Oct. 1, 1968 R. J. PIOCH 3,403,620

LOADING AND COMPACTING APPARATUS PARTICULARLY FOR REFUSE

Original Filed Aug. 24, 1965 4 Sheets-Sheet 1

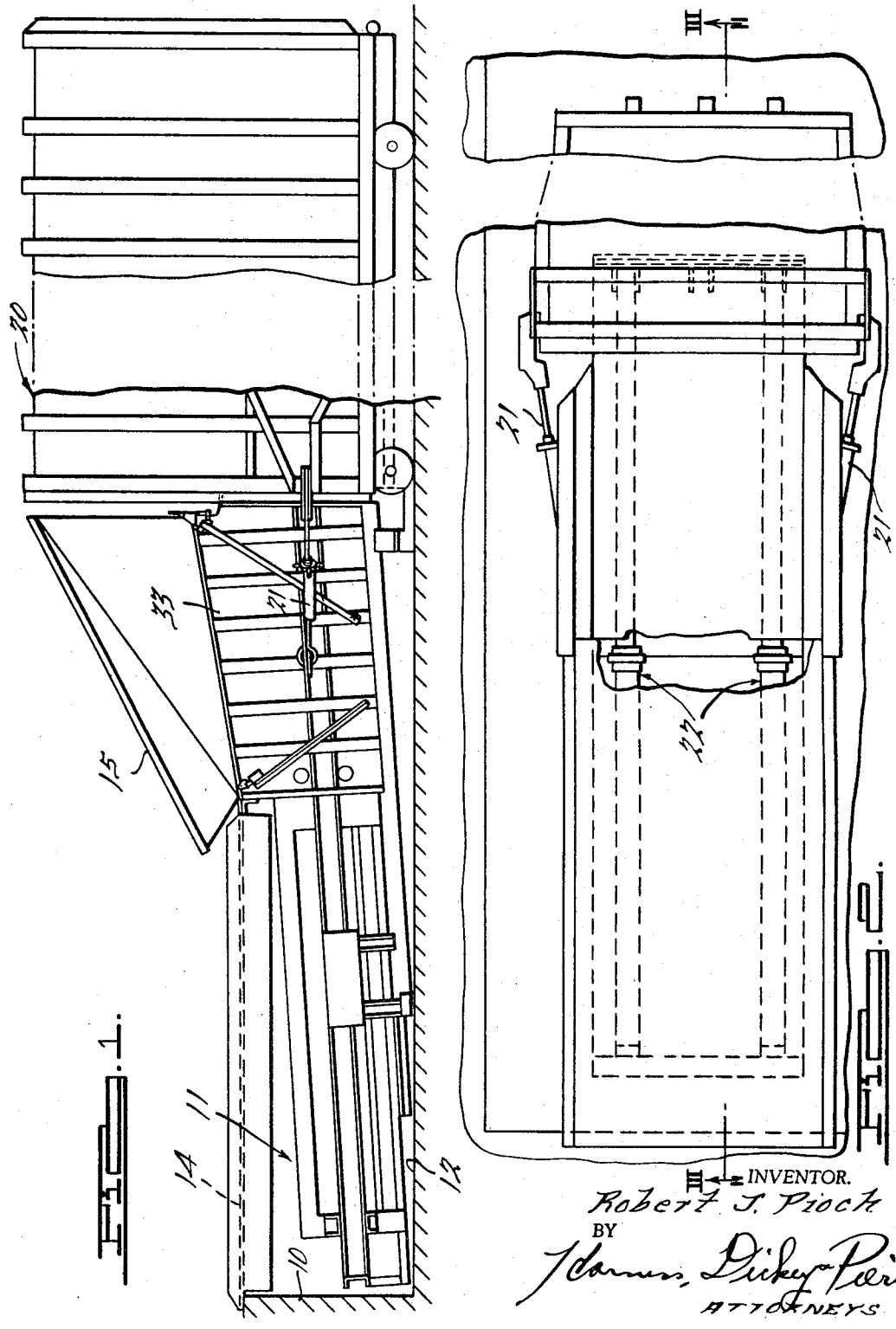


Fig. 1

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LOADING AND COMPACTING APPARATUS PARTICULARLY FOR REFUSE

Original Filed Aug. 24, 1965 4 Sheets-Sheet 2

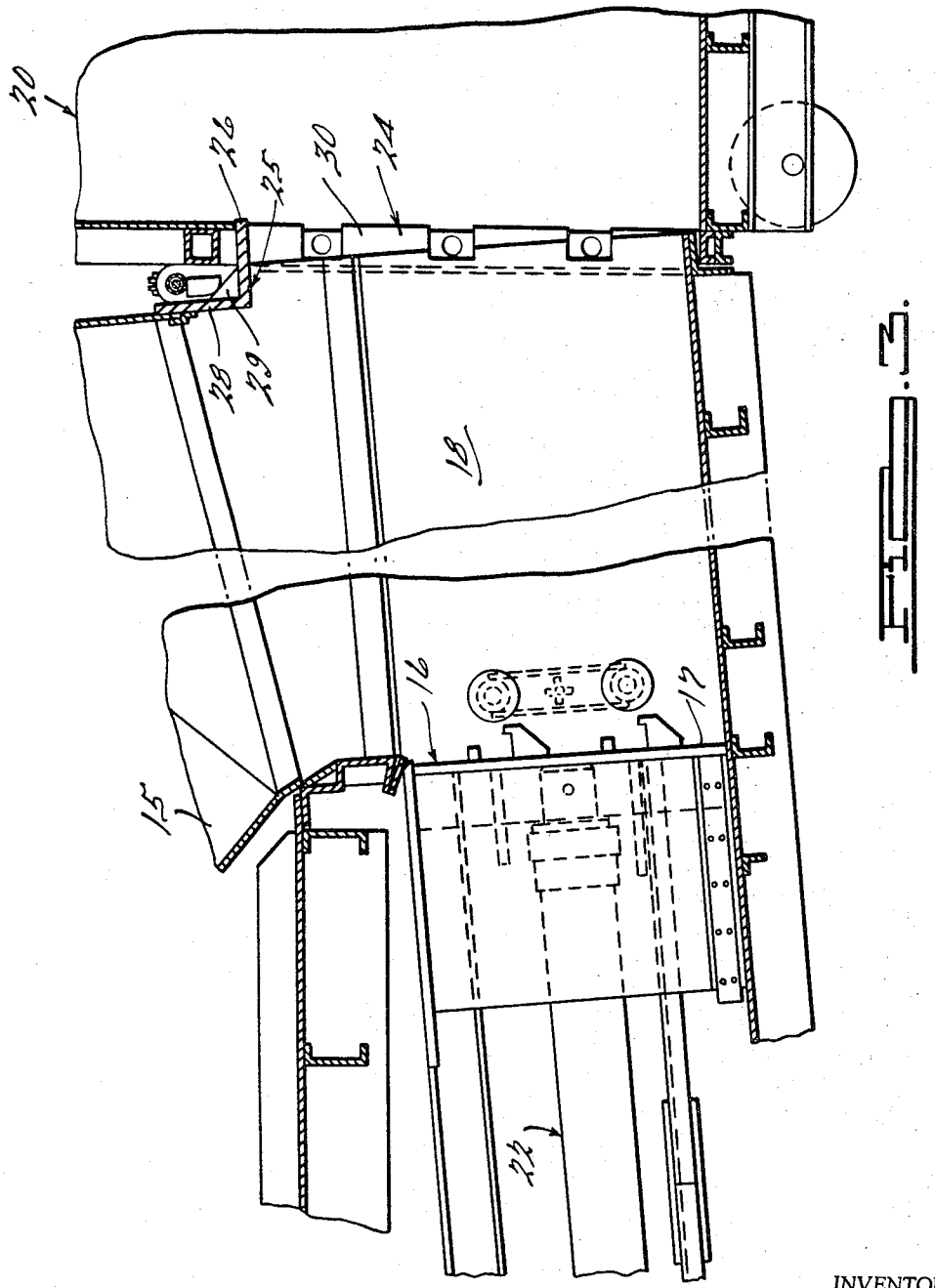


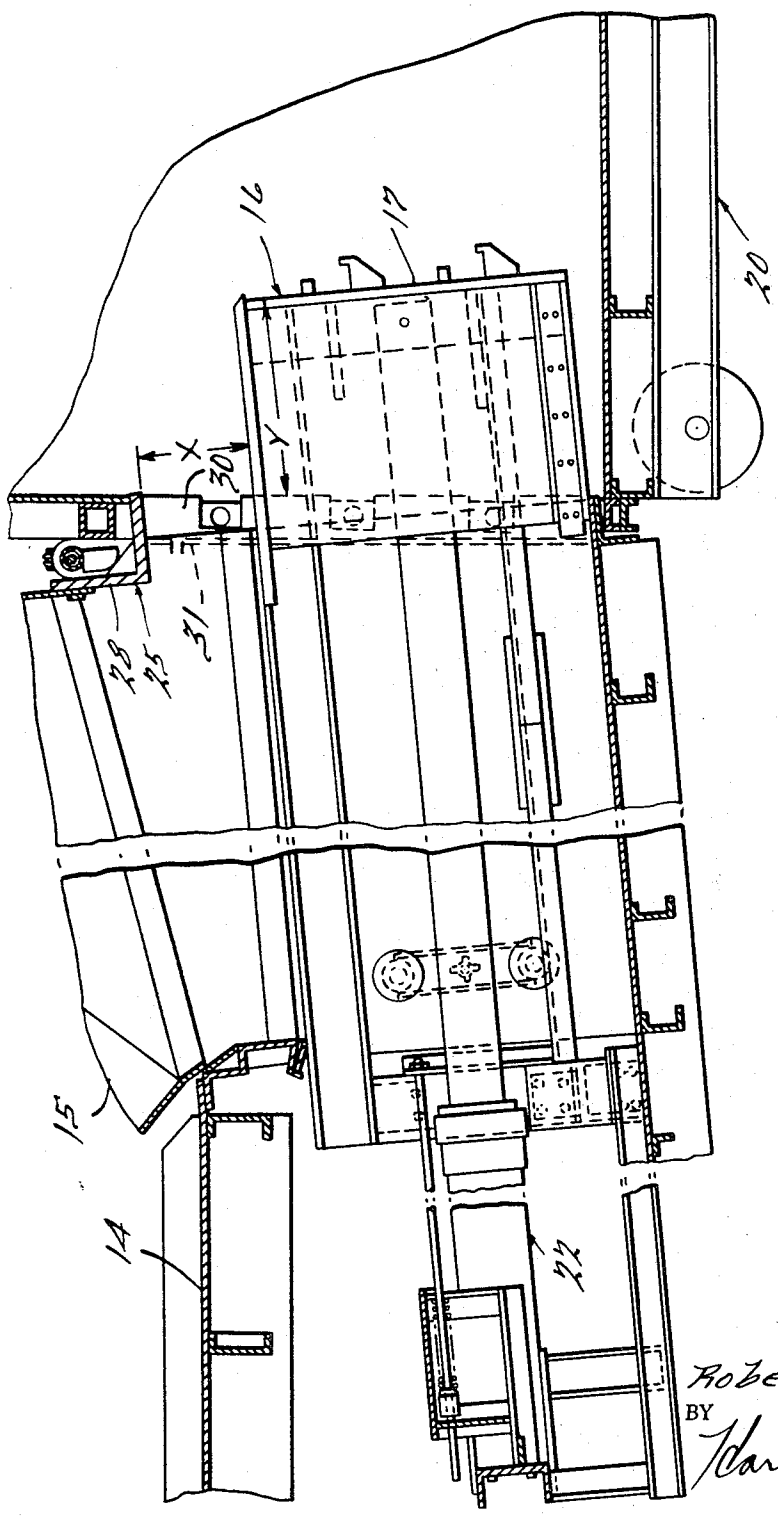
Fig. 2

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LOADING AND COMPACTING APPARATUS PARTICULARLY FOR REFUSE

Original Filed Aug. 24, 1965 4 Sheets-Sheet 3





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LOADING AND COMPACTING APPARATUS PARTICULARLY FOR REFUSE

Original Filed Aug. 24, 1965 4 Sheets-Sheet 4

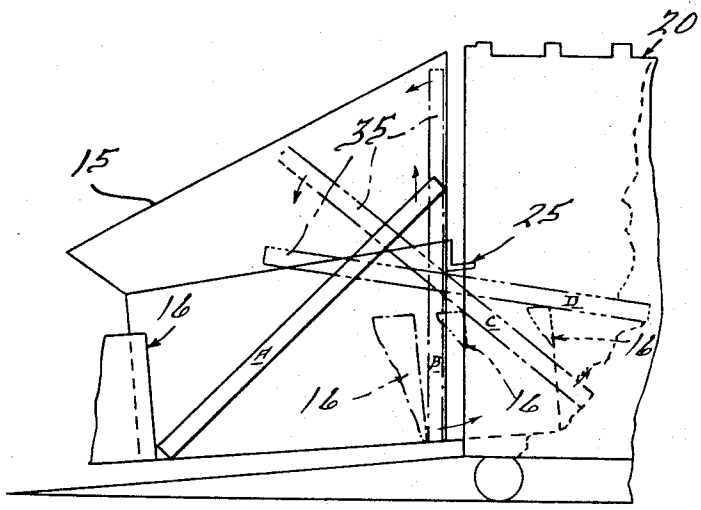


FIG. 5.

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United States Patent Office 3,403,620
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3,403,620

LOADING AND COMPACTING APPARATUS PARTICULARLY FOR REFUSE

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Original application Aug. 24, 1965, Ser. No. 482,080, now Patent No. 3,289,572, dated Dec. 6, 1966. Divided and this application June 20, 1966, Ser. No. 558,988
2 Claims. (Cl. 100—214)

ABSTRACT OF THE DISCLOSURE

In a stationary compactor of the type disclosed in Patent 3,250,414 and which is designed to handle miscellaneous trash and push it into and compact it within a suitably reinforced container, a rectangular ram is employed which is of a height substantially less than that of the opening through which the material is pushed. The loading chamber of the compactor, into which material is dropped in front of the ram, is substantially the same width as the ram. A rigid header bar extends across the front upper corner of the casing and in use the ram travels from a retracted position substantially withdrawn from the chamber into a position projecting into the container. A substantial vertical clearance is left between the top of the ram and the header bar, and the ram when fully projected extends into the container a distance which is at least 50% greater than such vertical clearance. The exent of such vertical clearance is such as to permit heavy or rigid materials to pass under the header bar without being crushed, and the degree of projection of the ram into the container is sufficient to carry long materials into the container, or alternatively, to tip long items toward a horizontal position which permits them to fall to the bottom of the chamber when the ram is retracted.

This application is a division of application Ser. No. 482,080, filed Aug. 24, 1965, now Patent 3,289,572 granted Dec. 6, 1966.

The present invention relates to compacting and containerizing apparatus for loose bulk material, and particularly for compacting and containerizing trash to facilitate hauling and disposal thereof with minimal equipment and labor. A principal object of the invention is to provide improved apparatus of the indicated character adapted to handle a wide variety of materials differing in density, size, moisture content and other characteristics, such as are encountered in general trash which may be collected from household sources, as well as industrial wastes.

In order to reduce the volume of the material to as great an extent as is practicable and reduce to a minimum the size, weight and cost of the vehicle employed to transport the compacted material to its destination, and also reduce the labor involved to a minimum. I prefer to employ a permanently installed stationary compaction system consisting of a power-driven ram which is so designed and arranged that it is capable of pressure-filling with compacted material standardized reinforced containers which may be coupled thereto for loading and which are interchangeable so that, after loading, a container filled with compacted material may be uncoupled and hauled away to a disposal destination and another empty container substituted for loading. Apparatus of the character indicated is disclosed in my Patent No. 3,250,414, which was copending with the aforementioned application Ser. No. 482,080.

The handling of general trash with apparatus of the indicated character presents problems resulting from the widely variant character and dimensions of the material which must be handled. Discarded furniture, bed springs, pieces of pipe, broken concrete, cement blocks, and other articles of wood, metal, cardboard, as well as vegetable

waste, glass, and virtually everything used in household and industrial activities may be thrown into such machines. The compaction chamber, into which the material is thrown, may have a capacity of the order of two to six cubic yards. The container to be loaded may have a capacity of the order of fifteen to forty cubic yards. Frequently, due to the nature of the material, the so-called "compaction" may consist primarily of forcing together, and reducing the spacing between, parts of material which is not in itself materially compressible. In other instances the material may be highly compressible. In my preferred construction, the ram is of rectangular cross section, with a flat top. When the ram is withdrawn so that the compacting chamber is adapted to be loaded from above through its hopper top or other suitable loading system, the material falls down to a position in front of the ram, and the ram is then powered forwardly, pushing the material into and compacting it within the container. Until the container has been filled sufficiently so that the ram can exert substantial pressure behind previously-loaded material, the compaction pressure may not rise to a high value (although this varies with the frictional characteristics, compressibility, weight, moisture content, etc. of the material). As soon as substantial resistance is encountered, however, further loading progressively compresses the material in the container, up to the compaction pressure which the ram is capable of exerting, which may be of the order of 90,000 pounds. In some apparatus of this general character which has been employed in the past, the ram fits quite accurately in the charging opening through which the material is forced into the container. With such constructions if, when the ram is powered forwardly, any material is located between the ram and the top edge of the charging opening, it is necessary for the ram to shear or completely crush the material before the ram can complete its stroke. I avoid attempting to shear or crush such material. Instead, as shown in my aforementioned copending application, I leave a substantial clearance space between the top of the ram and the header bar which defines the top of the charging opening. Such clearance is great enough so that no trash which is apt to be encountered must be sheared or completely crushed in order to permit the ram to move forwardly to the limit of its stroke. If the components were constructed heavily enough to actually crush or shear all such rigid materials as might be encountered, it would not only be necessary to provide great power, with a correspondingly heavy and expensive construction of the ram, compaction chamber and header bar, but the power generated would be so great that it would also be necessary to construct the transportable container in a correspondingly heavy manner. Constructing a container of the proper size strongly enough for such pressures would be impractical; that is, the power would be great enough to burst or bulge the container, unless the construction of the container were so heavy as to render it impractical to transport over the roads.

A further difficulty results from the fact that relatively long pieces of pipe, posts or heavy timbers are sometimes encountered which during loading may lie diagonally over or against the nose of the ram, and may at the forward end be wedged against or into previously loaded material, or against a wall of the container so that as the ram moves forwardly it tends to exert a sliding and camming action or a lifting action on the pipe or beam, or a toggle-like pivoting action, and thereby force the beam either laterally or upwardly, or both, with great force. In fact under any of several such situations a pipe, beam or the like may be lifted against the header, or driven into a side wall of the container, or of the compaction chamber, with a force which may greatly exceed the driving force of the ram itself. High and highly localized forces of the order of

250,000 p.s.i. can be generated in such manner, and under such conditions the walls of the compaction chamber or of the container, or the header which protects the upper edge of the charging opening, or the frame of the machine, may be strained beyond the elastic limit and thereby permanently damaged.

The present invention aims to provide an improved construction of the indicated class which is capable of handling a wide variety of materials in large volume and of exerting great pressure thereupon, but which reduces the tendency of long rigid or tangled or interconnected objects to become wedged or angularly positioned so as to cause the machine to develop unduly high and localized forces of the character referred to above.

A further object is to provide such a mechanism having its parts arranged in such manner that the material is more efficiently projected into the container.

Other objects and advantages will be apparent upon consideration of the present disclosure in its entirety.

In the drawings:

FIGURE 1 is a side elevational view, partly broken away, of compaction apparatus and an associated container adapted to be loaded thereby, illustrating a preferred embodiment of my invention;

FIG. 2 is plan view of the same also partly broken away;

FIG. 3 is a fragmentary vertical longitudinal sectional view on a larger scale and centrally broken away, taken substantially on the line III—III of FIG. 2 and looking in the direction of the arrows, showing the ram retracted;

FIG. 4 is a view similar to FIG. 3 showing the ram projected, and

FIG. 5 is a fragmentary diagrammatic view corresponding to a central longitudinal vertical section of principal components of the apparatus showing progressive positions assembled by the parts and by a large incompressible beam which has been loaded into the hopper.

Referring now to the drawings, reference character **10** designates a shipping dock and reference character **12** designates a floor adjacent the dock, these parts being shown as representative of an environment where my invention might be installed and used. A platform **14** which forms a part of the compaction unit generally designated **11** constitutes in effect a walkway extension jutting from the dock **10** and extending forwardly therefrom over the floor **12** to provide access to the loading station. A hopper **15** at the loading station opens into the ram chamber **18** of the compaction unit. Platform **14** also acts as a cover for the ram and for the actuating means therefor. The compression chamber **18** is directly beneath the hopper **15** and the material to be compacted falls into chamber **18** and is ejected therefrom by the ram **16**. The container into which the material is forced by the ram is generally designated **20**. The general construction and arrangement of these parts may correspond to the disclosure of my aforementioned copending application. As more particularly disclosed therein, the ram is adapted to be projected and retracted by hydraulic means such as the hydraulic cylinder and piston assembly generally designated **22**.

The container **20** has a rear charging opening **24** of rectangular cross section and of a width which is only slightly greater than that of the ram, and the ram and the closely fitted side walls of the ram chamber **18** fit closely at the sides into the opening **24** and substantially fill such opening in a lateral direction when the container is coupled to the compactor **11** by the releasable fastening means **21**. The opening **24** is substantially higher than the vertical dimension of the ram **16**, however, and the header bar **25** at the forward portion of the compaction chamber which protects the upper margin of the opening **24** and in effect defines the top of such opening will be seen to be spaced above the ram by a distance or overclearance which is shown at X in FIG. 4. The header **25** consists of a generally horizontal bottom plate **26** and a generally vertical back plate **28**, these parts being rigidly attached to each other and to the ram chamber structure as by welding and by gussets **29**. The forward corners of the side walls **33** of the ram chamber structure are defined by vertical angle irons which include vertical longitudinal flanges **30** which project forwardly into and lie closely against the sides of the charging opening **24** in the container and laterally extending rear flanges **31** which limit the extent to which the container overfits upon the ram chamber of the compactor.

When the ram is fully retracted, as shown in FIG. 3, its front wall **17** forms a rear wall for the compaction chamber **18**. When fully projected, as shown in FIG. 4, the front wall **17** of the ram preferably extends a substantial distance into the container **20**. In a preferred device constructed as illustrated the ram is 60 inches wide and 30 inches high. The clearance between ram and header, designated by the dimesion X of FIGURE 4, is 10 inches, and when the ram is fully projected it extends into the container approximately 15 inches. By such substantial projection of the ram into the container several benefits are achieved. Long material, such as pipes, poles, lengths of wood, partly broken parts of boxes, furniture or other large members which may lie angularly across the top of the ram and which may be tangled or wedged together with material lying on top of the projected ram, will, by virtue of this arrangement, be lifted to a horizontal position, if they cannot be moved forwardly by the forward movement of the ram. The long forward movement of the ram also tends to separate the material in the container from any remaining outside on top of the ram after the ram is fully projected and so helps to clear the unit. Unless a pole, pipe or other overlying part is very long, it will fall down, into a position in front of the ram, when the ram is next retracted, so that upon the next forward stroke it is pushed into the container. Such lifting and separating of angularly disposed material, most of which is of course much shorter than the occasional very long member contemplated in the discussion just concluded, also tends to dislodge and loosen any material behind the header bar **25** and above the ram.

I have found that with an overclearance between ram and header bear (dimension X, FIG. 4) of ten inches, which is sufficient to eliminate the problem of high shearing forces with virtually all objects which might be encountered, there is a tendency for some types of material overlying the ram to hang up and fail to fall down into a position in front of the ram, so that it cannot be forced into the container in the intended fashion, under certain conditions when the container is nearly full, if the forward travel of the ram is not carried to a position such that the face **17** of the ram extends into the container a distance at least equal to the overclearance X. Preferably, the penetration of the ram (dimension Y, FIG. 4) is of the order of 150% of the clearance X.

In FIG. 5, I have represented in dot-dash lines at A, B, C and D four successive positions which a long, heavy beam or pipe **35** might assume during forward travel of the ram. This would, of course, constitute an unusual and extreme use of the machine but might nevertheless be encountered, particularly in view of the frequent operation of these machines by unskilled labor. It will be seen that as, and after, position C is reached, the forward movement of the ram exerts a strong rocking and camming force tending to lift the member **35**. Due to the space between the top of the ram and the header bar **25**, and the long travel of the ram (inwardly to the D position), this action does not generate a force which might bow the header bar to such extent as to deform it beyond its elastic limit. It will be understood that the position such as troublesome or large piece might assume could vary greatly. As shown at position C, its forward end might become caught or wedged into material already in the container. The subsequent forward movement of the ram toward position D exerts a rocking cou-

ple on the piece 35 tending to lift its front end. If the piece is very strong, this will lift the material in the container to permit the piece to assume a more nearly horizontal position across the top of the ram, such as is shown at D. Unless it is very strong, however, the piece will break or bend if it catches in a load which is already partly packed, rather than remaining straight or unbroken while moving from C to D as illustrated. In either event, it will drop down upon the next retraction of the ram and thereafter be pushed into the container by the face of the ram on the next stroke.

While one commercially practical embodiment of the invention has been described and illustrated herein somewhat in detail, it will be understood that various changes may be made as may come within the purview of the accompanying claims.

What is claimed is:

1. Apparatus of the stationary high overclearance nonshearing type for loading and compacting the contents of a container having a rectangular charging opening, comprising a compacting unit including side walls defining a rectangular ram chamber having an open-top for loading and a front discharge opening for registry with the charging opening of a container, the side walls of the unit being joined near the top front thereof by a rigid header bar adapted to define the effective upper limit of the charging opening when the unit is in use, a rectangular ram movable in a substantially rectilinear path through said ram chamber from a retracted position which is spaced from the charging opening to a projected position in which it extends into the container through the charging opening, the width of the ram substantially conforming to the spacing of said side walls, the height of the ram being substantially less than the effective height of the charging opening and spaced downwardly from the header bar a distance sufficient to permit all rigid materials apt to be encountered in the work for which the apparatus is designed to pass under the bar without being sheared or completely crushed, the ram in the projected position extending into the container a distance at least equal to the difference between the height of the ram and the effective height of the charging opening.

2. Apparatus of the stationary, high overclearance, nonshearing type for loading and compacting the contents of a container having a rectangular charging opening, comprising a compacting unit including side walls defining a rectangular ram chamber, having an open-top for loading and a front discharge opening for registry with the charging opening of a container, the side walls of the unit being joined near the top front thereof by a rigid header bar adapted to define the effective upper limit of the charging opening when the unit is in use, a rectangular ram movable in a substantially rectilinear path through said ram chamber from a retracted position which is spaced from the charging opening to a projected position in which it extends into the container through the charging opening, the width of the ram substantially conforming to the width of the charging opening, the height of the ram being substantially less than the effective height of the charging opening and spaced downwardly from the header bar a distance sufficient to permit all rigid materials apt to be encountered in the work for which the apparatus is designed to pass under the bar without being sheared or completely crushed, the ram in the projected position extending into the container a distance which is at least 150 percent of the difference between the height of the ram and the effective height of the charging opening.

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