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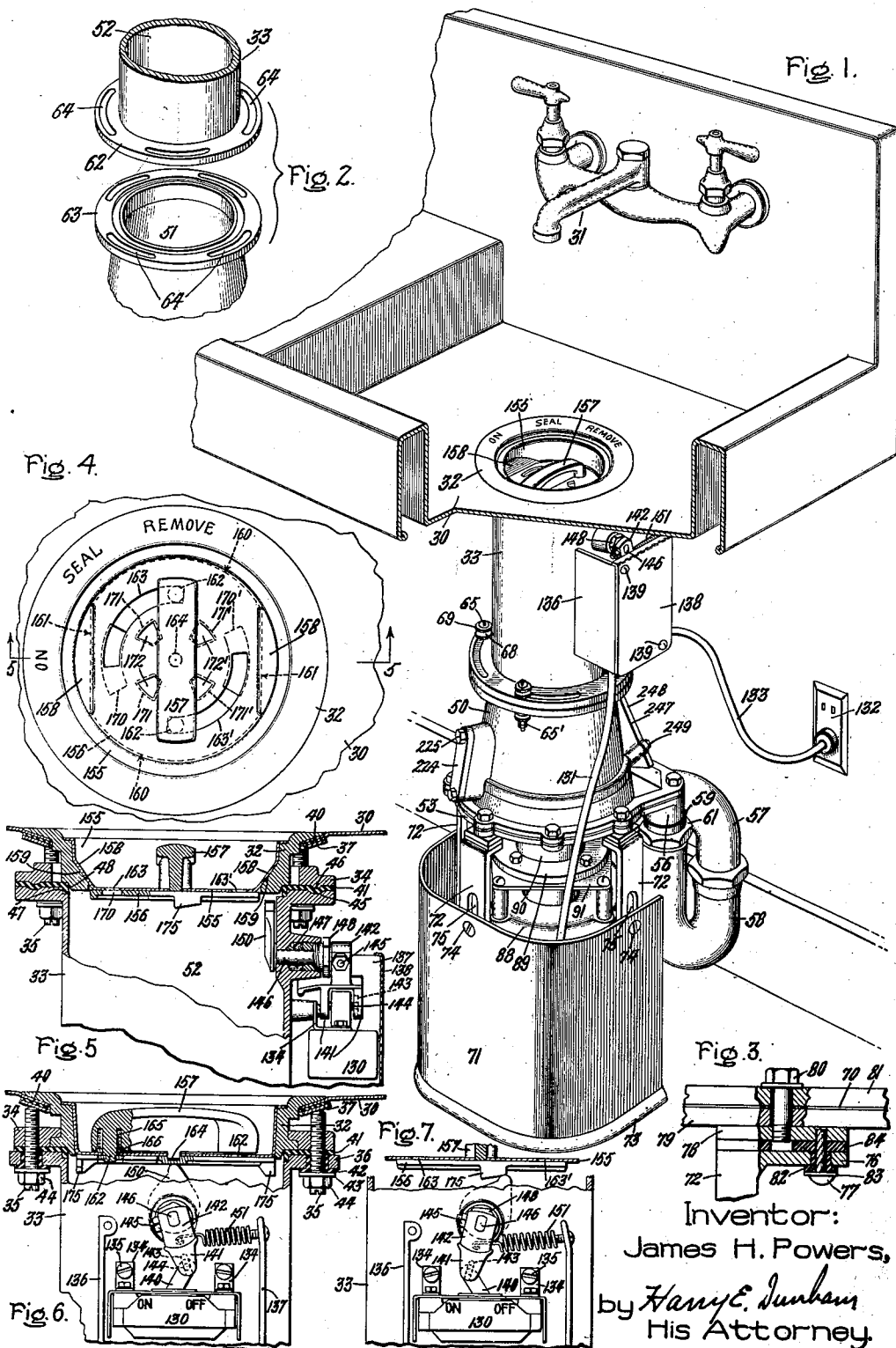
J. H. POWERS

2,220,729

APPARATUS FOR THE COMMINATION AND DISPOSAL OF WASTE MATERIAL

Filed Dec. 31, 1937

3 Sheets-Sheet 1



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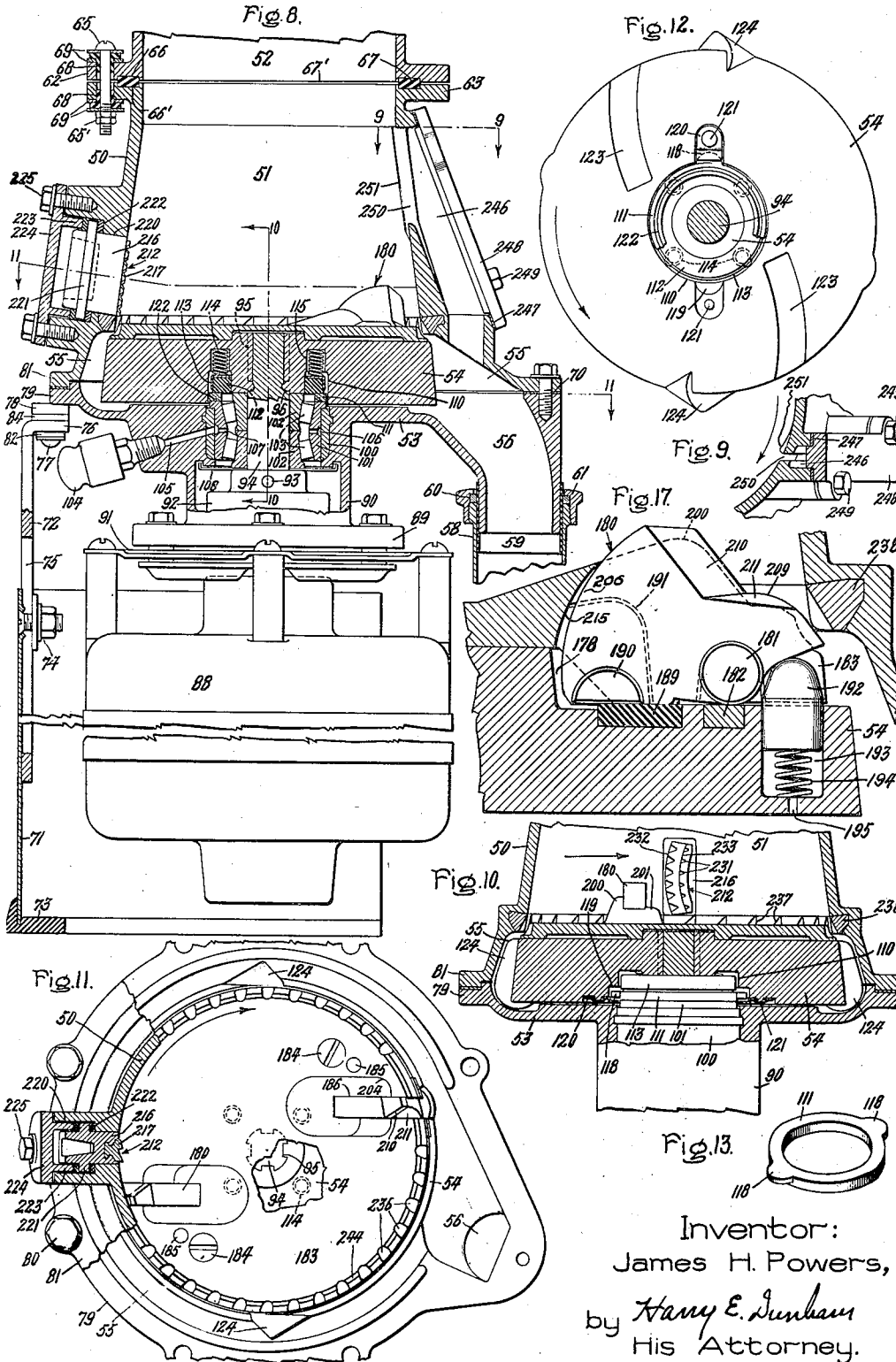
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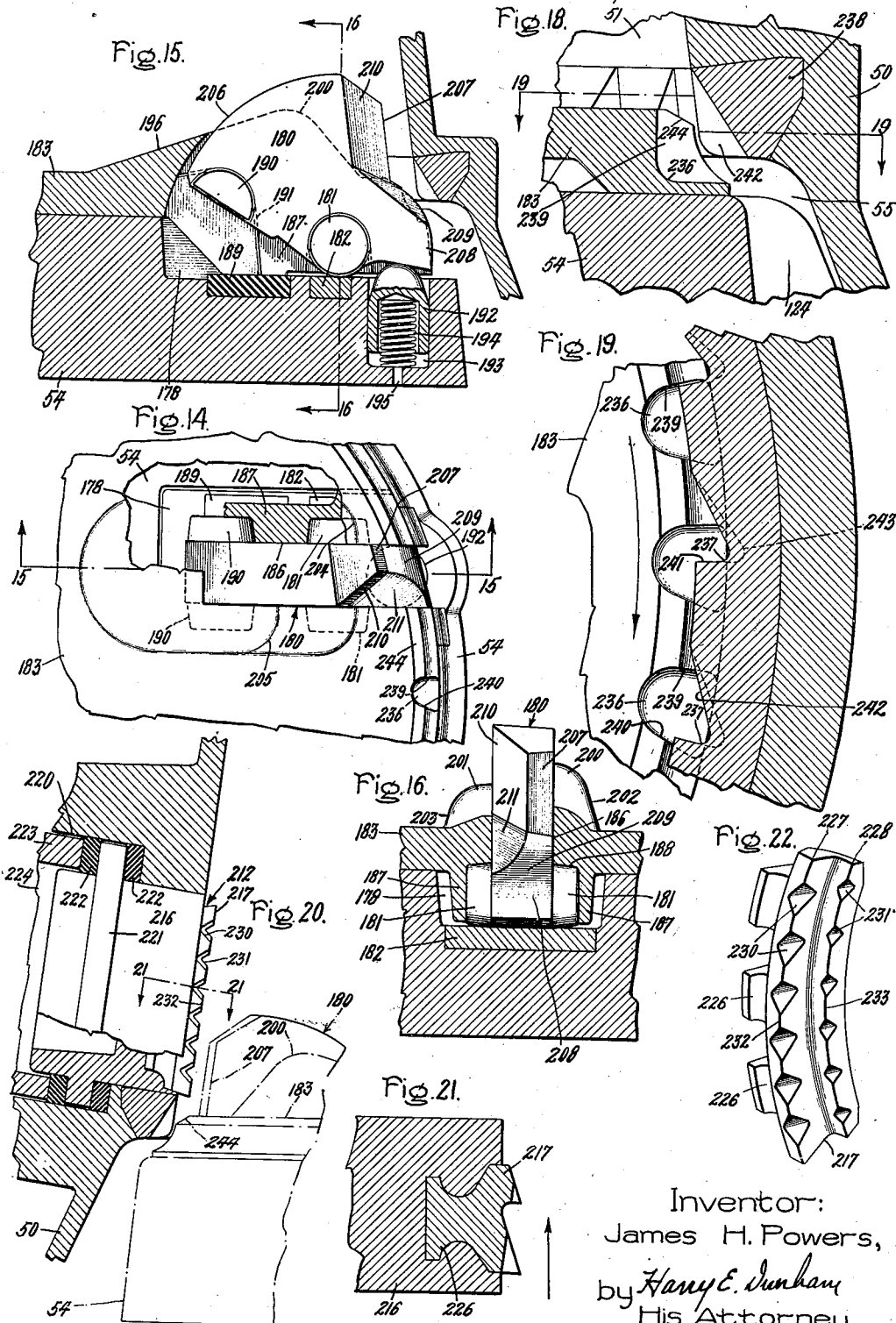
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UNITED STATES PATENT OFFICE

2,220,729

APPARATUS FOR THE COMMINATION AND DISPOSAL OF WASTE MATERIAL

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31 Claims. (Cl. 83-6)

The present invention relates to apparatus for comminuting and disposing of waste material, and has for an object the provision of an improved apparatus, of simplified and economical construction, for the comminution, by grinding, crushing, or cutting, of garbage in the form of vegetable matter, meat bones and the like, and of other forms of waste material, and for the flushing of the comminuted material into a sewer system or the like with the aid of water.

Among the more specific objects of the invention are the provision of an improved housing construction, improved control mechanism, and improved agitating and comminuting mechanism in an apparatus for disposing of waste material in a rapid, efficient, and sanitary manner.

A further object of the invention is the provision of improvements in waste disposal apparatus of the type disclosed in my Patent No. 2,185,037 granted December 26, 1939, and in the Patent to A. Alexay, No. 2,156,075 granted April 25, 1939, both of which patents are assigned to the assignee of the present invention.

Other objects and the details of that which I believe to be novel and my invention will become apparent from the following description and the claims appended thereto taken in conjunction with the accompanying drawings in which is illustrated an exemplary form of waste disposal apparatus embodying the present invention and incorporating an electric motor-driven grinding machine connected with the drain opening of a kitchen sink, or like structure, for receiving material to be ground and water for flushing into a sewer system, and having also safe and easily operable control mechanism for controlling the operation of the apparatus.

In the drawings, Fig. 1 is a perspective view showing the manner of installing my improved waste disposal unit beneath a kitchen sink or like structure; Fig. 2 illustrates a detail of the construction of the housing of the unit; Fig. 3 is a detail view, partially in section, of a part of the supporting structure; Fig. 4 is a plan view looking down on the top of the unit to show the control operating element; Fig. 5 is a section, taken along the line 5-5 of Fig. 4, showing the upper part of the unit and details of the control mechanism with the control operating element in one position; Fig. 6 is another view, looking from the right at the portion of the apparatus illustrated in Fig. 5, showing other details of the control mechanism; Fig. 7 illustrates the control mechanism with the control operating element in another position; Fig. 8 is a side view, partially

in section, of a part of the waste disposal unit shown in perspective in Fig. 1; Fig. 9 shows, partially in section along the line 9-9 of Fig. 8, another detail of the housing; Fig. 10 is a vertical section along the line 10-10 of Fig. 8; Fig. 11 is a horizontal section along the line 11-11 of Fig. 8; Fig. 12 is a view of the bottom of an element shown in Fig. 11; Fig. 13 is a detail perspective of an element shown in Fig. 12; Fig. 14 is an enlarged detail plan view, partially cut away, of a portion of the structure of Fig. 11; Fig. 15 is a vertical section along the line 15-15 of Fig. 14; Fig. 16 is a vertical section along the line 16-16 of Fig. 15; Fig. 17 shows the structure of Fig. 15 with certain of the parts in different positions; Fig. 18 is an enlarged vertical section of a portion of the structure of Fig. 10; Fig. 19 is a horizontal section along the line 19-19 of Fig. 18; Fig. 20 is an enlarged vertical section of a portion of the structure of Fig. 8; Fig. 21 is a horizontal section along the line 21-21 of Fig. 20; and Fig. 22 is an enlarged detail perspective view of a shredding element shown in section in Fig. 21 and forming part of my invention.

Referring particularly to Figs. 1-6 of the drawings, 30 designates a kitchen sink or like structure having a faucet 31 and a drain opening. Seated in the drain opening is an adapter ring 32 to which is connected the upper part 33 of the housing of the electric motor-driven appliance, or waste disposal unit, embodying my present invention. The connection is made by means of an internally flanged supporting ring 34, which engages flanged portions of the adapter ring, as best shown in Fig. 6, and bolts 35 which extend through a flange 36 on the upper end of housing part 33 into threaded engagement with the supporting ring. The upper ends of bolts 35 engage a clamping ring 37 to effect compression of a gasket 40 of resilient material, such as rubber, between the clamping ring and the underneath surface of sink 30. Another resilient gasket 41 is inserted between the upper flanged end 36 of housing part 33 and supporting ring 34, and bolts 35, where they pass through flange 36, are surrounded by resilient bushings 42 which have enlarged lower end portions clamped between the lower face of flange 36 and the washers 43 and adjusting nuts 44 on bolts 35. Flange 36 has arcuate grooves 45 there around arranged to cooperate with arcuate ridges 46 around ring 34 to compress resilient gasket 41 therebetween so as initially to tension portions of the gasket and thereby insure resiliency of the gasket under compression. The upper end of housing part 33 has

also a sharp ledge 47 around the inner periphery thereof and arranged to cooperate with a similar sharp peripheral ledge 48 on the bottom of adapter ring 32 to compress and sharply bend the inner portion of gasket 41 to effect a moisture-tight sealing of the junction between housing part 33 and adapter ring 32. In the connection arrangement just described, bolts 35 are screwed up tightly against clamping ring 37, which is backed by gasket 40 and sink 30 and which preferably is of relatively soft metal, so as to force supporting ring 34 down tightly onto the lower external flange of adapter ring 32. Thus the upper rim flange of the adapter ring is drawn down tightly against the rim of the sink drain opening so that the adapter ring is secured rigidly relative to the sink structure. As a result of the arrangement described, housing part 33 is resiliently suspended from supporting ring 34, and the cushioning provided by resilient gaskets 40 and 41 and bushings 42 serves to minimize greatly, if not entirely to prevent, the transmission of noise and vibration from housing part 33 through rings 32 and 34 and bolts 35 to the sink structure.

Joined to the lower end of upper housing part 33, as best shown in Fig. 8, is a lower housing part 50, of frustro-conical form, which defines a grinding chamber 51 into which material to be ground may be fed through the cylindrical material admission passage 52 defined by upper housing part 33. The lower end, which is the larger end, of part 50 is closed by means of a bottom plate 53 which is formed to cooperate with the lower end of part 50 to form a chamber for a flywheel 54 of a rotatable material impelling device later to be described, and the outer annular space 55 of which chamber is arranged to receive comminuted material and water from chamber 51. Plate 53 is formed with a drain or discharge conduit 56 which communicates with annular material receiving space 55 and which is arranged for connection with a waste pipe of a sewer system or the like for the flushing of water and comminuted material out of the waste disposal unit. Preferably, such connection is made to a waste pipe 57 through a trap 58, and a suitable form of connection is illustrated in Fig. 8 wherein the end of conduit 56 extends slidably into the upper end of the pipe forming trap 58 to provide for vertical adjustment of the disposal unit relative to the sewer connection. A sleeve 59 of rubber or other suitable resilient and chemically resistant material is interposed between conduit 56 and pipe 58 to seal the junction while providing for relative sliding between the two parts. Further to insure the effectiveness of the seal, there is provided a gasket 60 of any suitable material compressed about sleeve 59 at the upper end of pipe 58 by means of a clamping nut 61.

As will be seen best from Figs. 1 and 2, housing parts 33 and 50 are joined in such manner as to reduce greatly the possibility of transmission of noise and vibration from one to the other and to provide for selective relative rotation therebetween about the vertical axis of the housing. The attachment flanges 62 and 63 of housing parts 33 and 50 respectively are provided with arcuate slots 64 the midpoints of which are angularly displaced 90° relative to each other and each of which slots extends over an arc of approximately 45°. The two housing parts are connected together by means of bolts 65 which are disposed in corresponding ones of the slots 64 and which have clamping units 65'. Housing parts 33 and 50 have oppositely disposed an-

nular recesses 66 and 66' respectively, in which is seated an annular gasket 67 of soft resilient material such as rubber. Surrounding bolts 65 are bushings 68, also of soft resilient material such as rubber, which have enlarged heads disposed between washers 69 and which extend into slots 64 to provide a resilient seating for connection bolts 65. Gasket 67 is made of sufficient thickness to maintain a small clearance, as indicated at 67', between the two housing parts when clamping nuts 65' are drawn up on bolts 65 sufficiently to hold the housing parts in their proper relationship. With this arrangement, gasket 67 is clamped between the two housing parts to seal the junction therebetween and to provide a very effective cushion between the housing parts, while bushings 68 cushion the bolts 65. Thus, there is provided a further insulation against the transmission of noise and vibration to the sink or like structure 30, to which housing part 33 is resiliently connected, from housing part 50 which supports the grinding mechanism and has the driving motor connected thereto as will be described hereinafter.

With connection bolts 65 disposed in the left-hand ends of the slots 64 in flange 62 and in the right-hand ends of the corresponding slots 64 in flange 63, the lower housing part 50 is disposed in the position illustrated in Fig. 1 relative to the upper housing part 33, so that drain conduit 56 is located on the rear right-hand side of the unit, as shown. However, the slip joint between the two housing parts provides for selective adjustment of the position of lower part 50 so as to place conduit 56 in proper position for connection with sewer pipes located in different positions relative to the sink drain opening. For example, if an installation is encountered wherein the sewer pipe is on the left-hand rear side, bolts 65 may be loosened and housing part 50 rotated 90° to the right relative to housing part 33 so as to bring drain conduit 56 into position to be joined to such sewer connection. In this latter case, bolts 65 would be disposed in the right-hand ends of the slot 64 in flange 62 and in the left-hand ends of the corresponding slots 64 in flange 63. This is an important advantage of the housing structure in accordance with my present invention in that it provides a ready means for selective positioning of the drain conduit while permitting installation of the upper housing part in a proper position, relative to the sink structure, as illustrated in Fig. 1. A further advantage of the two-part housing is that lower housing part 50, and the other elements of the unit attached thereto and hereinafter described, may be removed for replacement or servicing without disturbing the connection of upper housing part 33 with the sink structure.

In Figs. 1, 3, and 8 are illustrated the details of a supporting stand for resiliently supporting the waste disposal unit and for relieving the sink structure of a considerable portion of the weight of the unit. This supporting stand comprises a base member 71 and a plurality of uprights 72, three of such uprights being utilized in the embodiment illustrated. Base member 71 is approximately U-shaped in horizontal section and seats in a footing 73 of rubber or other suitable resilient material for preventing transmission of noise and vibration from the base member to the floor upon which the member is mounted. The base member has bolt assemblies, inclusively designated 74, which are arranged to be received

in elongated vertical slots 75 in the upright members so as to provide for vertical adjustment of the upright members in accordance with the height of the sink structure encountered in any particular installation. The upper ends of the upright members have inwardly and horizontally extending bracket portions 76 for connection with the disposal unit. Bracket portions 76 are connected by means of self-threading screws 77 or other suitable means with stiff metal plates 78. As will be seen from the detail view of Fig. 3, each of the plates 78 is rigidly fastened beneath the outwardly extending flange 79 of bottom plate 53 by means of one of the bolts 80 which serve to join flange 79 with the outwardly extending flange 81 on the bottom of lower housing part 50, and which bolts serve also to compress a sealing gasket 70 between the two flanges 79 and 81. Screws 77, one of which is shown in Fig. 3, are disposed on opposite sides of bolt 80 and are insulated from bracket portion 76 by means of bushings 82 of resilient material, which bushings surround the screws as they pass through bracket portion 76 and have enlarged heads clamped between bracket portion 76 and washers 83 carried by the screws. Between the bracket portion 76 and the plate 78 of each of the connections there are disposed washers 84 of resilient material, such as rubber, which are disposed in surrounding relation to screws 77. With this arrangement, plates 78 are held rigid with respect to the disposal unit while the bracket portions 76 of uprights 72 are cushioned relative to the unit by means of the resilient bushings 82 and the resilient washers 84. This greatly minimizes the transmission of noise and vibration from the waste disposal unit to the supporting structure while, as previously pointed out, resilient footing 73 minimizes the transmission of noise and vibration from the supporting structure to the floor. Thus it will be seen that the housing of the unit is resiliently suspended between supporting ring 34 and the supporting stand. The side walls of the base member 71 illustrated provide a neat appearing partially enclosing casing for hiding the driving motor and a portion of its mounting which comprise parts of the waste disposal unit. The walls of the base member may be made higher so as to hide more of the unit, or a base member of the type illustrated may serve in cooperation with a similar U-shaped element to provide a vertically adjustable enclosing casing.

For operation of the comminuting mechanism of the waste disposal unit, there is provided a motor 88 which is suspended, with its shaft extending vertically, from a flange 89 on the lower end of a sleeve 90 formed integrally with and extending downwardly from bottom plate 53. The connection between motor 88 and flange 89 is in the form of a resilient suspension diagrammatically illustrated and inclusively designated 91, which suspension does not form part of the present invention but is of the type described in detail in U. S. Letters Patent No. 2,089,066 to W. J. Morrill, issued Aug. 3, 1937, and assigned to the assignee of the present invention. The drive shaft of motor 88 is connected with a suitable form of flexible coupling indicated at 92, and the upper end of this flexible coupling is connected by means of a pin 93 to a stub shaft 94 for driving the rotatable material impelling device, later to be described, of which fly-wheel 54 forms a part. The upper end of this stub shaft may be connected with the fly-wheel in any suitable

manner, but in the illustrated embodiment is cast into the fly-wheel and splined, as indicated at 95, at its upper end to prevent rotational displacement of the fly-wheel relative to the shaft. Shaft 94 has also an annular groove 96 for receiving a portion of the material of the fly-wheel to prevent longitudinal displacement of the fly-wheel on the shaft.

The opening in bottom plate 53 through which shaft 94 extends has a bearing sleeve insert 100 cast therein and adapted to receive and support the outer race 101 of a roller bearing assembly. The inner race 102 of the bearing assembly is pressed onto shaft 94, and two sets of tapered rolls 103 are arranged between these two races in such manner as to provide a thrust bearing for the shaft and fly-wheel assembly. For lubrication of the bearing there is provided a grease cup fitting 104 which is carried by bottom plate 53 and which communicates through a passage 105 in the bottom plate and in sleeve 100 with an annular groove 106 in outer race 101, which groove 106 is arranged to distribute lubricant through passages 107 in the outer race into the space between the two races occupied by rolls 103. The lower end of the opening in bottom plate 53 which accommodates the bearing assembly is closed by means of a cup-shaped plate 108.

An annular chamber 110 is provided in the lower part of fly-wheel 54 and arranged concentrically of shaft 94. In this chamber is disposed a thrust washer 111 of the type shown in Fig. 13. This thrust washer is composed of any suitable wear resisting material which also is chemically resistant to grease and substances which may come into contact with the washer during the grinding and disposing of waste food products and the like. Washer 111 is pressed downwardly tightly onto the upper end of outer race 101 by means of a packing washer 112 of suitable resilient material, such as rubber, which fits tightly about the portion of fly-wheel 54 which forms the inner wall of chamber 110. An annular metal cup washer 113 is provided for reinforcing packing washer 112. A plurality of springs 114, four of such springs being employed in the illustrated embodiment, are disposed in angularly spaced apart bores 115 in the fly-wheel and arranged to press downwardly upon cup washer 113 to effect tight engagement of the cup washer with thrust washer 111 and tight engagement of washer 111 with the upper surface of outer race 101. Thrust washer 111 has oppositely disposed ears 118 projecting outwardly into recesses 119 extending radially of chamber 110 in fly-wheel 54, as shown in Figs. 10 and 12, to cause rotation of the thrust washer with the fly-wheel. Metal clips 120, supported on riveted-over projections 121 on the bottom of the fly-wheel, are arranged to engage the underneath sides of ears 118 to prevent washer 111 from dropping out of chamber 110 during assembly or disassembly of the fly-wheel, bearing and seal. In order to reduce the friction of engagement of the thrust washer with the upper end of outer bearing race 101 without at the same time reducing the effectiveness of the sealing action of the thrust bearing, there is provided in the bottom face of the thrust washer an annular groove 122 which is best shown in Fig. 12. As a result of the sealing arrangement just described, water is prevented from leaking from space 55 past the two washers 111 and 112 into the bearing while grease is prevented from leaking from the bearing into the space 55.

The bottom of fly-wheel 54 is provided also with approximately radially extending curved slots 123 which tend to collect and impel outwardly any water and comminuted material which enters the space between the bottom of the fly-wheel and the adjacent surface of bottom plate 53. On the outer periphery of the fly-wheel are one or more integrally formed vanes 124 which, during operation of the waste disposal unit when fly-wheel 54 is being rotated at a relatively high speed by motor 88, act in the manner of a centrifugal pump to impel the comminuted material and water outwardly from space 55 into drain conduit 56. The resultant pressure in conduit 56 and the connected sewer system pipes tends to produce a forced flow of the water and comminuted material carried thereby through the piping system so as to prevent stoppage thereof and also tends to keep the pipes clean.

Energization of motor 88 is controlled by a suitable form of switching mechanism, inclusively designated 130 (see Figs. 1, and 5 to 7), which switching mechanism is connected to the motor by means of a suitable lead 131 and which is arranged to be connected to a wall socket, indicated at 132, by means of a suitable lead 133. The switching mechanism is mounted on the side of upper housing part 33 by means of brackets 134 and screws 135. An enclosing casing, formed by a pair of side plates 136 and 137 secured to housing part 33 and a cover plate 138 fastened to the side plates by means of screws 139, is provided for the switching mechanism. The switching mechanism includes a switch arm 140 which projects upwardly and is received between spaced apart arms 141 of a switch operating lever 142. These arms 141 have elongated slots 143 for slidably receiving a transverse pin 144 carried by switch arm 140. Operating lever 142 is rigidly fastened, by means of a bolt 145, on the outer end of a shaft 146 which extends through an opening in the side of housing part 33. Leakage of water through this opening is prevented by means of a packing washer 147 and a packing nut 148 which surround shaft 146. On the inner end of shaft 146 is mounted a trip lever 150 which extends upwardly in housing part 33 to a point just beneath adapter ring 32. A tension spring 151 is connected between switch operating lever 142 and side plate 137 for biasing lever 142 to its right-hand position, illustrated in Fig. 6, to effect movement of switch arm 140 to its "off" position so as to deenergize motor 88.

For operation of trip lever 150, and thereby the switching mechanism, there is provided an improved sink drain stopper or closure device similar to that disclosed in my previously identified patent. This stopper or closure device comprises essentially a cylindrical cup-shaped plug member 155, a baffle plate 156, and an actuating element or handle 157. Two opposite sides of the plug member are beveled inwardly at the bottom, as shown at 158, to provide substantially plane slanting surfaces arranged to engage inwardly slanting substantially plane surfaces of ledges 159 formed on opposite sides of the inner wall of adapter ring 32. By reason of the cooperative engagement of the beveled portions 158 of the plug member with the ledges 159 of the adapter ring, proper positioning of the plug member is insured and rotation of the plug member is prevented when it is seated in the adapter ring opening. As shown by the broken lines in Fig. 4, baffle plate 156 has substantially the same

shape as the bottom of plug member 155, in that the plate has oppositely disposed curved sides 160 which correspond to the oppositely disposed curved portions of the plug member and has also oppositely disposed straight sides 161 which correspond to the oppositely disposed straight side portions 158 of the plug member. Plate 156 is mounted on the lower side of plug member 155 and is connected with handle 157 by means of pins 162 which extend downwardly from the handle through arcuate slots 163 and 163' in the plug member and into riveted engagement with socket openings in the plate. The bottom of handle 157 has a downwardly projecting boss 164, located midway of the ends of the handle, which boss projects through a centrally located opening in the plug member into a socket in the baffle plate to provide a pivot for rotation of the handle and the baffle plate, and pins 162 are disposed respectively adjacent the opposite ends of the handle. Compression springs 165 are placed in annular recesses in the handle surrounding pins 162 and these springs by their engagement with the bottoms of the depressions and with washers 166, which washers bear against the bottom wall of the plug member, serve to maintain the baffle plate in firm engagement with the bottom surface of the bottom wall of the plug member, while at the same time providing for free rotation of the handle and plate without binding thereof against the bottom wall of the plug member.

Baffle plate 156 has a pair of arcuate slots 170 and 170' disposed at the same distance from the center of plug member 156 as the pair of arcuate slots 163 and 163'. The baffle plate has also two pairs of oppositely disposed openings 171 and 171' angularly displaced 90° from each other and arranged at a lesser distance from the center of the plug member than slots 170 and 170'. The plug member also has two pairs of oppositely disposed openings 172 and 172' angularly displaced 90° relative to each other and disposed at the same distance from the center of the plug member as openings 171 and 171'. When the baffle plate is in its position illustrated in Figs. 1, 4, 5, and 6, relative to the plug member, handle 157 points to the legend "Remove" on adapter ring 32 and portions of slots 170 and 170' in the baffle plate register with portions of the slots 163 and 163' respectively in the plug member, while openings 171 and 171' in the baffle plate register with openings 172 and 172' respectively in the plug member so as to provide for drainage of water from sink 30 into the housing of the waste disposal unit. Under these conditions the plug member may be removed from its seat in the opening in adapter ring 32 since the straight sides 161 of the baffle plate register with the straight sides 158 of the plug member and therefore do not engage the ledges 159 of the adapter ring. With the plug member seated in the adapter ring opening, handle 157 may be turned 45° in a counterclockwise direction, as viewed in Fig. 4, until it points to the legend "Seal" on the adapter ring, under which conditions slots 163 and 163' and openings 172 and 172' in the plug member are closed by solid portions of the baffle plate so that flow of water from the sink through the adapter ring drain opening is prevented. Rotation of the handle another 45°, in the counterclockwise direction, to the position wherein it points to the legend "on" on the adapter ring causes portions of slots 170 and 171' to register with portions of the slots 163' and 163 respec-

tively. Also, under this last condition, one of the openings 171 registers with one of the openings 172 and the other of the openings 171 registers with one of the openings 172', while one of the openings 171' registers with the other of the openings 172 and the other of the openings 171' registers with the other of the openings 172'. Hence, when the handle indicates "on", the closure device again permits flow of water from the sink into the waste disposal unit. When the handle indicates "seal" or "on", the curved portion of baffle plate 180 extend under the ledges 189 of adapter ring 32 to prevent removal of plug member 155 from the adapter ring opening.

On the bottom of baffle plate 156 adjacent the periphery thereof are downwardly projecting cams 175 arranged to engage the upper curved end of trip lever 150. Two of these cams, angularly displaced 180° from each other, are provided since the closure device may be placed in the adapter ring opening in two different positions displaced 180° from each other. Hence, it is necessary to have the two cams so that one or the other of them may be made to engage lever 150, regardless of which of its two positions is occupied by the stopper device. When handle 157 indicates either "remove" or "seal", neither of the cams 175 engages trip lever 150. However, when the handle is turned to the "on" position, one or the other of the cams, depending upon the positioning of plug member 155, engages the upper end of trip lever 150 to force it to the right, as indicated in Fig. 7, thereby causing lever 142 to move to the left, against the bias of spring 151, to move switch arm 140 to its "on" position. The switching mechanism then effects energization of motor 88 to cause operation of the grinding mechanism hereinafter described. Under these circumstances, with handle 157 in "on" position, the slots and openings of the baffle plate and plug member are in such registry, as previously described, as to permit flow of water from faucet 31 through the sink drain opening into the housing of the waste disposal unit to aid in the grinding operation. Also, as previously pointed out, it is impossible to remove the stopper device from the adapter ring opening when the handle is in "on" position, so that an operator is protected from injury due to reaching into the housing of the unit while the grinding mechanism is in operation. There is sufficient friction between plate 156 and plug member 155 to hold cam 175 in engagement with lever 150 and switch arm 140 in "on" position against the action of spring 151. However, immediately upon turning of handle 157 in a clockwise direction toward the "seal" or "remove" positions, trip lever 150 is released by cam 175 so that spring 151 becomes effective to pull lever 142 to the right to move switch arm 140 to "off" position, as illustrated in Fig. 6. The lower surfaces of both cams 175 are slanted downwardly away from the trip lever, as will be seen from Figs. 5 and 7, so as to insure against binding of the cams on the trip lever. From the foregoing description it will be seen that when handle 157 is in "seal" position, so as to close the sink drain opening and prevent the flow of water there-through to aid in the grinding operation, the driving motor 88 is deenergized by the switching mechanism. This partially insures against undesirable dry operation of the unit. Also, when the handle is turned to "remove" position, for removal of the stopper device from the adapter ring opening, the motor is deenergized so that

any one reaching into the housing of the unit will not be injured by the grinding mechanism.

The comminuting mechanism of the present invention comprises in the main an improved stationary cutting and shredding device carried by the housing of the waste disposal unit and an improved rotatable material impelling device for cooperation with the stationary cutting and shredding device. The details of the rotatable impelling device will now be described with reference particularly to Figs. 8, 11, and 14 to 17. In the top of fly-wheel 54 and respectively on opposite sides thereof are formed a pair of peripheral compartments 178, one of which is shown in the detail views of Figs. 14 to 17, for receiving respectively a pair of sector-shaped blades 180. These blades have integrally formed trunnions 181 projecting horizontally on opposite sides thereof for rotation of the blades in planes normal to the top surface of the fly-wheel or, in other words, in substantially vertical planes. Thrust plates 182, of hard wear resisting bearing metal, are inserted in the fly-wheel structure at the bottoms of compartments 178 for supporting trunnions 181. On the top of the fly-wheel is mounted a disk 183 which throughout its central top area and the major portion of the remainder of its top area is flat and free of obstruction. In carrying out the present invention it is not necessary that the top of the disk be absolutely flat, since disks having slightly concave or convex tops also may be employed, but it is of importance that the central top area and the major portion of the remainder of the top area of whatever disk is employed be substantially free of obstruction. Screws 184 serve to fasten the disk of the fly-wheel, and these screws operate in conjunction with vertical pins 185 to prevent rotational displacement of the disk on the fly-wheel. Disk 183 has a pair of vertically extending peripheral slots 186 communicating respectively with compartments 178 and arranged for vertically guiding blades 180. Projecting downwardly from the disk into the compartments and respectively on opposite sides of each of the slots 186, are integrally formed side plates 187 which have bearing recesses 188 for receiving trunnions 181. Thus, the trunnions are constrained to rotate on thrust plates 182 and in bearing recesses 188 so that proper positioning of blades 180 is maintained. The blades are so formed that their weight is overbalanced toward the center of disk 183 with the result that normally, when the fly-wheel and disk are not in rotation, the blades occupy their inward or completely retracted positions, illustrated in Fig. 17, wherein the inward bottom surfaces of the blades rest upon buffer plates 189 inserted in recesses in the fly-wheel structure at the bottoms of compartments 178. The buffer plates are made of rubber or other suitable resilient, wear-resistant and chemically-resistant material.

When motor 88 is energized in the manner previously described to cause rotation of fly-wheel 54 and disk 183, which rotation in the illustrated embodiment is in a clockwise direction as designated by the arrow in Fig. 11, blades 180 tend to fly outwardly under the influence of centrifugal force to their positions indicated in Fig. 15, wherein stop elements 190, formed integrally with and projecting outwardly from the blades, engage the walls of stop recesses 191 formed in the bottom of disk 183. However, this outward movement of the blades is retarded by plungers 192, the rounded tops of which engage the un-

derneath surfaces of the blades outwardly of their trunnions. Plungers 192 are disposed in vertical recesses 193 in the fly-wheel structure and are biased upwardly by means of coil compression springs 194 which are disposed in longitudinal bores in the plungers and press against the bottom walls of compartments 193. Restricted orifices 195 are provided in the bottom of the fly-wheel structure in communication with the bottoms of compartments 193 to permit only a gradual escape of air or other fluid medium from compartments 193, so that plunger 192, springs 194, compartments 193 and orifices 195 act in the manner of dashpots to retard outward movement of blades 180. This dashpot arrangement serves a double purpose. One of these purposes is the delaying of the movement of blades 180 to their operative positions, indicated in Fig. 15, until the driving motor attains a predetermined desired speed. The other purpose is to form a cushion for the blades so as to absorb shock and noise when the blades engage plungers 192, and further to prevent noisy impact of stop projections 190 against the walls of stop recesses 191. If motor 88 is stopped, or for any reason its speed is reduced below the desired minimum, the inwardly overbalanced weight of the blades tends to cause the blades to retract against the reduced centrifugal force. This retraction is accelerated by the action of spring biased plunger 192. Buffers 189 prevent noise and shock when the blades reach their completely retracted positions.

In order effectively to guide blades 180 and to brace them against damage or displacement due to impact thereagainst in horizontal planes, the top of disk 183 is provided with integrally formed irregularly rounded protuberances 196. Each of these protuberances is somewhat oval in plan view and is split longitudinally by one of the slots 186, as shown in Figs. 11, 14 and 16. Beginning at a point spaced from the center of the disk, the protuberance illustrated in the detail views of Figs. 14 to 17, slants outwardly and upwardly to a pair of rounded apexes 200 and 201 disposed respectively on the trailing and leading sides of blade 180. The apex 200 of the trailing portion 202 of the protuberance is higher than the apex 201 of the leading portion 203, and the trailing portion 202 slants outwardly and downwardly relatively gradually from its apex 200 to a point, indicated at 204 in Figs. 11 and 14, adjacent the periphery of the disk, where the trailing portion curves in to blade 180 adjacent the outer extremity of the blade. Thus the trailing portion 202 provides a large backing and bracing area for the trailing side of the blade. On the leading side of the blade, where such large backing or bracing area is not needed, the leading portion 203 of the protuberance has a lower apex 201, as previously pointed out, and slants outwardly and downwardly more precipitously to a point, indicated at 205 in Figs. 11 and 14, where the leading portion 203 curves in to the blade, which point 205 is further removed from the outer extremity of the blade than the point 204. Thus the leading portion 203 of protuberance 196 leaves a considerable outward area of the leading side of the blade free for contact with material to be ground (see Fig. 8). In addition to providing guidance and bracing for the blade, the protuberance just described serves also, due to its being rounded both vertically and horizontally, to deflect and prevent entrance of material into slot 186 and compartment 178 and

thereby reduces to a minimum the danger of jamming or other improper functioning of the blade. Moreover, the rounded contour of the leading portion 203 of the blade is operative, in a manner which will be described more in detail hereinafter, to deflect material upwardly over the blade when the rotatable impelling device is overloaded, thereby to prevent jamming of material between the blade and the stationary shredding element or walls of the housing of the unit with resultant stoppage of the rotatable impelling device.

The back of each of the sector-shaped blades 180 faces toward the center of disk 183 and curves upwardly and outwardly, as indicated at 206, while the front, which faces outwardly toward the housing wall, is divided into an upwardly extending straight portion 207 and an outwardly projecting foot portion 208, the top of which foot portion curves outwardly and downwardly as shown at 209. The trailing parts of straight portion 207 and curved foot portion 208 are formed so that they lie approximately parallel with the circumference of disk 183 and the inner curved wall of housing part 50, as will be seen from Figs. 11 and 14, while the leading edges of portions 207 and 208 are beveled so as to provide faces 210 and 211 respectively which slant inwardly from the circumference of disk 183 and the curved wall of housing part 50. Also, blades 180 are so arranged that their vertical planes of movement about trunnions 181 intersect the horizontal plane of the top of disk 183 in portions of chords disposed to the rear, relative to the direction of rotation, of parallel extending radii from the center to the circumference of disk 183. As a result of this arrangement of the blades, which will be evident from an inspection of Fig. 11, the front of each of the blades approaches the stationary shredding device, inclusively designated 212, in such manner that any force against the blade, produced by reason of material between the front of the blade and the stationary shredding device, will have its main vector lying in the vertical plane of rotation of the blade, which plane slants backwardly at an acute angle to a radius extending from the center of rotation to the shredding device. Hence, such force will tend to rotate the blade straight back in its slot 186 and towards its retracted position rather than tending to twist the blade in a horizontal plane in a manner to cause binding of the blade in its slot 186 and bearing recesses 188.

With an understanding of the form and arrangement of the parts of the rotatable impelling device, its operation may now be described. While the waste disposal unit is idle and during the initial period of relatively slow rotation of the impelling device subsequent to energization of motor 88 in the manner previously described, each of the blades 180 reposes in its inward and downward completely retracted position, shown in Fig. 17, wherein the curved back 206 of the blade lies beneath the overhanging curved wall 215 which forms part of the rear wall of slot 186. Only a small part of the blade projects above the top of rounded protuberance 196, and the rear of beveled face 210 of the blade lies back substantially even with and parallel to the top of the rear portion 202 of protuberance 196, while the beveled face 211 extends substantially horizontally and projects slightly above the top of disk 183. Under these conditions, the two beveled faces 210 and 211 cooperate with the rounded leading portion 203 of the protuberance to de-

flect material upwardly and over the protuberance and blade with very little frictional resistance. Also, the flat main body portion of the top of disk 183 offers practically no resistance to rotation, and the wide angle space between the front of the blade and the wall of the housing reduces to a minimum the resistance to rotation at this point. Thus, even though the interior of the housing is fully charged with a more or less packed mass of material to be ground, the danger of stalling of the motor at the start is practically eliminated, and such little resistance is imposed to rotation of the impelling device that the motor may attain its normal operating speed in a very short time. This is of advantage not only from the standpoint of convenience and efficiency of operation but also in that it permits the use of a low torque, low cost motor. Other advantages of the low substantially flat top impelling device located in the bottom of the housing are that it increases the capacity of the unit by permitting efficient utilization of the whole of the space within the material feeding passage 52 and grinding chamber 51, and that it permits waste material, especially large pieces such as bones and grapefruit rinds, to reach the absolute bottom and zone of maximum efficiency of waste reduction in the grinding chamber.

When motor 88 attains a certain speed, blades 180 start to swing outwardly to their operative positions under the influence of centrifugal force. However, the dashpot arrangement, including resiliently supported plunger 192, cushions the blades so as to reduce the noise of starting and prevent stress on the parts such as would occur if the blades, unimpeded, should fly out quickly to their operative positions. The dashpot arrangement may also be adjusted so as to afford sufficient delay in the outward movement of the blades to permit the motor to accelerate to full operating speed before the blades finally reach their extreme outermost operative positions illustrated in Fig. 15. Thus, the motor is able more effectively to take care of the increased resistance to rotation resulting from the upward and outward movement of the blades to reduce the space between the fronts of the blades and the housing wall.

When blades 180 are in their advanced or operative positions, illustrated in Fig. 15, and the impeller device is being rotated at proper speed, the rounded tops and backs of the blades produce a gouging, tearing, and scraping action on the material resting on disk 183 and this action serves to break up larger objects such as bones, grapefruit rinds, and the like, and serves also, in case the waste in the grinding chamber has become packed, to reduce the packed condition. Due to the shape of the blades and the relatively small amount which they project above disk 183, the action referred to is accomplished with a minimum of penetration resistance. The material in the grinding chamber is set in rotation by its frictional contact with the top of disk 183 and also by impact with the blades and the protuberances 196. Thus it will be seen that the blades serve not only as cutters but also as impellers. Rotation of the material tends to cause the particles thereof to move outwardly toward the walls of the housing under the influence of centrifugal force, and this outward movement is unimpeded due to the slant of the inner portions of protuberances 196 and the curving of the backs of the blades which permits the waste to ride up and

over the protuberances and blades toward the outside of the grinding chamber. Smaller particles of the waste are caught in the approximately V-shaped pockets, between the beveled faces 210 and 211 of the blades and the wall of the housing so that these particles are positively forced against the stationary shredding device 212. Larger objects also are forced against the shredding device by the impelling action of the blades and centrifugal force. The waste material tends to pack in a mass around the outside of the grinding chamber and this packing, if it becomes acute, tends to slow down the impelling device and reduce the efficiency of reduction of the material. However, the blades and protuberances constantly tend to deflect material inwardly. The unobstructed low pressure area at the center of disk 183 provides a space into which the inwardly deflected material can move and spread out and thus aids materially in preventing acute packing and congestion of waste around the periphery of the grinding chamber. The constant agitation or out and in movement of the particles of waste, due to the outward impelling thereof by centrifugal force and the inward deflecting thereof by the blades and protuberances, increases the efficiency of the reducing action since it insures a constantly changing position of the waste relative to the blades and shredding device so that no one object or body of waste is operated on to the exclusion of the remainder of the waste in the grinding chamber. This agitation of the waste has an added important advantage in that it produces a thorough saturation of the waste with the water supplied to the disposal unit for aid in the grinding operation. This action is similar to that produced by alternately squeezing and releasing a sponge. The saturation of the waste results in the production of a flowable mixture which may pass readily from the grinding chamber to the plumbing system and which is ideal for plumbing drains.

In case objects tend to jam between the impeller blades and the wall of the housing or the stationary shredding device, the resultant force is directed in a manner, as previously pointed out, to cause the blades to rotate inwardly toward their retracted positions, thereby increasing the angular space between the blades and the housing wall so as to relieve the jamming. A similar action takes place in case the rotating impelling device becomes so overloaded as to reduce the speed of the motor. In this latter case, as the motor speed is reduced, the centrifugal force operating on the blades is reduced and spring pressed plungers 192 rotate the blades inward toward their retracted positions. The resultant increase in the space between the blades and the housing wall, the backward and downward movement of the blades and the upward deflection of material by beveled faces 210 and 211, then operates in the manner previously described to reduce the resistance to rotation of the impelling device so that the motor may speed up to normal operating speed, whereupon the blades again return to their advanced operating positions. Thus, the form and manner of mounting the blades in my improved impelling device practically prevents stalling of the motor, not only at the start, but also during operation. When the grinding operation is finished and the motor de-energized in the manner previously described, the blades are returned to their retracted positions due to their inwardly overbalanced weight and the action of spring pressed plungers 192. Re-

silient buffer plates 189 reduce the operating noise and prevent material stresses when the blades are returned to retracted positions due to motor stoppage or when the blades are driven back by impact forces during operation.

The efficient operation and advantages of my improved impelling device just described may be secured with either one or more stationary shredding devices and with shredding devices of different forms, such as, for example, of the form disclosed in the previously identified patent of A. Alexay, or modifications thereof. However, I have provided an improved stationary shredding device inclusively designated 212 and now to be described with reference more particularly to Figs. 20 to 22. This improved shredding device is of simple and economical construction and comprises in the main a supporting block 216 into which is cast a toothed insert 217, although the toothed insert or shredding element may be secured to the supporting block in other ways, if desired. Block 216 is disposed in a recess 220 which extends through the side wall of lower housing part 50, as best shown in Fig. 8. The block has a flange 221 extending therearound and when the block is mounted in recess 220 this flange is cushioned on both its inner and outer sides by means of bumpers 222 of rubber or other suitable material. The block and the bumpers are held in position by flanges 223 which project inwardly from a closure plate 224 which covers the outer side of recess 220 and which is secured to housing part 50 by means of screw bolts 225. The arrangement of flange 221 and bumpers 222 is such that the cutting face of shredding element 217 projects into the grinding chamber for cooperation with blades 180, as shown in Fig. 20. Also, the cutting face of element 217 is maintained approximately in a surface of generation about the axis of rotation of the impelling device. Bumpers 222 cushion the shredding device against both direct and reactive impact and materially lessen the transmission of noise and vibration from the shredding device to the housing. Insert 217 is comprised of stainless cutlery steel, cemented carbide such as that designated by the trade name "Carboloy," or other suitable hard and wear-resisting material. The back of the insert illustrated has dovetailed projections 226 for anchoring the insert in block 216. The cutting face of the insert, or shredding element, is formed with two sharp-edged curving ridges 227 and 228, although more than two such ridges may be employed if desired. The edges of the ridges extend in arcs of circles having a common center, although the edges may extend in arcs having different centers, or may extend in approximate curves and approximately parallel. The shredding element is mounted so that material impelled against the element in the direction of rotation comes into contact successively with the ridges, and so that the apexes of the curving ridges face in the opposite direction to the direction of rotation of the impelling device. Thus the convex sides of the ridges are presented as the leading sides to material impelled thereagainst in the direction of rotation. A plurality of pairs of notches 230 and 231 are formed in the leading ridge 227 and trailing ridge 228 respectively with the two notches of each pair in line transversely of the face of the shredding element. These notches taper toward the rear or trailing side of the shredding element so that the spaces between the teeth 232, formed in the leading ridge by notches 230, are deeper than the spaces

between the teeth 233 formed in the trailing ridge by notches 231. Thus the trailing teeth 233 are broader than the leading teeth 232, as is clearly shown in Fig. 22. As a result of the form and arrangement of shredding element 217, a variety of different reducing actions take place when material is forced against the shredding element by the rotatable impelling device. The material first contacts the leading or convex side of ridge 227 and is then deflected at a variety of angles through and over teeth 232 and 233. Since the teeth 232 of the leading ridge are deeper cut and narrower than the teeth 233 in the trailing ridge 228, due to the upward slope of notches 230 and 231 toward the trailing side of the shredding element, the leading teeth effect an initial penetration of the waste to relatively coarsely shred, cut, and break up the material. The material then passes over the leading teeth 232 and through the notches 230 into contact with the trailing teeth 233 which due to the fact that they are broader and the notches 231 narrower, further reduce the material to finely divided state. Also, some of the material coming in contact with the ridges is deflected along the convex leading sides thereof, so as to produce a shearing action due to the fact that the ridges throughout major portions of their lengths slant in the direction of rotation, or, in other words, extend diagonally with respect to a generatrix of the surface of generation of the cutting face of the shredding element. While the cutting, shredding, and shearing action is taking place, the shredding element tends automatically to be freed or cleared of material so that the element is in effect self-relieving to prevent jamming. Moreover, due to the way in which material forced against the shredding element meets the curved edges, the forces of impact of the material are greatly lessened and the cutting, shredding, and shearing action is effected with a minimum of penetration resistance.

Disk 183, in addition to serving as a supporting and guiding element for blades 180, serves also as a strainer element since the size of the particles of comminuted material which may pass from grinding chamber 51 to annular receiving space 55 is controlled by the spacing or clearance between the rim of disk 183 and the lower rim of the portion of housing part 50 which forms grinding chamber 51. In the disposal unit illustrated, the disk is operative in cooperation with the lower rim of the grinding chamber wall to perform a secondary material reducing action through the agency of peripheral notches 236 in the disk and notches 237 in the lower rim of the grinding chamber wall. These notches will be described with reference more particularly to Figs. 14, 18, and 19. Notches 237 may be formed directly in the cast lower housing part 50 which forms the grinding chamber, but in the illustrated embodiment these notches are formed in a reinforcing band or ring insert 238 cast into housing part 50 at the lower rim of the grinding chamber. This insert is comprised of very hard, wear and corrosion-resisting material, of high tensile strength, such as heat treated stainless steel, and acts to relieve the housing of wear and to prevent creepage and expansion thereof in the zone where the housing is subjected to the greatest wear and impact forces. A large number of the notches 236 are formed in the periphery of disk 183 and these notches provide pockets of limited size communicating with the top of the disk for receiving smaller particles which

drop down after being operated upon by the rotating impeller device and stationary shredding device. The trailing walls 239 of notches 236 are approximately straight and vertical so as to provide square shoulders which intercept the waste particles as they attempt to pass through the clearance between the disk and the housing wall. The leading walls 240 of notches 236 flare outwardly slightly relative to the trailing walls 239, as will be seen from Figs. 14 and 19, so as to provide a larger outlet or relief to prevent particles from lodging in the notches. Particles of material which drop into notches 236 therefore are thrown outwardly by centrifugal force and such outwardly thrown particles are intercepted by the notches 237 in ring 238. These latter notches 237 extend above the top of the strainer disk and are somewhat wider to allow ready passage thereinto of the outwardly thrown particles. The trailing walls 241 of notches 237, that is the walls which are disposed in opposing relation to the oncoming approximately straight trailing walls 239 of notches 236, lie approximately in vertical planes radial with respect to the center of the grinding chamber so as to provide square shoulders similar to the square shoulders of the trailing walls of notches 236. Thus the opposing square shoulders of walls 239 and 241 cooperate to produce a shearing action to further reduce the size of particles passing through the clearance between the strainer disk and the housing wall. The leading walls 242 of notches 237 flare outwardly at an acute angle to their trailing walls 241 and the outer walls 243 of notches 237 extend at a greater angle to the vertical than the wall of housing part 50 which forms grinding chamber 51, as will be seen from Figs. 18 and 19. Hence, notches 237 are larger at the bottom than at the top so as to provide a relieving action to facilitate the passage of particles of material downwardly and outwardly of the notches into material relieving space 55. Thus, it will be seen that notches 236 and 237 are effective to produce a secondary reducing action and control of the size of material permitted to pass from grinding chamber 51 to space 55, while the form and arrangement of the notches is such as to prevent wedging and accumulation of material in the notches. The secondary reducing action of the notches is particularly advantageous in the disposal of flat leafy waste materials, such as pea pods, corn husks, artichokes, cabbage leaves, lettuce leaves and the like, which tend to slide flatwise through the clearance between the strainer disk and the lower rim of the grinding chamber. Such flat waste material is caught and sheared by the notches and reduced to a size and form which will not clog the disposal unit or the plumbing system. The notches function also to relieve the drag or resistance to rotation imposed by material in the small clearance between the strainer disk and the housing rim. If the strainer disk rim and the housing rim were smooth all the way around, considerable congestion and frictional resistance would be set up in the small clearance, but the clearance of the illustrated unit has a multitude of closely spaced small relieving spaces, provided by the notches, so that the congestion and friction are greatly reduced. Also, the fact that the notches flare toward the bottom results in acceleration of the waste downwardly from the clearance so as to prevent congestion. The bevel 244 around the upper rim of the strainer disk increases the time of exposure of larger pieces of waste to the shredder element

212 and tends to control the size of material which may enter the small clearance and the notches. Similar results may be attained by slightly dishing, or rendering slightly concave, the top of disk 183 so that material impelled outwardly by centrifugal force will be deflected slightly upward by a raised outer portion of the disk. The pumping action previously described, of vanes 124 in space 55, also aids materially in preventing congestion in the clearance.

A further function of notches 236 and 237, particularly the latter which extend above the top of the strainer disk 183, is to provide ample drainage for water from the sink through the unit both when the unit is in operation and when it is not in operation. If the clearance between the strainer disk and housing wall were made sufficiently small properly to control the size of material passing therethrough, and without employing the notches, there would be danger of stoppage of the clearance and filling up of the unit with water so as to overflow into the sink. The notches permit proper control of the size of material while at the same time providing passages for water to flow from the grinding chamber.

Under some conditions I have found it desirable to provide a conduit for by-passing water around the strainer clearance, particularly in cases where large quantities of water are to be drained from the sink through the housing of the disposal unit when the latter is not in operation. Such a by-pass conduit may be provided, as shown in Figs. 8 and 9, by a duct or passage 246 formed in the outer surface of housing part 50. The outer side of this passage is closed by means of a gasket 247 and a plate 248 fastened to the housing part by bolts 249. The lower end of the passage opens into space 55 just above drain conduit 56 and the upper end of the passage communicates through an elongated narrow vertical slot 250 with grinding chamber 51. Slot 250 opens into the grinding chamber considerably above the bottom of the chamber so as to prevent the driving of material therinto by the rotatable impelling device. A vertically extending rounded ridge 251 is formed on the leading side of slot 250 to deflect material over the slot, in the direction of the arrow in Fig. 9, when a body of material is being rotated in the grinding chamber by the impelling device. The passage of material and water over the slot during operation of the unit tends to create a suction which clears and keeps the slot free from stoppage. In case the clearance and notches at the bottom of the grinding chamber are unable to pass the whole amount of water supplied to the grinding chamber from the sink, the water will rise in the grinding chamber until it reaches slot 250 and then flow out through passage 246 to the drain conduit 56. Thus, backing up and flooding of the water into the sink is prevented. Cover plate 248 may be removed for inspection and cleaning of passage 246. A further advantage of passage 246 is that it prevents the formation, in the flywheel chamber and material receiving space 55, of an air lock which would retard the passage of water from the interior of the housing of the disposal unit.

As will be evident from the foregoing description, certain aspects of my invention are not limited to the particular details of construction of the exemplary embodiment illustrated, and I contemplate that various modifications and applications of the invention will suggest themselves

to one skilled in the art. It is my intention, therefore, that the appended claims shall cover such modifications and other applications as do not depart from the true spirit and scope of my present invention.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. In a waste disposal apparatus, the combination of a housing providing a receptacle for waste material and having an opening for admission of material to the receptacle, said housing having also a waste discharge conduit for connection with a sewer or the like, relatively high speed motor operated means supported by said housing and operable for comminuting material in said receptacle, means for resilient suspension attachment of said housing to a kitchen sink or like structure, and a supporting stand adapted to be mounted on a portion of a building structure such as a floor or wall and having means cooperative therewith for resiliently supporting said housing, said stand and said attachment means providing for resilient suspension of said housing between a portion of a building structure on which the stand is mounted and a sink or like structure to which the housing is attached.

2. In a waste disposal apparatus, the combination with a unitary waste disposal appliance including a housing having means including detachably joined upper and lower housing parts defining a receptacle for waste material and power driven means for comminuting material in said receptacle, said upper housing part providing a material admission passage and having means for relatively permanent fixed attachment to a sink or like structure independently of said lower housing part, said lower housing part defining a grinding chamber and supporting said power driven means and having a discharge conduit for comminuted material; of an adjustable supporting stand for said appliance comprising a floor mountable rigid base member having side walls affording a shield for at least partially enclosing and concealing parts of said appliance and having vertically adjustable bracket elements detachably connected with said lower housing part for supporting the appliance.

3. In a waste disposal apparatus, the combination with a unitary waste disposal appliance including a housing providing a receptacle for waste material and power driven means for comminuting waste material in said housing, of a separable supporting stand for said appliance comprising a U-shaped base member of relatively rigid construction having vertically extending side walls providing a shield at least partially enclosing and concealing said appliance on three sides and bracket means carried by said base member and detachably connected with said housing for supporting the appliance.

4. In combination with a sink or like structure, a unitary waste disposal appliance including a housing providing a receptacle for waste material and having a material admission opening in the upper end thereof and power driven means for comminuting material in said housing, means for connecting said housing with said structure with said opening in registry with an opening in said structure, and a floor mounted separable supporting stand for said appliance comprising a base member of relatively rigid construction having side walls providing a shield for at least partially enclosing and concealing said appliance and having substantially vertically adjustable bracket

elements detachably connected with said housing for supporting the appliance.

5. In a grinding machine, an enclosing housing having wall portions defining a chamber for comminution of material therein and having an opening in the bottom thereof, means for comminuting material in said chamber including a rotatable material impelling device, which said device includes a member supported for rotation in said housing substantially coaxially of said opening with the top of the member disposed adjacent the bottom of said chamber, which said top has a generally flat disk-like contour with a central portion substantially free of obstruction and has an overall area substantially the same as said opening, said device including also material impelling and reducing means supported for rotation with said member and arranged to project upwardly from the top of the member outwardly of said central unobstructed portion, and power means operative to rotate said device at relatively high speed to cause high speed impingement of said impelling and reducing means against material in said chamber.

6. In a grinding machine, an enclosing housing having wall portions defining a chamber for comminution of material therein, means for comminuting material in said chamber including a substantially vertical axis material impelling device, which said device includes a member supported for rotation in said housing with the top of the member located adjacent the bottom of said chamber, which said top has a generally flat disk-like contour with a central portion substantially free of obstruction and the outer portion of which top extends in close proximity to the walls of said chamber adjacent the bottom of the chamber, said device including also material impelling means supported for rotation with said member and arranged to project upwardly from the top of the member outwardly of said central unobstructed portion, and power means operative to rotate said device at a speed sufficient to cause said impelling means to impart relatively high speed rotation and agitation to material in said chamber.

7. In a grinding machine, a housing having wall portions defining a chamber for comminution of material therein, a member supported for rotation in said housing about a substantially vertical axis with the top of the member located adjacent the bottom of said chamber, which top is of generally flat disk-like contour with a central area substantially free of obstruction and the diameter of which top is at least substantially equal to the diameter of the adjacent portion of said chamber, material impelling elements supported for rotation with said member and having portions arranged to project upwardly from the top of the member outwardly of said unobstructed area, the inwardly facing surfaces of said elements slanting relatively smoothly upwardly and outwardly from said central area in order to provide minimum resistance to movement of material outwardly from said central area toward the periphery of said top, and power means operative to rotate said member at a speed sufficient to impart relatively high speed rotation to material in said chamber.

8. In a grinding machine, an enclosing housing having wall portions defining a substantially vertical axis chamber for comminution of material therein, stationary material reducing means supported at the side of said chamber, a member supported for rotation in said housing about

a substantially vertical axis with the top of the member located adjacent the bottom of said chamber, which top is of generally flat disk-like contour with a central area substantially free of obstruction and the outer portion of which top extends in close proximity to the walls of said chamber, material impelling means supported for rotation with said member and arranged to project upwardly from the top of the member outwardly of said unobstructed central area, and power means operative to rotate said member at relatively high speed so as to cause said impelling means to effect relatively high speed rotation and agitation of material in said chamber and relatively high speed impingement of such material against said stationary reducing means.

9. In an apparatus for disposal of waste material such as garbage and the like, a housing defining a chamber for reception of water and waste material to be comminuted and having an opening in the bottom thereof, a waste discharge conduit connected with said opening and adapted to be connected with a sewer or the like, stationary cutting means supported at the side of said chamber, a substantially vertical axis member supported for rotation adjacent the bottom of said chamber and having a generally flat disk-like top, the central area of which top is substantially free of obstruction and the outer portion of which top extends in proximity to the walls of said chamber, material impelling means supported for rotation with said member and arranged to project upwardly from the top of the member outwardly of said central unobstructed area, and power means operative to rotate said member at relatively high speed to cause said impelling means to impel material at relatively high speed against said stationary cutting means.

10. In an apparatus for disposal of waste material such as garbage and the like, a housing defining a chamber for reception of water and waste material to be comminuted and having an opening in the bottom thereof, a waste discharge conduit connected with said opening and adapted to be connected with a sewer or the like, stationary cutting means supported at the side of said chamber, a substantially vertical axis member supported for rotation adjacent the bottom of said chamber and having a generally flat disk-like top with a central area substantially free of obstruction, a material impelling element supported for rotation with said member and for movement outwardly in a generally radial direction to a position for cooperation with said stationary cutting means, said element having a portion arranged to project above the top of said member outwardly of said central unobstructed area when said element is in outward operative position, biasing means for restraining said element in an inwardly retracted position when said member is not in rotation, and power means operable to rotate said member at a speed at least sufficient to effect outward movement of said element under the influence of centrifugal force.

11. In apparatus for the comminution of material and including a housing defining a grinding chamber, a material impelling device comprising an element rotatable in said housing and having a substantially flat disk-like surface facing said chamber, said surface having a central area free of obstruction, a material impelling member carried by said element and supported for movement outwardly toward the periphery of said element, said member having a portion arranged to project from said surface outwardly

of said central unobstructed area when said member is in its outward operative position, biasing means for maintaining said member in an inwardly retracted position when said element is not in rotation, and power means operable to rotate said element at a speed at least sufficient to effect outward movement of said member to operative position under the influence of centrifugal force.

12. In apparatus for the comminution of material and including a housing defining a grinding chamber, a material impelling device comprising an element rotatable in said housing and having a substantially flat disklike surface facing said chamber, said surface having a central area free of obstruction, a material impelling member supported by said element for movement outwardly to an operative position under the influence of centrifugal force and biased for movement to an inwardly retracted position when said element is not in rotation, said member when in its said outward operative position having a portion projecting from said surface outwardly of said central unobstructed area, bracing and guiding means for said member including a rounded protuberance on said surface disposed outwardly of said central area, which said protuberance has portions disposed on the trailing and leading sides of said member and at the back of said member toward said central area, and power means operable to rotate said element at a speed at least sufficient to effect outward movement of said member to operative position under the influence of centrifugal force.

13. In apparatus for the comminution of material and including a housing defining a grinding chamber, a material impelling device comprising an element rotatable in said housing and having a substantially flat disk-like surface facing said chamber, said surface having a central area free of obstruction, a material impelling member supported by said element for movement outwardly to an operative position under the influence of centrifugal force and biased for movement to an inwardly retracted position when said element is not in rotation, said member having a portion arranged to project from said surface outwardly of said central unobstructed area when said member is in its outward operative position, a protuberance on said surface having a portion disposed at the back of said member toward said unobstructed central area, which said portion of said protuberance has a surface substantially smoothly slanting outwardly and upwardly from said central area, and power means operable to rotate said element at a speed at least sufficient to effect outward movement of said member to operative position under the influence of centrifugal force.

14. In apparatus for the comminution of material and including a housing defining a grinding chamber, a material impelling device comprising an element rotatable in said housing and having a substantially flat disk-like surface facing said chamber, a material impelling member supported by said element for movement outwardly to an operative position under the influence of centrifugal force and biased for movement to an inwardly retracted position when said element is not in rotation, a protuberance on said surface having a portion disposed on the leading side of said member, said member when in its said outward operative position having a portion projecting beyond said portion of said protuberance for impelling engagement with material in said

chamber, the leading surface of said portion of said protuberance being rounded in a manner to effect smooth deflection of material over said member when the member is in a retracted or substantially retracted position, and power means operable to rotate said element at a speed at least sufficient to effect outward movement of said member to operative position under the influence of centrifugal force.

15. In apparatus for the comminution of material and including a housing defining a substantially vertical axis grinding chamber, a material impelling device comprising an element rotatable adjacent the bottom of said chamber about a substantially vertical axis and having a substantially flat disk-like top, the central area of which top is free of obstruction, a material impelling member supported by said element for movement outwardly under the influence of centrifugal force and biased for movement to an inwardly retracted position when said element is not in rotation, said member having a portion projecting above the top of said element and said portion having a back surface, toward said central area, which slants smoothly upwardly and outwardly relative to said central area so as to provide minimum obstruction to material moving outwardly from said central area toward the periphery of said element and minimum obstruction to retraction of said member toward its inward position, and power means operable to rotate said element at a speed at least sufficient to effect outward movement of said member to operative position under the influence of centrifugal force.

16. In apparatus for the comminution of material and including a housing defining a grinding chamber, a material impelling device including an element rotatable in said housing, a member pivotally supported by said element for movement inwardly and outwardly in a plane substantially normal to the plane of rotation of said element, power means operable to rotate said element at a speed at least sufficient to cause said member to move outwardly toward the periphery of said element under the influence of centrifugal force developed by rotation of said element, and biasing means operative to effect movement of said member inwardly toward a retracted position upon reduction in the speed of rotation of said element below a predetermined limit.

17. In apparatus for the comminution of material and including a housing defining a grinding chamber, a material impelling device including an element rotatable in said housing, which said element has a surface facing said chamber and a recess adjacent the periphery of said element and in communication with said surface, a member pivotally supported in said recess for movement inwardly and outwardly in a plane substantially normal to the plane of rotation of said element, power means operable to rotate said element at a speed at least sufficient to cause said member to move outwardly toward the periphery of said element under the influence of centrifugal force developed by rotation of said element, said member having a portion arranged to project out of said recess beyond said surface when said member is in an outward position, and biasing means operative upon reduction in the speed of rotation of said element below a predetermined limit for effecting movement of said member inwardly toward a retracted position wherein a major portion of said member is hidden in said recess.

18. In apparatus for the comminution of ma-

terial and including a housing defining a grinding chamber, a material impelling device including an element rotatable in said housing about a substantially vertical axis, a member pivotally supported by said element for movement inwardly and outwardly in a substantially vertical plane, and power means operable to rotate said element at a speed at least sufficient to cause said member to move outwardly toward the periphery of said element under the influence of centrifugal force developed by rotation of said element, the weight of said member being overbalanced inwardly of its pivotal support so as to exert a biasing force on said member tending to effect movement of the member inwardly toward a retracted position upon reduction in the speed of rotation of said element below a predetermined limit.

19. In apparatus for the comminution of material and including a housing defining a substantially vertical axis grinding chamber and a stationary cutting device supported by said housing at the side of said chamber, a device for impelling material against said stationary cutting device and including an element rotatable adjacent the bottom of said chamber about a substantially vertical axis and having a substantially flat top with a central portion of said top free of obstruction, said element having also a recess communicating with said top adjacent the periphery thereof, a member pivotally supported in said recess for movement inwardly and outwardly in a substantially vertical plane, power means operable to rotate said element at a speed at least sufficient to cause said member to move outwardly toward the periphery of said top under the influence of centrifugal force developed by rotation of said element, stop means for stopping said member in a predetermined outward position for cooperation with said stationary device in the comminution of material, means for delaying and cushioning the outward movement of said member to its said outward position, means operative upon reduction in speed of rotation of said element below a predetermined limit for effecting movement of said member inwardly to a retracted position, and resilient means for cushioning said member upon movement thereof to retracted position.

20. In apparatus for the comminution of material and including a housing defining a grinding chamber the wall of which is a substantially regular surface of generation, and a stationary cutting device in said chamber; a material impelling device including an element rotatable in said housing adjacent said stationary device and substantially coaxially of said chamber, a member pivotally supported by said element for movement inwardly and outwardly in a plane substantially normal to the plane of rotation of the element, power means operable to rotate said element at a speed at least sufficient to cause said member to move outwardly to an operative position under the influence of centrifugal force developed by rotation of said element, said member having a portion which, when the member is in its said outward operative position, extends relatively closely to the wall of said chamber and substantially parallel with a generatrix of said wall for cooperation with said stationary cutting device in the comminution of material, and means operative upon reduction in the speed of rotation of said element below a predetermined limit for effecting movement of said member inwardly toward a retracted position, said portion of said member extending in substantially spaced acute

angular relationship with said chamber wall when said member is in retracted position.

21. In apparatus for the comminution of material and including a housing defining a grinding chamber the wall of which is a substantially regular surface of generation, and a stationary cutting device in said chamber; a material impelling device including an element rotatable in said housing adjacent said stationary device and substantially coaxially of said chamber, a member pivotally supported by said element for movement inwardly and outwardly in a plane substantially normal to the plane of rotation of the element, power means operable to rotate said element at a speed at least sufficient to cause said member to move outwardly to an operative position under the influence of centrifugal force developed by rotation of said element, said member having a portion which, when the member is in its said outward operative position, extends relatively closely to the wall of said chamber and substantially parallel with a generatrix of said wall, said portion of said member having a beveled leading edge for directing material against said stationary cutting device, and means operative upon reduction in the speed of rotation of said element below a predetermined limit for effecting movement of said member inwardly toward a retracted position, said portion of said member extending in substantially spaced acute angular relationship with said chamber wall when said member is in retracted position.

22. In an apparatus for comminution of waste material such as garbage and including a housing defining a grinding chamber and a rotatable material impelling device in said chamber; a unitary stationary shredding device supported on one side of said chamber and having a cutting surface of substantial breadth and height facing toward the center of said chamber for cooperation with said impelling device, which said cutting surface lies substantially in a surface of generation about the axis of said impelling device and has a plurality of elongated sharp-edged ridges extending in closely spaced substantially parallel side by side relationship, said ridges throughout substantial portions of their lengths extending diagonally with respect to a generatrix of said surface of generation and slanting in the direction of rotation of said impelling device, the tops of said ridges being notched to form a plurality of teeth therein.

23. In apparatus for the comminution of material and including a housing defining a grinding chamber, means for comminuting material in said chamber including a stationary shredding device supported by said housing and a rotatable material impelling device having means for impelling material substantially in the direction of rotation against said stationary device, said stationary shredding device including a shredding element having a cutting face provided with a plurality of sharp-edged substantially parallel curving ridges arranged so as to present convex sides of said ridges to material impelled thereagainst in the direction of rotation of said impelling device.

24. In apparatus for the comminution of material and including a housing defining a grinding chamber, means for comminuting material in said chamber including a stationary shredding device supported by said housing and a rotatable material impelling device having means for impelling material substantially in the direction of rotation against said stationary device, said sta-

tionary shredding device including a shredding element having a cutting face provided with a plurality of sharp-edged substantially parallel curving ridges arranged so as to present convex sides of said ridges to material impelled thereagainst in the direction of rotation of said impelling device, each of said ridges having transversely extending notches formed therein so as to define a multiplicity of teeth in each of said ridges.

25. In apparatus for the comminution of material and including a housing defining a grinding chamber, means for comminuting material in said chamber including a stationary shredding device supported by said housing and a rotatable material impelling device having means for impelling material substantially in the direction of rotation against said stationary device, said stationary shredding device including a shredding element having a cutting face provided with a plurality of sharp-edged substantially parallel ridges arranged to be engaged successively by material impelled against said element in the direction of rotation of said impelling device, said ridges having transverse notches formed therein so as to define a multiplicity of teeth in said ridges, said notches tapering from the leading side toward the trailing side of said element so that in a leading one of said ridges the notches are deeper and the teeth narrower than are the notches and teeth respectively in the immediately adjacent trailing ridge.

26. In apparatus for the comminution of material and including a housing defining a grinding chamber, means for comminuting material in said chamber including a stationary shredding device supported by said housing and a rotatable material impelling device having means for impelling material substantially in the direction of rotation against said stationary device, said stationary shredding device including a shredding element having a cutting face provided with a plurality of sharp-edged substantially parallel ridges arranged to be engaged successively by material impelled against said element in the direction of rotation of said impelling device, said ridges having transverse notches formed therein so as to define a multiplicity of teeth in said ridges, said notches tapering from the leading side toward the trailing side of said element and the notches in a trailing one of said ridges being in effect aligned extensions respectively of the notches in the next adjacent leading one of said ridges so that the notches in said one trailing ridge are narrower and shallower than the notches in said one next adjacent leading ridge.

27. In apparatus for the comminution of material and including a housing defining a grinding chamber, means for comminuting material in said chamber including a stationary shredding device supported by said housing and a rotatable material impelling device having means for impelling material substantially in the direction of rotation against said stationary device, said stationary shredding device including a shredding element having a cutting face lying approximately in a surface of generation about the center of rotation of said impelling device, said surface being provided with a pair of sharp-edged substantially parallel curving ridges arranged so as to present convex sides of said ridges to material impelling thereagainst in the direction of rotation of said impelling device, the trailing one of said ridges having transverse notches formed therein substantially in alignment respectively

with transverse notches formed in the leading one of said ridges, the teeth in said leading ridge formed by the notches therein being narrower than the teeth in said trailing ridge formed by the notches therein.

28. In apparatus for the comminution of material, a housing defining a substantially vertical axis grinding chamber having a substantially circular lower rim, means providing a space below said rim for receiving comminuted material, and means for comminuting material in said chamber including a material impelling device having adjacent said lower rim of said chamber an element rotatable coaxially of said chamber, said element having a substantially circular periphery in closely spaced relation to said lower rim of said chamber to form a clearance for passage of comminuted material from said chamber into said space and said element having a substantially flat top peripheral portion with a multiplicity of substantially evenly spaced notches formed in the outer edge thereof in communication with the top of the element, the trailing walls of said notches being substantially straight so as to provide sharp shoulders and the leading walls of said notches being flared at an angle relative to said trailing walls so that said notches are wider at the outside and bottom than at the inside and top respectively, the said lower rim of said chamber also having formed therein a multiplicity of substantially evenly spaced notches deeper and wider at the bottom than at the top and having substantially straight trailing walls to form sharp shoulders arranged to be in opposed relationship with the said sharp shoulders of said first mentioned notches for the shearing of material passing through said clearance.

29. In apparatus for the comminution of material, a housing defining a substantially vertical axis grinding chamber having a substantially circular lower rim, means providing a space below said rim for receiving comminuted material, and means for comminuting material in said chamber including a material impelling device having adjacent said lower rim of said chamber an element rotatable coaxially of said chamber, said element having a substantially circular periphery in closely spaced relation to said lower rim of said chamber to form a clearance for passage of comminuted material from said chamber into said space, said element having also a substantially flat top peripheral portion with a beveled outer edge and a multiplicity of substantially evenly spaced peripheral notches formed therein

in communication with the top of the element, portions of the trailing walls of said notches lying in planes substantially radial relative to the center of said element and the leading walls of said notches being flared at an angle relative to said trailing walls so that the notches are wider at the outside and bottom than at the inside and top respectively.

30. In apparatus for the comminution of material, a housing defining a substantially vertical axis grinding chamber having a substantially circular lower rim, means providing a space below said rim for receiving comminuted material, and means for comminuting material in said chamber including a material impelling device having adjacent said lower rim of said chamber an element rotatable coaxially of said chamber, said element having a substantially flat top peripheral portion with a substantially circular rim in closely spaced relationship to said lower rim of said chamber to form a clearance for passage of comminuted material from said chamber into said space, the said lower rim of said chamber having formed therein a multiplicity of substantially evenly spaced notches which are deeper and wider at the bottom than at the top and the tops of which notches extend above the level of said flat top peripheral portion of the said rotatable element.

31. In apparatus for the comminution of material, a housing having therein a grinding chamber and having an opening for admission of material into said chamber, said housing also being adapted for the supply of water thereinto, means including a rotatable material impelling device for comminuting material in said chamber, means providing a relatively small clearance adjacent the bottom of said chamber for the passage of water and comminuted material from said chamber, a discharge conduit communicating with said clearance for receiving therefrom water and comminuted material and adapted for connection with a waste pipe of a sewer system or the like, means providing a duct for by-passing water around said clearance, the upper end of said duct opening into the interior of said housing through an elongated substantially vertically extending and relatively narrow slot disposed substantially above the level of said clearance, the lower end of said duct communicating with said discharge conduit, and means on the leading side of said slot, relative to the direction of rotation of said device, for deflecting material over said slot.

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