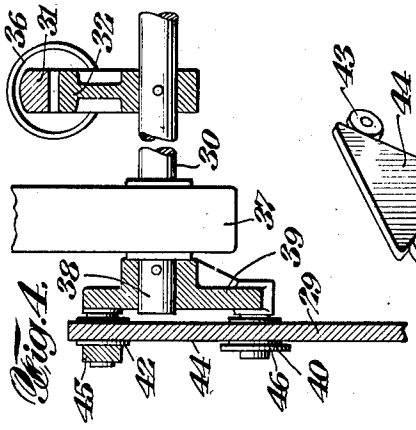


Fig. 4.

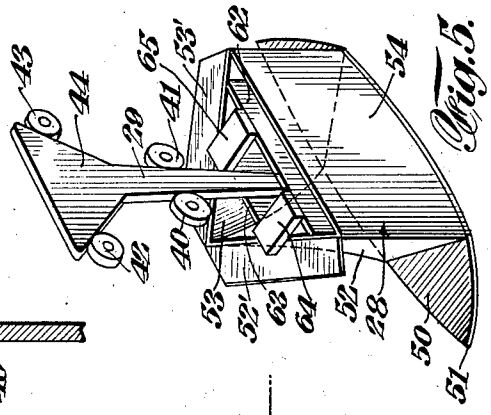


Fig. 5.

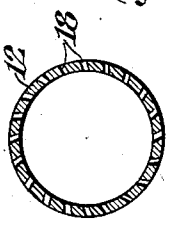


Fig. 6.

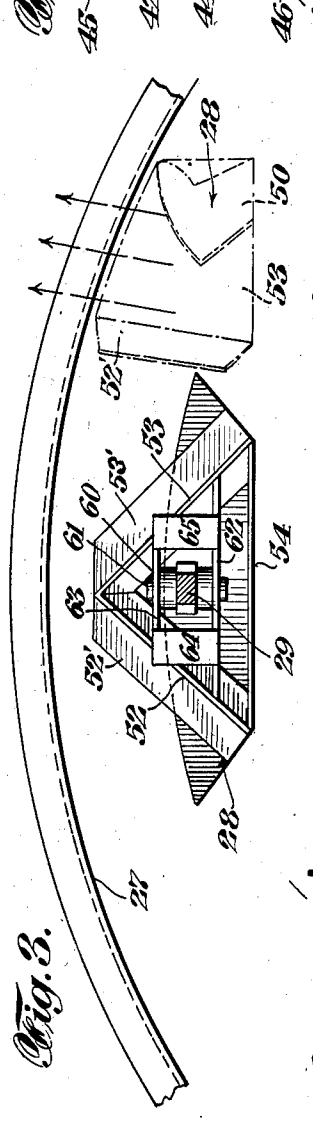


Fig. 3.

Fig. 2.

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UNITED STATES PATENT OFFICE

2,240,702

ASH REMOVING APPARATUS FOR INCINERATORS OR THE LIKE

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Application June 28, 1940, Serial No. 342,884

16 Claims. (Cl. 110—165)

This invention relates to apparatus for incinerating waste material such as garbage, trash, or other refuse or mixtures thereof.

In incinerators of the above class herein referred to, the material to be burned, comprising for example various kinds of municipal waste, is introduced through an opening at the top of a generally cylindrical furnace having within its lower portion an upstanding rotatable conical grate structure. A bed of the drying and burning refuse forms around and above this grate structure and as the grate rotates, air is blown into the material through suitable apertures in the conical grate. As the material becomes burned, the residue comprising ash and a variety of incombustible objects, gradually passes down through the annular space between the conical grate and the lower wall portions of the furnace, into an ash pan. This ash pan may be rotatable and may be filled with water into which the lower wall portions of the furnace may depend, whereby the lower portion of the furnace is sealed against the escape of air and dust. The ash pan may have an upwardly and outwardly extending peripheral wall portion spaced from the lower wall portions of the furnace, whereby the ash and other residues may be removed from the pan through the resulting annular space.

Under some circumstances difficulties occur with this general type of incinerator, in removing the very irregular unburned residues from the rotatable ash pan. Since such residues may include a large variety of objects, such as tin cans, irregular pieces of metal, lengths of wire and wire springs, the same often cannot be satisfactorily removed by any common form of automatic ash discharge equipment. That is, some of the irregular objects instead of being removed, would merely slide along the rotatable ash pan, or become jammed between the pan and furnace wall, or entangled with the ash extracting equipment, thus jamming the latter against further action. With the present invention these difficulties have been obviated by providing oscillating scoop structures and improved mounting means therefor.

Various further and more specific objects, features and advantages will clearly appear from the detailed description given below taken in connection with the accompanying drawings forming a part of this specification and illustrating by way of example a preferred embodiment of the invention. The invention consists in such novel features, arrangements, combinations of parts and operations thereof, as are described in connection with the apparatus herein disclosed by way of example only.

In the drawings, Fig. 1 is a vertical sectional view through the lower portion of an incinerator and accompanying mechanism constructed in accordance with one example of the invention;

Fig. 2 is a view taken substantially along the line 2—2 of Fig. 1 and showing a residue removing scoop and mounting means therefor in further detail;

Fig. 3 is a view looking down toward the scoop construction of Fig. 2;

Fig. 4 is a detailed sectional view taken substantially along the line 4—4 of Fig. 2;

Fig. 5 is a perspective view of one of the scoop members and a supporting arm therefor; and

Fig. 6 is a horizontal sectional view of a portion of the conical grate member of Fig. 1, showing the preferred form of air discharge openings therein.

Referring now to Fig. 1, the lower portion of a cylindrical furnace wall is indicated at 10 for enclosing the fire bed of the waste material 11. Within the central portion of the bottom of the furnace, a generally conical and upstanding grate portion 12 may be mounted as shown, upon a rotatable base 13. The base 13 may in turn be carried in a rotatable pan structure including a bottom portion 14 supported on an annular ball race means or other anti-friction means as at 15 and adapted to be rotated by a peripheral annular gear 16 engaging a motor driven pinion (not shown).

Beneath the center of the grate base, an air duct 17 may be provided adapted to be connected to a suitable source of heated air under some pressure, which heated air is supplied to the interior of the grate 12 and its base 13 and is discharged through apertures as at 18 into the fire bed.

In the arrangement as shown in Fig. 1, while the base of the grate 13 may be mounted for rotation on a substantially vertical axis comprising preferably also the vertical axis of the furnace, yet the conical grate portion 12 preferably has an axis which diverges upwardly somewhat from the axis of the furnace and grate base, for instance, by a small angle as indicated at 19. This feature comprises the subject matter of the copending application of John P. Robertson, Ser. No. 342,890, filed on even date herewith, wherein same is described in further detail.

The uppermost portion of the conical grate may comprise a separable piece 20 of spherical shape, and having perforations as at 21, and also having

a flanged and bolted connection as at 22 with the main body of the cone. The lower peripheral portion of the cone may be cylindrical as at 23 and provided with a flange as at 24 for connection with a corresponding flange on the base 13, which may also be cylindrical at least at its upper portions. The lower portions 25 of the base 13 may extend outwardly, i. e., as a horizontal segment of a cone, and downwardly to points where it merges with the base of the pan 14.

The lower edge of the furnace wall 10 may be provided with a downwardly and outwardly flared apron portion as at 26 for extending into a body of water and ash or residue in the pan. The annular space between the apron 26 and the base of the conical grate affords a place for the ash and residue to gradually pass down into the pan.

The pan may be formed with side walls extending upwardly and outwardly as at 27 and for reasons which will hereinafter be apparent, the inside wall surfaces of these side walls preferably conform to the surface of a sphere having its center within or adjacent the upper portion of the conical grate.

For removing the ash and other residues from the pan, two or more oscillatable scoops as at 28 may be provided, each being supported by an arm as at 29 and operated by an ocillatable shaft as at 30. As shown in Fig. 1, the shaft 30 preferably extends inwardly toward the furnace and upwardly somewhat, substantially along a radius of the sphere to which the pan walls conform. This will enable the scoops 28 to be so oscillated in a swinging movement, that they normally remain in contact with the inside surfaces of the pan wall substantially throughout their arcuate movement. The shaft 30 may be oscillated for example by rack and pinion segment means 31, 32 (Fig. 2), the rack being slidably operated by pistons 33, 34 actuated in cylinders 35, 36 by fluid pressure, controlled in any desired manner familier to those skilled in the art of oscillating pumps, for example.

The shaft 30 may be carried at its inner end by bearing means 37 and the overhanging end of the shaft 38 (Fig. 4) may have fixed thereto a yoke-like member 39 carrying four rollers as at 40, 41, 42, 43 (Figs. 2, 4, 5). The upper end of the arm 29 for supporting the scoop may be formed with an increasing width or with a generally triangular portion as at 44, and the upper side edges of this portion are adapted normally to rest upon the rollers 42, 43, whereas the rollers 40, 41 normally bear against the edges of the arm 29, intermediate its ends. In order to retain the upper portion 44 of the arm 29, between the rollers 42, 43, the pins which carry these rollers may be interconnected as by a bar 45. The lower rollers 40, 41 may be provided with flanges as at 46 (Fig. 4) for similarly holding the mid portion of the arm 29 against displacement in directions toward the furnace.

It will be apparent that the above described arrangement including the rollers 40—43, comprises a lost motion connection between the scoop arm 29 and the oscillating shaft 30, whereby in the event the scoop should engage an irregular obstacle in the pan, the scoop and arm may rise vertically (or radially of shaft 30) to ride over the obstacle and at the same time the arm 29 and scoop may move somewhat angularly with respect to the shaft 30. That is, as the arm 29 rises, if an obstacle is engaging the righthand side of the scoop (Fig. 2), then the arm 29 will ride up in contact with roller 40, and the triangular portion 44 will ride up in contact with roller 43, and out of contact with roller 42, thus permitting the arm and scoop to lag somewhat in their oscillating movement as compared with the shaft 30. Similarly, if an obstacle engages the lefthand side of scoop 28, the arm 29 will ride up in contact with roller 41, and the triangular portion 44 will ride up in contact with the roller 42 and out of contact with roller 43. After the obstacle in the pan is thus surmounted, scooped out or thrust aside temporarily, then the arm 29 and the scoop may drop back to their normal positions. It will be apparent that this form of connection permits the scoop when engaging an irregular incombustible obstacle in the ash, to assume an arcuate path of travel sufficiently different from its normal path, if necessary, to prevent jamming or breaking of the scoop and its operating connections. And if the obstacle is not at first scooped out of the pan, it will be repeatedly attacked by the scoop in various positions so that it will soon be removed.

Each of the scoops 28 may comprise a bottom plate as at 50 preferably arcuate in form, that is, with its ends curved upwardly and made pointed as at 51 (Fig. 5). The scoop may also have three wall portions as at 52, 53, 54 extending in a normally generally vertical direction in respect to the bottom plate and forming a housing-like structure of triangular horizontal cross section, with the wall portions 52, 53 substantially converging at or adjacent the inside spherical wall surface of the pan 27. Each of the plates 52, 53 may be formed with flanges along their upper edges as at 52', 53' whereby the plates 52, 53 respectively, together with these flanges and the protruding portions of the bottom plate 50, in effect form chutes from which the material is discharged from the scoop when the scoop is oscillated in either direction to its uppermost positions as shown by the dotted lines in Figs. 2 and 3.

The scoop supporting arms 29 as shown in Figs. 2 and 3 may be pivotally connected as at 60 to the scoops. For this purpose a short shaft or pin 61 may be mounted in a pair of cross plates as at 62, 63 which may in turn be fixed at their ends to the plates 52, 53. A pair of cross bars or strips as at 64, 65 may be secured to the top edges of the plates 62, 63 for engaging the side edges of the supporting arms 29 to limit the range of possible pivotal movement of the scoop in respect to its supporting arm. The edges of the plates 50, 52, 53 which abut the inside wall surface of the pan 27 are made arcuate as shown, so as to contact uniformly with the interior spherical wall surfaces of the pan.

It will be apparent that with the scoops and oscillating supports as shown, the scoops may be oscillated in either direction from their normal lowermost position (Fig. 2), to the locations indicated by dotted lines at the upper peripheral edge of the pan. In view of the radial position of the operating shaft 30 in respect to the pan surfaces, the scoops will normally follow closely the spherical contour of the pan wall and thereby scoop the residue up along the inside wall surface of the pan and then discharge same by gravity over the upper edge of the wall and into ash or residue receivers as at 70, 71. Since the oscillating shafts 30 are directed inwardly and somewhat upwardly of the furnace, the scoop arms 29 oscillate generally in a plane extending upwardly and outwardly of the annular space between the pan edge and the furnace wall.

Thus, the scoops 28 in following their arcuate paths, are able at their lowermost positions to enter the space below the lower furnace wall portions 26 and hence dislodge and remove any large or irregular articles which might otherwise remain fast and obstruct the movement of ash from the fire bed.

Various features of construction of the furnace and its associated parts in so far as same are not hereinabove specifically referred to, may if desired be made in accordance with the constructions shown or described in U. S. Patent No. 2,171,538, reference to which is hereby directed.

While the invention has been described in detail with respect to a particular preferred example, it will be understood by those skilled in the art after understanding the invention that various changes and modifications may be made without departing from the spirit and scope of the invention, and it is intended therefore in the appended claims to cover all such changes and modifications.

What is claimed as new and desired to be secured by Letters Patent is:

1. In a furnace construction, the combination of a rotatable annular ash pan adapted for receiving water to seal the lower portion of the furnace against escape of gases or dust, a substantially concentric annular furnace wall having an annular portion for depending into the water, the periphery of the pan being spaced from such wall, to afford access of ash-removing means to the pan, ash-removing means extending down in the resulting space to points beneath said wall portion, and means for oscillatably mounting said ash-removing means about an axis directed inwardly toward the furnace and upwardly whereby the ash-removing means oscillates along a plane directed upwardly and outwardly of the furnace.

2. Apparatus for removing unburned material from a rotating circular ash pan of a furnace, comprising a scoop member, a supporting arm connected at one end to said member, an oscillatable shaft extending generally at right angles to said arm, and means for connecting the other end of said arm to said shaft whereby the scoop member may be oscillated along a generally arcuate path at the inside wall surface of the pan for scooping the material up along its inside wall surface and for then discharging such material over the upper peripheral edge of the pan, said connecting means including guide portions at each side of said arm for variable contact with the arm and permitting movement of the scoop and arm radially of the shaft when obstacles in the pan tend to raise the scoop from its normal arcuate path.

3. Apparatus for removing unburned material from a rotating circular ash pan of a furnace, comprising a scoop member, a supporting arm connected at one end to said member, an oscillatable shaft extending generally at right angles to said arm, and means for connecting the other end of said arm to said shaft whereby the scoop member may be oscillated along a generally arcuate path at the inside wall surface of the pan for scooping the material up along said inside wall surface and for then discharging such material over the upper peripheral edge of the pan, the upper portion of said arm being of increasing width and said connecting means including guide portions at each side of the arm for variable contact therewith respectively at arm portions of different widths, permitting limited movement of the scoop and arm radially and angularly of the shaft when obstacles in the pan engage the scoop.

4. Apparatus for removing irregular material from a moving receptacle, comprising an oscillatable shaft, an arm depending therefrom, a scoop member attached to said arm, and means for connecting said arm to said shaft while permitting limited movement of the scoop and arm radially and angularly of the shaft when the scoop engages obstacles.

5. Apparatus for removing irregular material from a moving receptacle, comprising an oscillatable shaft, an arm depending from the end of said shaft, the upper portion of said arm being of increasing width transversely of the shaft, a scoop member attached to said arm, and means for connecting said arm to said shaft comprising a member fixed to the shaft and carrying arm guide portions for variably contacting respectively with arm portions of different widths, permitting limited movement of the scoop and arm radially and angularly of the shaft when the scoop engages obstacles.

6. Apparatus for removing irregular material from a moving receptacle, comprising an oscillatable shaft, an arm depending from the end of said shaft, the upper portion of said arm being of increasing width transversely of the shaft, a scoop member attached to said arm, and means for connecting said arm to said shaft comprising a member fixed to the shaft and carrying two pairs of spaced guide rollers, said pairs of rollers respectively contacting with arm portions of different widths permitting limited movement of the scoop and arm radially and angularly of the shaft when the scoop engages obstacles.

7. Apparatus for removing irregular material from a rotating circular pan, comprising a scoop member, means for mounting and operating said member to oscillate along a generally arcuate path at the inside wall surface of the pan for scooping the material up along said wall surface and for then discharging same over the upper peripheral edge of the pan, said scoop member including means pivotally connecting same along a generally horizontal axis, to said mounting means.

8. Apparatus for removing irregular material from a rotating pan, comprising a scoop member, an arm, from the lower end of which the scoop depends, and means for mounting and operating said arm to oscillate the scoop along a generally arcuate path at the inside wall surface of the pan for scooping the material up along said wall surface and for then discharging same over the upper peripheral edge of the pan, said scoop comprising a bottom plate, a pair of plate members normally upstanding from said bottom plate at angles whereby they converge toward said inside wall portion, and whereby when the scoop is oscillated in either direction to positions adjacent said upper edge of the pan, one of said pair of plate members forms a chute from which the material is discharged over said pan edge.

9. Apparatus for removing irregular material from a rotating pan, comprising a scoop member, an arm, from the lower end of which the scoop depends, means for mounting and operating said arm to oscillate the scoop along a generally arcuate path at the inside wall surface of the pan for scooping the material up along said wall surface and for then discharging same over the upper peripheral edge of the pan, said scoop comprising a bottom plate, a pair of plate members

normally upstanding from said bottom plate at angles whereby they converge toward said inside wall portion, and whereby when the scoop is oscillated in either direction to positions adjacent said upper edge of the pan, one of said pair of plate members forms a chute from which the material is discharged over said pan edge, and means between said converging pair of plate members for pivotally attaching the scoop to said arm.

10. Apparatus for the discharge of unburned residues from a furnace comprising a rotatable ash pan having an upwardly and outwardly extending peripheral wall substantially conforming to the surface of a segment of a sphere, a generally coaxial furnace wall portion depending into said pan in spaced relation to said wall, means in the resulting annular space for removing the residues from the pan, including a scoop member, means for mounting and operating said scoop member to normally swing along a generally arcuate path about an axis extending above the pan inwardly and upwardly substantially along a radius of the sphere to which said pan wall conforms, whereby the scoop in its lowermost position is below said furnace wall portion and as it swings upward in either direction, substantially follows the contour of said pan wall, for scooping the residue up along the inside surface of the pan wall and discharging same over the upper edge of such wall.

11. In combination with a furnace for burning waste material and producing ashes with irregular incombustible objects therein, a rotating ash pan having upwardly extending peripheral walls, a furnace wall having lower portions depending into the pan in spaced relationship to, and generally coaxial with the pan walls, and means extending into the resulting annular space for removing said ash and objects from the pan, said means comprising an arm extending down into such space, a scoop member secured to the lower end of said arm, means for oscillatably supporting said arm whereby the scoop swings in a generally arcuate path along said annular space and along the inside wall surfaces of the pan for scooping the ash and objects up along said wall surfaces and discharging same over the upper edges of the pan walls.

12. Apparatus for removing unburned material from a rotating circular ash pan of a furnace, comprising a scoop member, a supporting arm connected at one end to said member, an oscillatable shaft positioned over the pan and extending generally radially thereof, and means connecting the other end of said arm to said shaft whereby the scoop member swings in a generally arcuate path along the inside wall surface of the pan for scooping the material up along said surface and discharging same over the upper peripheral edge of the pan.

13. Apparatus for removing irregular material from a rotating circular pan, comprising a scoop member, means for mounting and operating said member to oscillate along a generally arcuate path at the inside wall surface of the pan for scooping the material up along said wall surface and for then discharging same over the upper peripheral edge of the pan.

14. Apparatus for removing unburned residues from a furnace, comprising a circular ash pan rotatably mounted in respect to an axis extending vertically of the center of the pan, said pan having an upwardly and outwardly extending peripheral wall, a scoop member, means for mounting and operating said member to normally swing along a generally arcuate path about an axis extending generally radially of the pan and above the pan edge, said scoop member and said means being so constructed and arranged that the scoop in its lowermost position is closely adjacent the pan wall and as it swings upward in either direction, remains close to the outwardly extending pan wall, for scooping the residues up along the inside surface of said wall and discharging same over the upper peripheral edge of the wall.

15. Apparatus for removing unburned material from an annular rotating ash receiver of a furnace, comprising means oscillatable back and forth in an arcuate path extending generally along the periphery of the receiver, for thrusting the material over the peripheral edge of the receiver, and from succeeding surfaces of the receiver as the latter rotates past said means.

16. Apparatus for removing unburned residues from a furnace, comprising a circular ash pan rotatably mounted in respect to an axis extending vertically of the center of the pan, said pan having an upwardly and outwardly extending peripheral wall substantially conforming to the surface of a segment of a sphere, a scoop member, means for mounting and operating said member to normally swing along a generally arcuate path about an axis extending above the pan and substantially along a radius of the sphere to which said pan wall conforms, said scoop member and said means being so constructed and arranged that the scoop in its lowermost position is closely adjacent the pan wall and as it swings upward in either direction, remains close to the outwardly extending pan wall, for scooping the residues up along the inside surface of said wall and discharging same over the upper peripheral edge of the wall.

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