June 7, 1949. G. W. RUNDLE 2,472,725

CRUSHING AND GRINDING MACHINE

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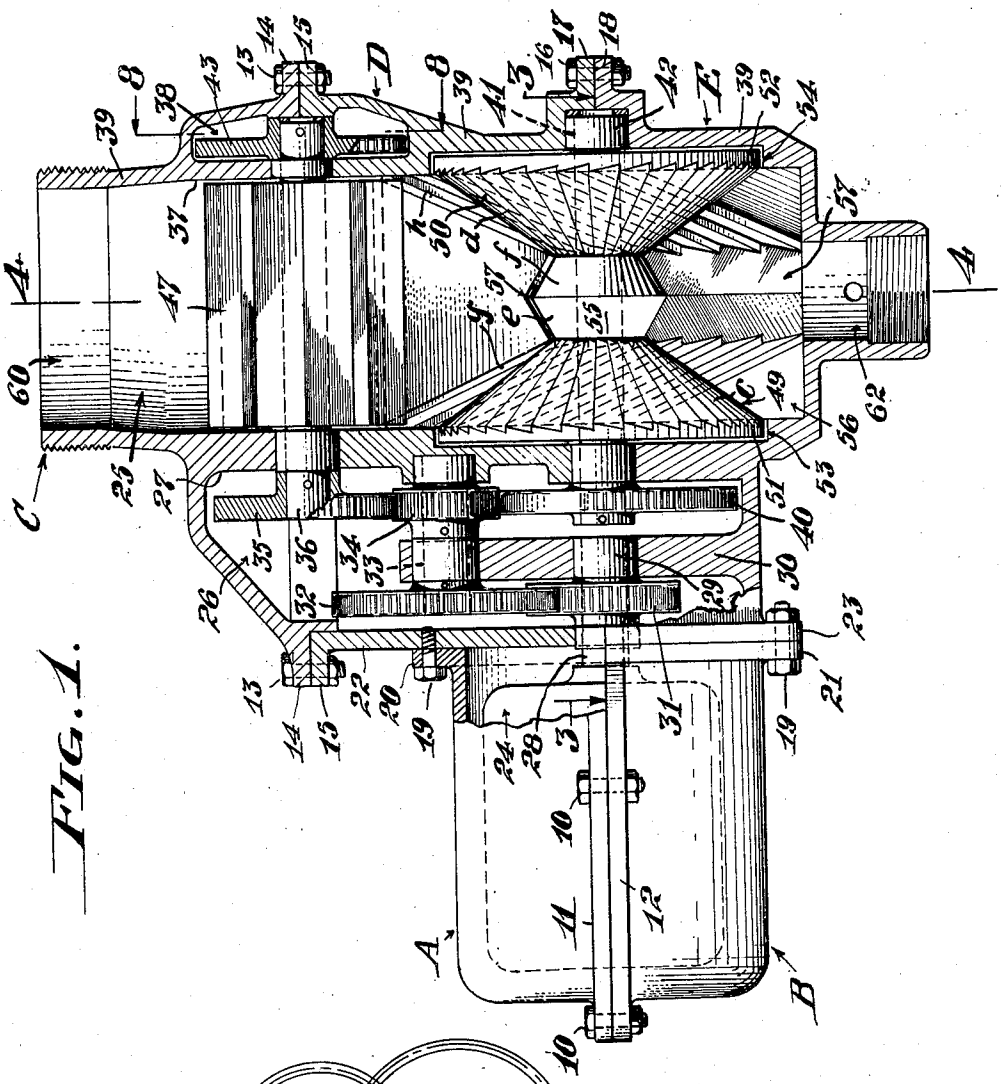


FIG. 1.

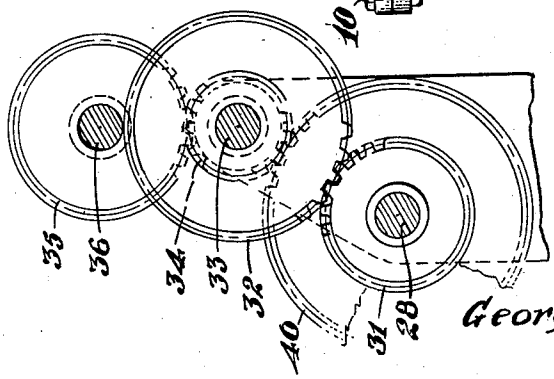


FIG. 2.

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CRUSHING AND GRINDING MACHINE

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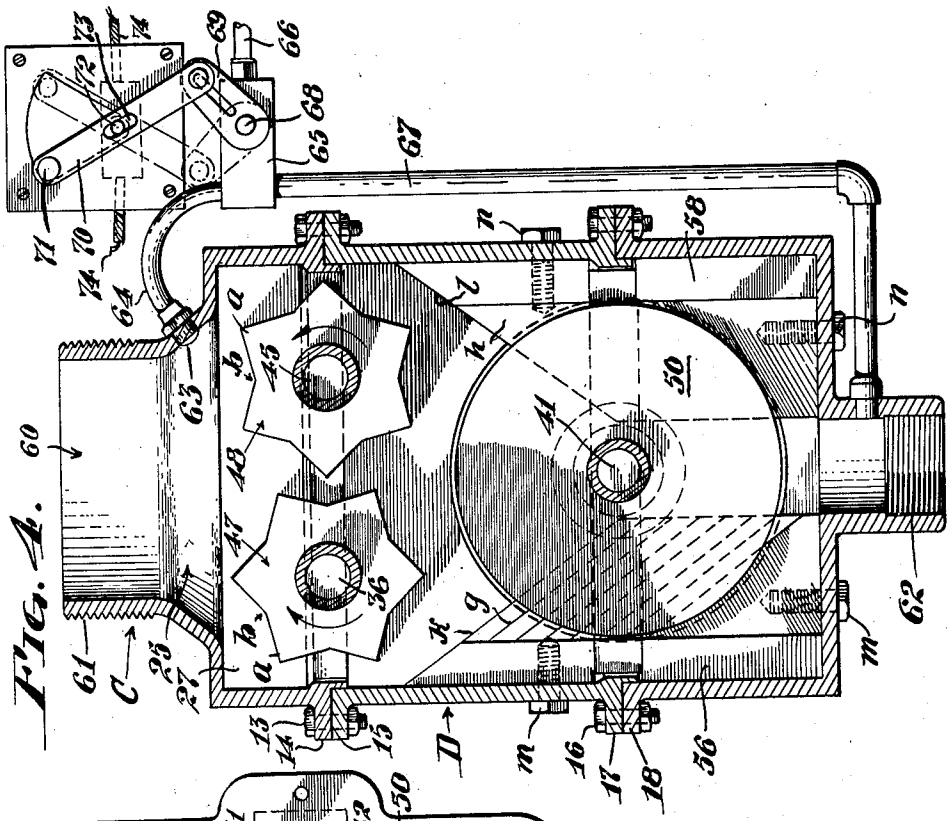


FIG. 4.

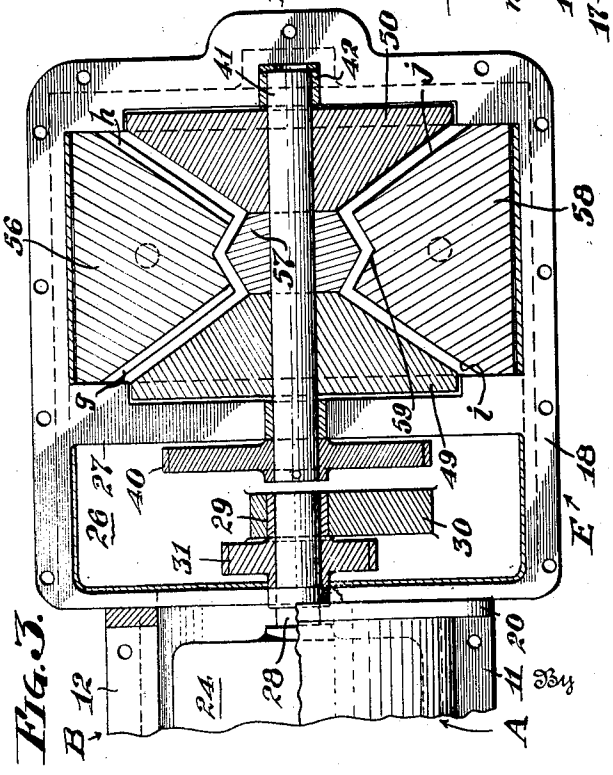


FIG. 3.

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CRUSHING AND GRINDING MACHINE

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FIG. 5.

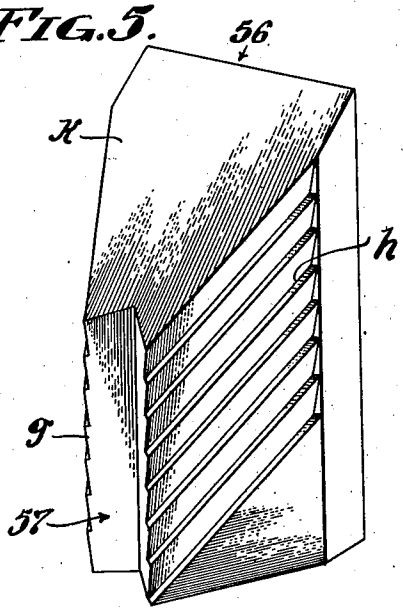


FIG. 7.

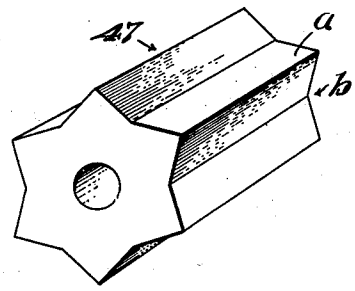


FIG. 8.

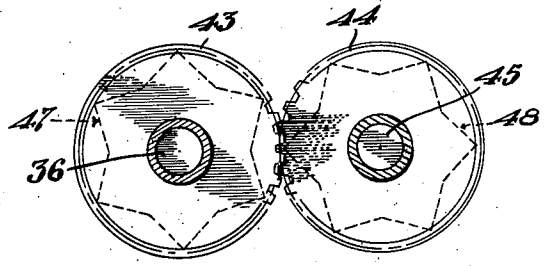


FIG. 6.

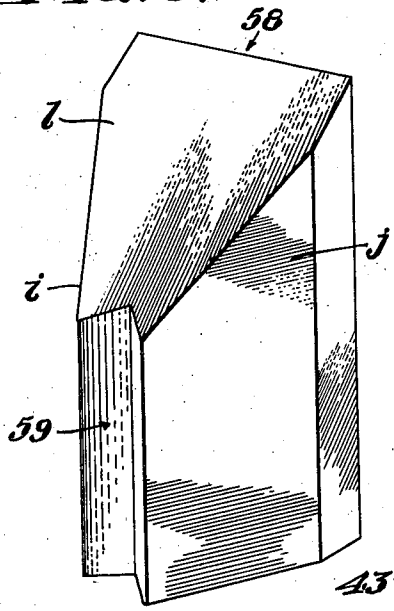
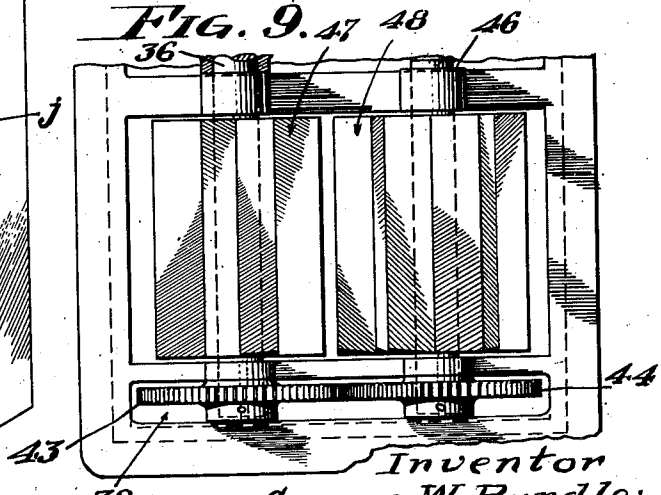


FIG. 9.



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2,472,725

CRUSHING AND GRINDING MACHINE

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Application November 26, 1945, Serial No. 630,714

1 Claim. (Cl. 241—155)

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This invention relates to crushing and grinding mechanism and has as its primary object the provision of a machine which is particularly applicable for use in the domestic disposal of garbage.

Another object is to provide a crusher and grinder which is adapted to be applied to the conventional kitchen sink and to a sewer line and operated to effect reduction of refuse food stuffs by a crushing and grinding action in such fashion that the ground materials may be directed into the sewer main and thus be disposed of.

Another object is to provide a crusher and grinder in which bones and similar substances may be initially crushed and then subjected to a grinding action so as to reduce such substances into sufficiently fine particles as to permit their being introduced into a sewer pipe through the usual trap structure.

Another object is to provide a crushing and grinding mechanism of the above character embodying an arrangement of crushing rollers and a grinding mechanism in which replacement of worn or broken parts may be readily effected.

A further object is to provide a crushing and grinding machine in which the parts are so formed and arranged as to be readily produced and assembled and which machine is highly efficient in operation.

With the foregoing objects in view, together with such other objects and advantages as may subsequently appear, the invention resides in the parts and in the combination, construction and arrangement of parts hereinafter described and claimed, and illustrated by way of example in the accompanying drawings, in which:

Fig. 1 is a view in vertical section, partly in elevation of the crushing and grinding machine;

Fig. 2 is a diagram of the gear transmission mechanism illustrated in Fig. 1;

Fig. 3 is a detail in horizontal section taken on the line 3—3 of Fig. 1;

Fig. 4 is a view in end elevation of the crushing and grinding mechanism with the housing thereof shown in vertical section taken on the line 4—4 of Fig. 1;

Fig. 5 is a perspective view of a stationary grinding element;

Fig. 6 is a perspective view of a stationary filler block designed to be associated with the grinding element shown in Fig. 5 and with rotary grinding rollers;

Fig. 7 is a perspective view of a crushing roller;

Fig. 8 is a detail in end elevation taken on the line 8—8 of Fig. 1, as seen in the direction indicated by the arrows, with parts removed depicting the relative arrangement of a pair of crushing rollers; and

Fig. 9 is a plan view of the pair of crushing rollers.

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Referring to the drawings more specifically, the characters A, B, C, D and E indicate the sections of a housing within which the operative parts of the machine are mounted and encased; the sections A and B being connected together as by bolts 10 engaging flanges 11 and 12 on the sections A and B respectively; sections C and D being connected together by bolts 13 connecting flanges 14 and 15 on the sections C and D; the sections D and E being connected together by bolts 16 engaging flanges 17 and 18 on the sections D and E, while the sections A and B are collectively connected to the united sections D and E by bolts 19 passing through flanges 20 and 21 on the sections A and B and engaging wall portions 22 and 23 on the sections D and E respectively. The sections A and B constitute a casing for an electric motor 24.

The interior of the housing formed by the sections C, D and E is divided into chambers 25 and 26 by a partition 27 formed collectively of portions of the sections C, D and E; the chamber 25 containing the crushing and grinding mechanism of the machine, while the chamber 26 contains a transmission mechanism for driving the crushing and grinding mechanism as will presently be described and is designed to contain a suitable lubricant.

The drive shaft 28 of the motor 24 extends into the chamber 26 and is journalled in a bearing 29 carried in a standard 30 formed integral with the section E, and mounted on the drive shaft 29 is a spur gear 31 meshing with a gear wheel 32 on a stud shaft 33 journalled in and extending through the upper end portion of the standard 30.

A toothed gear wheel 34 mounted on the stud shaft 33 meshes with a gear wheel 35 on a shaft 36 extending through the partition 27 across the chamber 25 and through a partition 37 separating the chamber 25 from a gear chamber 38 formed on the end wall 39 of the housing sections C and D opposite the partition 27. The gear wheel 34 also meshes with a gear wheel 40 on a shaft 41 which extends through a bushing in the partition 27 across the chamber 25 and is journalled at its outer end in a bearing 42 carried by the end wall 39 of the sections D and E. The outer end of the shaft 36 is fitted with a gear wheel 43 in the chamber 38 which meshes

with a corresponding gear wheel 44 on a shaft 45 extending through the partition 37 and across the chamber 25 with its opposite end journalled in the partition 27 as indicated at 46 in Fig. 9.

Mounted on the shafts 36 and 45 is a pair of complementary crushing rollers 47 and 48 formed with longitudinally extending teeth *a* of angular cross section with adjacent teeth defining an angular channel *b* therebetween; the crushing rollers being arranged in offset circumferential relation to each other so that on rotation thereof the teeth of one of the rollers will move in and out of the angular spaces defined by the teeth of the companion roller. The crushing rollers are disposed in such spaced relation to each other as to afford a clearance between the faces of a tooth and the tooth *a* surfaces defining the opposed channel *b* of the adjacent roller, as particularly shown in Fig. 4.

Mounted on the shaft 41 in the chamber 25 is a pair of opposed toothed frusto-conical grinding rollers 49 and 50 having circular marginal portions 51 and 52 respectively which extend into circular recesses 53 and 54 formed in the opposed faces of the partition 27 and the outer end wall 39 of the housing in close proximity to the margins of the recesses. Teeth *c* and *d* on the tapered faces of the rollers 49 and 50 extend longitudinally and radially thereof.

The interior ends of the grinding rollers 49 and 50 abut a spacing collar 55 on the shaft 40 which collar has tapered end portions *e* and *f* leading inwardly from the mid-center of the collar to the ends thereof which lies contiguous the inner end portions of the teeth *c* and *d* of the grinding rollers.

Arranged within the chamber 25 and projecting between the grinding rollers 49 and 50 is a stationary grinding element 56 having tapered side walls formed with teeth *g* and *h* arranged with the teeth extending downwardly at an inclination to the horizontal and in oblique relation to contiguous teeth *c* and *d* of the grinding rollers 49 and 50. The outer edge of the element 56 is formed with a V-groove 57. The grinding element 56 is arranged in the chamber 25 with its teeth *g* and *h* slightly spaced from the teeth *c* and *d* of the rollers 49 and 50 and with the walls of the channel 57 spaced from the tapered walls *e* and *f* of the collar 55.

A filler block 58 is arranged in the chamber 25 opposite the grinding element 56 and has inclined side walls *i* and *j* leading to a longitudinal V-groove 59 on the reduced edge of the block. The block 58 is arranged in the chamber 25 with the inclined walls *i* and *j* thereof spaced a short distance from contiguous opposed teeth *c* and *d* of the grinding rollers 49 and 50 and with the surfaces of the groove 59 slightly spaced from the inclined surfaces *e* and *f* of the collar 55.

The upper ends *k* and *l* of the grinding element 56 and the filler block 58 respectively are inclined downwardly to afford a hopper-like arrangement to feed materials between the grinding rollers 49 and 50 and the fixed grinding element 56. The grinding element 56 and filler block 58 are demountably secured in place within the housing by bolts *m* and *n* respectively, as particularly shown in Fig. 4.

The upper end of the section C is formed with an intake opening 60 through which materials to be crushed or ground may be fed to the chamber 25 above the crushing rollers 47 and 48; the opening 60 being preferably encircled by an annular threaded neck 61 adapted to be screwed

into engagement with the outlet of a sink or hopper. The lower end of the chamber 25 opens to discharge through an outlet passage 62 adapted to be connected to a waste pipe leading to any suitable point of discharge, such as a sewer.

Means are provided for delivering wash water to the interior of the housing which is here shown as embodying a spray nozzle 63 opening to the chamber 25 through the section C above the crushing rollers 47 and 48, which nozzle is attached to a conduit 64 leading from a cut-off valve 65 attached to a water feed pipe 66 leading from any suitable source of water supply under pressure. Also connected to the discharge side of the valve 65 is a conduit 67 which leads to the outlet passage 62 to direct flushing water to the latter for the purpose of augmenting discharge of ground materials from the machine. The valve 65 is of conventional construction and embodies a stem 68 fitted with a handle 69 connected to one end of a manually operable lever 70 fitted with a handle 71; the lever being pivoted at 72 and being operable to swing the arm 69 to effect opening and closing of the valve 65. The lever 70 is adapted to operate an electric switch 73 to close electric circuit through conductors 74 connecting with the terminals of the electric motor 24 so that on operating the lever 70 to open the valve 65 the switch 73 will be closed to direct current to the motor and on operating the lever 70 to close the valve 65, the switch 73 will be opened to cut off the current to the motor.

In the operation of the invention when it is desired to effect crushing and grinding of material such as garbage, the lever 70 is swung from the position shown in full lines in Fig. 4 to the position indicated in dotted lines so as to close the switch 73 and open the valve 65, whereupon the motor 24 will be actuated so as to drive the shaft 25 and the train of gears 31, 32, 34, 35 and 40 and thereby revolve the shafts 36 and 41; revolution of the shaft 36 acting through the gears 43 and 44 to drive the shaft 45 in a direction opposite that of the shaft 36. The crushing rollers 47 and 48 being fixed in the shafts 36 and 45 are revolved therewith and move in the direction indicated by the arrows in Fig. 4. Rotation of the shaft 41 drives the grinding rollers 49 and 50. The materials to be reduced are fed through the opening 60 into the chamber 25 where they are engaged by the crushing rollers 47 and 48 and fed therebetween where coarse and hard materials such as bones are subjected to a crushing action. The materials after passing between the crushing rollers are fed between the grinding rollers 49 and 50 and the toothed grinding element 56 where the materials are subjected to the grinding action and reduced sufficiently to be readily passed to discharge through the outlet 62. During this operation of the machine jets of water are delivered into the upper portions of the chamber 25 above the rollers 47 and 48 through the nozzles 63 and at the same time a stream of water is delivered to the outlet 62 from the pipe 67 so as to effect flushing of the ground materials and augmenting their discharge from the machine. After termination of a crushing and grinding operation the hand lever 70 is restored to the full line position shown in Fig. 4 thereby opening the switch 73 to stop the motor 24 and closing the valve 65 to terminate the flow of water to the machine.

While I have shown and described a specific

embodiment of my invention I do not limit myself to the exact details of construction set forth, and the invention embraces such changes, modifications and equivalents of the parts and their formation and arrangement as come within the purview of the appended claim.

I claim:

In a crushing and grinding machine, a housing having an intake opening in its upper end and an outlet passage in its lower end, a pair of cooperative crushing rollers on horizontal axes in the upper portion of said housing contiguous the intake opening, a pair of rotatable conical grinding rollers mounted on a shaft in said housing arranged with their tapered faces extending toward each other, the conical rollers being located beneath the crushing rollers and mounted with their axes parallel to the axes of the crushing rollers, radially extending teeth on the tapered faces of said grinding rollers, a grinding element fixed in the housing on one side of the grinding rollers and having inclined side walls extending between and slightly spaced from the toothed tapered faces of said grinding rollers, downwardly inclined teeth on said inclined faces, extending in oblique relation to the contiguous teeth on the grinding rollers, a filler block fixed in the housing on the opposite side of the grinding rollers and having inclined side faces overlying contiguous opposed teeth of the grinding rollers, a collar on the shaft abutting the inner ends of

the grinding rollers and having tapered circumferential walls, oppositely tapered from those of the grinding rollers, said stationary grinding element and said block each being formed with a vertical groove, the walls of which overlie the tapered walls of said collar in close proximity but spaced therefrom, the clearances between the grinding rollers, the collar, the fixed grinding element and the filler block providing the sole spaces for material to pass from the upper end of the housing to the outlet thereof and means for driving said crushing and grinding rollers.

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