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Anderson et al.

[11] **3,882,803**

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[54] **GRATE STRUCTURE FOR INCINERATION PLANTS**

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[52] **U.S. Cl.** ..... **110/18 R**; 110/38; 110/109

[51] **Int. Cl.** **F23b 1/22**

[58] **Field of Search** ..... 110/8 R, 15, 18 R, 38, 110/109

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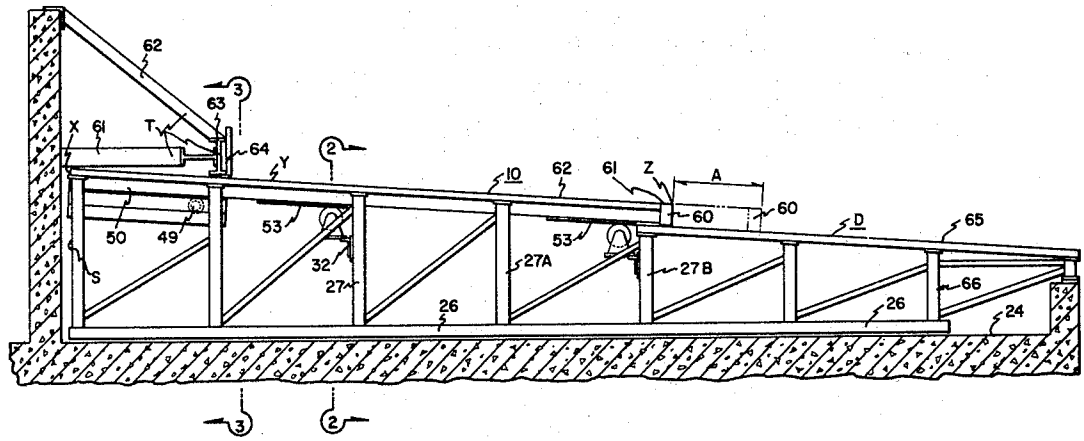
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Primary Examiner—Kenneth W. Sprago

[57] **ABSTRACT**

A combination fixed and movable grate structure wherein the latter reciprocates back-and-forth to advance materials dropped thereon onto a discharge or other fixed grate. Rollers or roller bearings support the movable plate or grate structure such that the same may be conveniently reciprocated back-and-forth. A stationary plate as well as a movable kicker plate coact together with the moving structure to advance in increments municipal waste deposited thereon.

9 Claims, 7 Drawing Figures



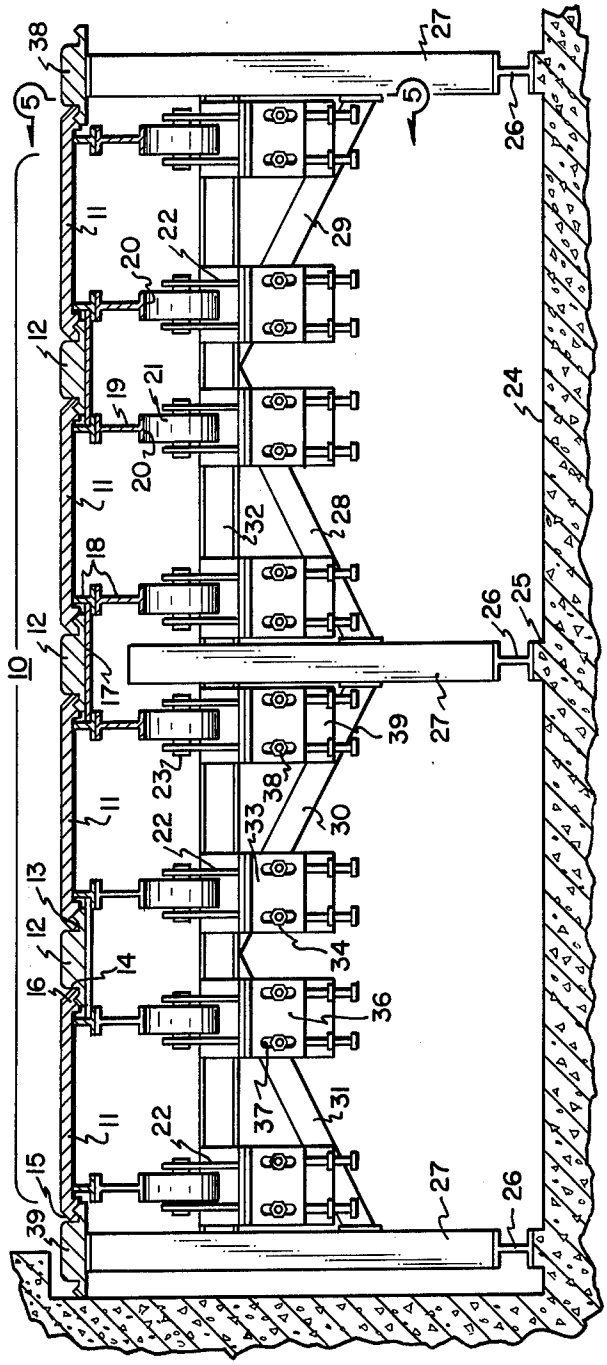


FIG. 2

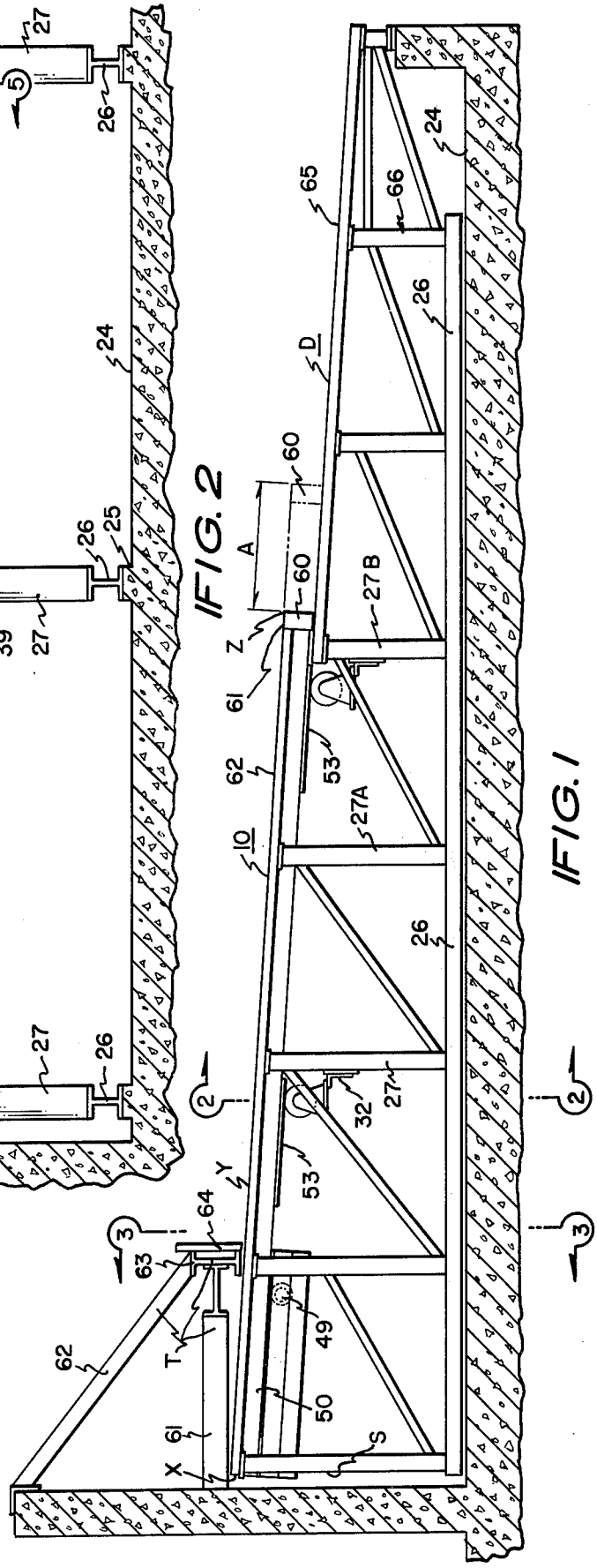


FIG. 1

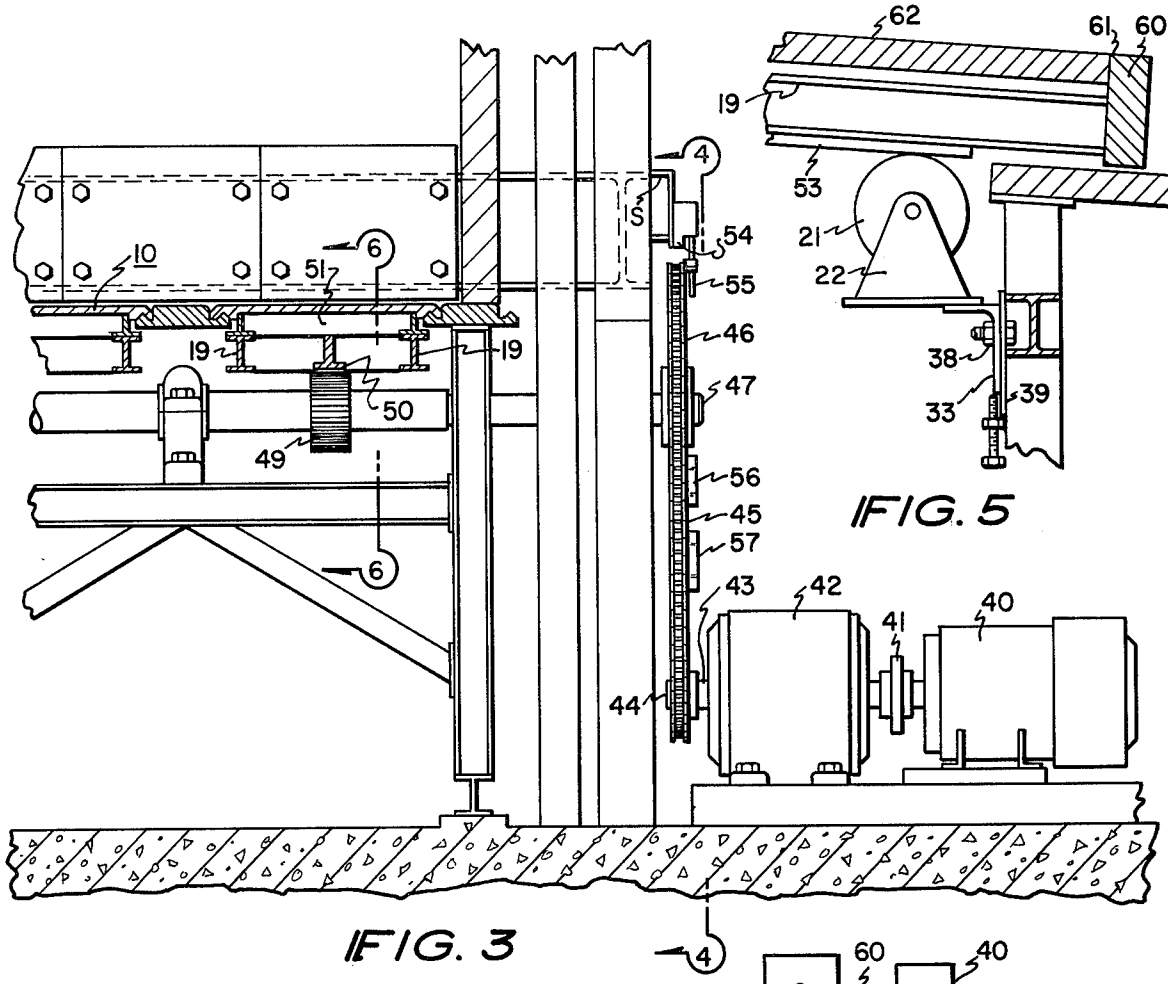


FIG. 5

FIG. 3

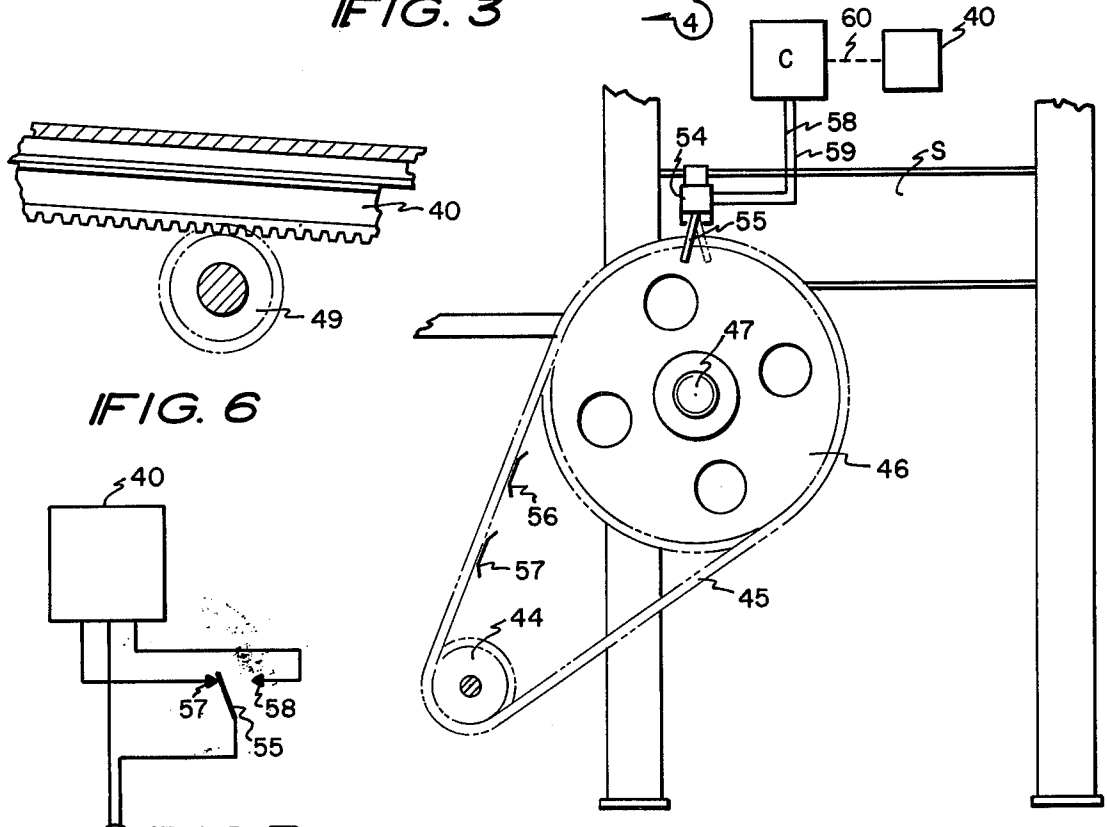


FIG. 6

FIG. 7

FIG. 4

GRATE STRUCTURE FOR INCINERATION PLANTS

The present invention relates to incinerator systems and, more particularly, to a new and improved incinerator system and grate system therein wherein waste debris as the same is being incinerated is advanced in an appropriate and convenient manner.

For a variety of reasons, endless belt structures in the past necessitated for continuous throughput operations have had marked disadvantages. Among these include physical support for the elongate structure desired, journalling, heat warpage, and so forth. What is needed is the provision of a structure providing continuous throughput wherein the moving structure is reduced in physical size.

In the present invention, both fixed and movable support-plate or support-grate structures are provided. As to the movable support plate structure, the same includes means for reciprocating the same back-and-forth, this in combination with an integral kicker plate operably related with and physically connected to the same as well as a stationary plate for precluding the rearward advance of materials once deposited thereon. Accordingly, as municipal waste or other debris is deposited onto the movable support plate structure of the invention, the same is advanced forwardly by the movable plate until the same drops onto a fixed plate or grate structure. The deposit of materials onto the receiving end of the movable support plate structure, in conjunction with an incorporated reaction baffle, precludes the rearward advance of materials previously deposited and rather aids in insuring that the debris advances continually forwardly in a series of successive steps. Bearing or support roller structure is provided and is adjustable so that the plate structure may be properly aligned. Additionally, the movable support plate structure is fragmented into support plates and intermediate support members, such that manufacturing costs may be reduced to a minimum and ultimate design optimized.

Accordingly, a principal object of the present invention is to provide a new and useful grate structure for incinerators.

An additional object is to provide a means for advancing materials from a reciprocating plate or grate structure to fixed plate or grate structure.

A further object is to provide reciprocating grate structure having both a kicker plate and a fixed plate designed such that discrete successive advances forwardly of trash material are effectuated, with debris travel in a reverse direction being impeded by the fixed plate structure provided.

The features of the present invention may best be understood by reference to the following description taken in connection with the accompanying drawings in which:

FIG. 1 is a side elevation illustrating one embodiment of the present invention.

FIG. 2 is an enlarged, fragmentary detail, seen in transverse vertical section, and taken along the line 2—2 in FIG. 1.

FIG. 3 is an enlarged, fragmentary transverse section taken along the line 3—3 in FIG. 1 and illustrating the rack and pinion intercooperation in producing the reciprocation of the movable plate desired.

FIG. 4 is an enlarged, fragmentary detail taken along the line 4—4 in FIG. 3 and illustrating a representative drive mechanism for the structure.

FIG. 5 is an enlarged, fragmentary detail taken along the line 5—5 in FIG. 2 and illustrating a representative structure by which bearing pads may be provided underneath the reciprocating structure.

FIG. 6 is an enlarged, fragmentary detail of representative rack and pinion structure utilized in the invention in a preferred embodiment thereof.

FIG. 7 is a simplified electrical schematic of representative circuitry that may be used with the reversing motor of the present invention such that a reciprocation of the movement of the rack and pinion combination provided may be obtained to achieve a longitudinal reciprocation of the movable plate or grate structure.

In FIGS. 1 and 2 the support plate structure **10** includes plural support plates **11** each supported by an intermediate support member **12.** Support member **12** may be longitudinally grooved at its side margins at **13** and **14** as indicated to receive, in securement fashion, the overlapping of margins **15** and **16,** respectively, of the individual support plates. Support members **12** themselves are supported by transversely extending means such as crossbars **17,** the latter being bolted, welded or otherwise secured to structures **18.** The lower portion of the same may comprise an I beam **19** the lower surface **20** of which provides a supporting bearing surface for respective roller bearing **21.** Respective bifurcated roller bearing mounts **22** journal each roller bearing **21** by conventional pin **23.**

A concrete bed **24** includes upstanding footings **25** on which rest longitudinal I-beams **26.** These support structural beams **27** and the latter may include welded cross-braces **28–31** that are welded in place. Cross-member **32** likewise may be welded to the structure to rigidly support the same. Either the angle brackets **32,** cross-braces **29–31,** or other structure may be supplied with brackets **33** welded to or otherwise affixed to bifurcated roller bearing mounts **22.** It is desirous that the roller bearings be adjustable as to height so as to accurately position the several I-beams **19.** Accordingly, adjustment means **34** may be provided. These can comprise specific slotted plates **36** that include vertical elongate apertures **37.** Bolt and nut attachment means **38** are disposed through the slots and to base mounting plates **39** that may be provided, the same having corresponding but circular apertures receiving the nut and bolt attachments aforesaid.

By such structure it is clearly seen that each of the roller bearings may be raised and lowered such that the upper peripheral surface thereof accurately engages the under-surface **20** of representative I-beam **19.** Outer members **38** and **39** can resemble intermediate members **12** and may be either affixed to their supports or journaled to and thereby being made movable with the remainder of support structure **10.** In any event, these members **38** and **39** comprise effective closures such that waste debris is as deposited on the movable support plate structure will not proceed down into the roller bearing area.

Additional braces 27A, 27B and so forth may be provided the structure as indicated.

What is important, see FIG. **1,** is that the support plate structure **10** moves, that is reciprocates back-and-forth as indicated by the arrow A. This reciprocation

structure is disclosed in FIGS. 3–6 and will now be described.

In FIG. 3 motor 40 includes a flexible coupling 41 which is connected to conventional gear reducer 42. The output shaft 43 of the latter includes a sprocket 44 that is connected by sprocket chain 45 to enlarged sprocket 46. The enlarged sprocket 46 is pinned or otherwise secured to the shaft 47 and the latter includes one or more pinions 48 keyed to shaft 47. Shaft 47 proceeds in opposite rotational displacement as shall be hereinafter pointed out. In any event, the pinions 49, one or more being employed upon shaft 47, engage respective rack gears 50 that are welded, bolted or otherwise secured to the structure 51 including representative I-beams 19. Thus, the rotational displacement in opposite directions of shaft 47 will be translated by the rack and pinion combination into a reciprocating translational movement of the entire support plate structure 10 by virtue of the reciprocating movement of one or more racks 50 in the structure to which these are affixedly mounted. FIG. 6 illustrates a representative rack and pinion engagement that can be utilized. In referring to FIG. 1 and FIG. 3, it should be observed that preferably at least two rack and pinion combinations will be used, one on either side of the structure as shown by representative combination in FIG. 3. More may be used if required. FIG. 5 illustrates a roller bearing structure as at 21 and 22 which is adjustably secured via nut and bolt attachments 38, see FIG. 5, to support plate 39 which is welded to the structure. If desired, a bearing pad 53 is welded or otherwise secured as shown in FIG. 5 to a representative I-beam 19, this to provide for a wear plate for the supporting engagement thereof by roller bearing 21.

It will be understood that a coupling motor or prime mover 40 to shaft 47 will be of the reciprocating type. The particular manner of electrical or other reciprocation effected or used in the invention forms no part thereof. There are many types of motors and motor-structure combinations which provide reciprocating motion to a shaft. Thus, if a microswitch as at 54 may be employed and be secured to fixed structure S, then the operating finger 55 thereof may be selectively engaged by actuators 56 and 57 attached to the sprocket chain 45. These actuators will of course be out of line of the sprockets but merely be adapted to engage microswitch finger 55. Accordingly, actuation of the microswitch is achieved in one direction by actuator 56 and in the reverse direction by actuator 57. Circuit C will be coupled by electrical leads 58 and 59 to the microswitch and will be coupled via 60 to motor or prime mover 40.

FIG. 7 illustrates a representative electrical circuit that can be used for reversing motor 40. The same may include a three-wire input, with contacts 57 and 58 being alternately engageable by microswitch arm 55. There are many ways of accomplishing this other than the specific circuit shown in FIG. 7. Circuit C may comprise FIG. 7.

Continuing on with the structure of FIGS. 1, 2 and 5, it will be noted that a kicker plate in the form of a cross-member 60 is provided and may be welded or otherwise secured to the series of I-beams 19 and be flush at 61 with the upper surfaces 62 of support plates 11.

In operation, the reciprocation of revolving rod 47 produces a corresponding translational reciprocation of racks 50 and the support structure keyed to the same. This in turn produces a reciprocation of I-beams 19 over roller bearings 21. Thus, the entire support plate structure 10 moves forwardly and rearwardly in a reciprocating manner. It is noted in FIG. 1 that the entire support plate structure 10 is sloping. Furthermore, stationary structure T, comprising braces 61, 62 and 63 includes a fixed plate or reaction baffle 64, see FIG. 1. Thus, as the upper support plate structure 10 reciprocates back-and-forth, and as material is dropped immediately forwardly of plate 64, to the right thereof as seen in FIG. 1 the material will progressively advance being moved by the former in a longitudinal direction over the support plate structure 10 of FIG. 1 (to the right), at which point it descends over a kicker plate 60. The reciprocation of kicker plate 60 through the distance A will further advance the material over the bed structure D, though fixed, in a progressively incremental manner. The bed structure D may be informed in various ways but generally will include a plate 65 welded and supported to suitable structure 66 as indicated in FIG. 1 and including the upstanding beams 27B.

What is provided hence is a new way of advancing municipal waste or other debris in a manner such that the same, upon falling on receiving area Y, is continuously advanced forwardly, in incremental manner, by a reciprocating grate structure moving the material, via fixed and movable plates 64 and 60, in a direction from end X to end Z of the movable support plate structure.

For convenience of illustration, enclosure structure for the grate structure, fuel supply and firing jets, being conventional, are not shown.

While particular embodiments of the invention have been shown and described, it will be obvious to those skilled in the art the various changes and modifications which may be made without departing from the essential features of the present invention and, therefore, the aim in the appended claims is to cover all such changes and modifications as fall within the true spirit and scope of the invention.

We claim:

1. A grate installation for incinerator plants including, in combination, a reciprocable support plate structure having forward and rear ends and a receiving area proximate the latter for receiving materials dropped from above thereon; structural means for supporting said support plate structure for back-and-forth movements thereover; fixed upright reaction baffle means transversely disposed above said support plate structure proximate and rearwardly of the receiving area thereof; means for translationally reciprocating said support plate structure, said baffle means comprising the sole means, with the dropping of succeeding materials, for advancing prior-dropped materials forwardly along said support plate structure; and bed structure operably disposed forwardly of and overlapping underneath the forward end of said support plate structure, said support plate structure having transverse kicker plate means at its forward end for advancing forwardly materials dropping over said forward end of said support plate structure onto said bed structure.

2. The grate installation of claim 1 wherein said reciprocable support plate structure comprises a series of longitudinally parallel plates and a series of longitudinally intermediate members supporting said plates, said

intermediate members operably and translationally bearing upon said structural means.

3. The grate installation of claim 1 wherein said structural means includes plural solely planar, raised roller bearing means for engaging and thereby supporting for translational movement said support plate structure.

4. The grate installation of claim 1 wherein said support plate structure includes wear plate means affixed to and disposed on the underneath side thereof, said structural means for supporting said support plate structure including solely planar upstanding bearing means for engaging said wear plate means.

5. The grate installation of claim 1 wherein said translationally reciprocating means comprises rack means keyed to said support plate structure for movement therewith, shaft means including pinion means engaging said rack means, and means for revolving said shaft.

6. Structure according to claim 5 wherein said means for revolving said shaft comprises a reversible motor, and means for initiating and limiting the revolvement travel of said motor at its output in both directions.

7. The grate installation of claim 1 wherein said reciprocable support plate structure includes plurar longitudinal intermediate structures, said structural means including means for bearingly supporting said intermediate structures, and longitudinal plate means longitudinally spanning said intermediate structures.

8. A grate installation for incinerator plants including, in combination, a reciprocable support plate structure having forward and rear ends and a receiving area proximate the latter for receiving materials; structural means for supporting said support plate structure for back-and-forth movements thereover; reaction baffle means transversely disposed above said support plate structure proximate and rearwardly of the receiving area thereof; means for translationally reciprocating said support plate structure; and bed structure operably disposed forwardly of and overlapping underneath the forward end of said support plate structure, said support plate structure having transverse kicker plate means at its forward end for advancing forwardly materials dropping over said forward end of said support plate structure onto said bed structure, said structural means including plural, raised roller bearing means for engaging and thereby supporting for translational movement said support plate structure, and wherein said engaging and supporting means are adjustable in height, whereby to adjust the planar disposition of said support plate structure.

9. A grate installation for incinerator plants including, in combination, translational, reciprocating means for receiving materials dropping thereon from a separate source disposed thereabove and having a forward end; upright fixed baffle means positioned above said reciprocating means for impeding rearward travel of said materials and for defining a baffle boundary of materials to be subsequently dropped upon said reciprocating means as the latter is successively advanced forwardly in its operating cycle, said reciprocating means including a forward kicker plate at said forward end, bed structure operably disposed beneath the forward end of said reciprocating means and structurally configured such that said kicker plate operates to successively advance materials, advancing over the forward end of said support structure, onto said bed in a series of successive pushing steps, and means for reciprocating said support structure along a direction between said baffle means and said kicker plate.

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