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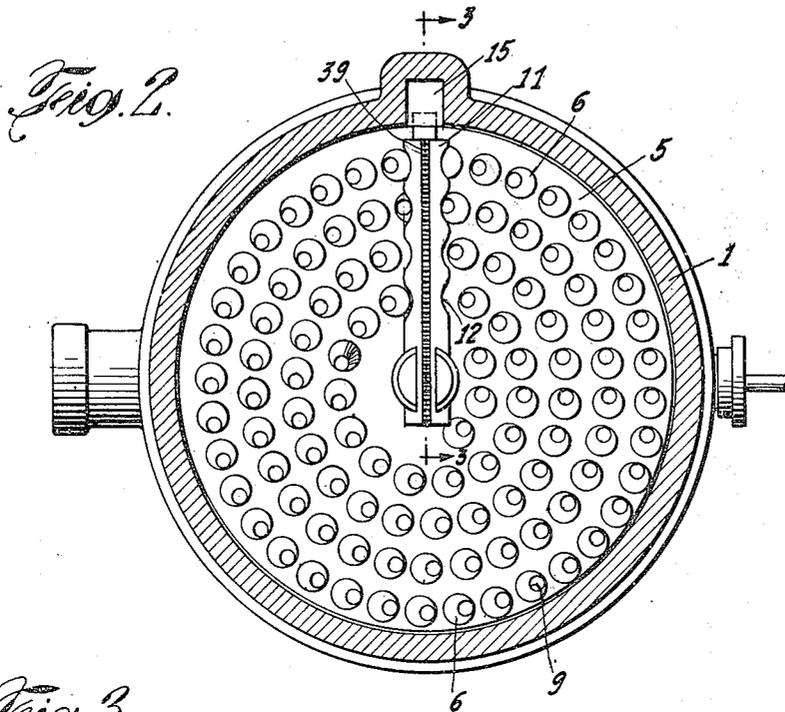
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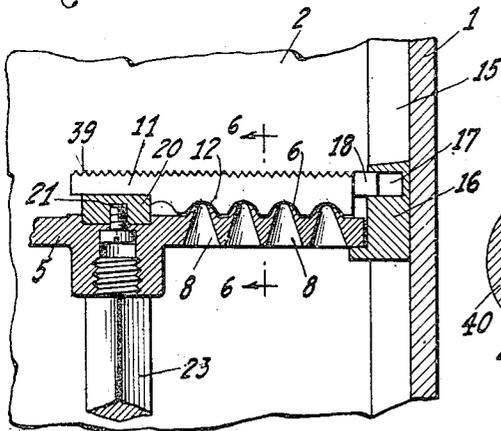
GRINDING MACHINE

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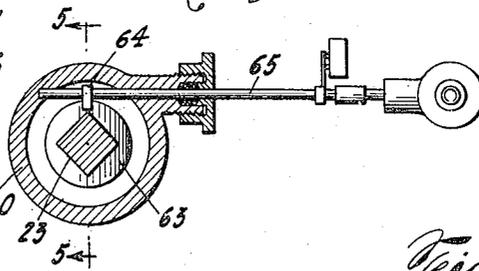
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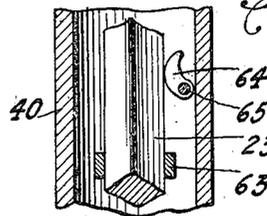
*Fig. 3.*



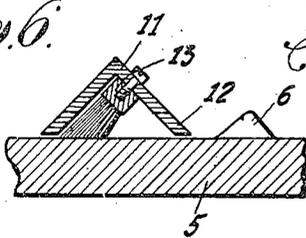
*Fig. 4.*



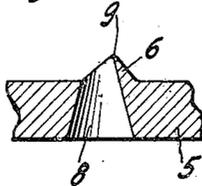
*Fig. 5.*



*Fig. 6.*



*Fig. 7.*



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## UNITED STATES PATENT OFFICE

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## GRINDING MACHINE

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10 Claims. (Cl. 83-7)

This invention relates to grinding machines, and pertains more particularly to machines for grinding and disposing of refuse material such as garbage.

5 The disposal of garbage has long been a problem, not only to municipal authorities, but also to the average householder. From the standpoint of municipal authorities, the collection and sanitary disposal of garbage is becoming increasingly expensive and difficult. From the  
10 standpoint of the individual householder, the disposal of garbage has always been an unpleasant burden.

15 The invention to be described hereinafter proceeds on the theory that the proper method of garbage disposal is in the form of sewage passing through the usual drainage and sewer connections for disposal in the usual manner, or for reclaiming by known methods. To do this,  
20 however, presupposes the existence of a machine capable of reducing all kinds of garbage refuse to a sufficiently comminuted state to enable it to pass through drain and sewer pipes without danger of clogging the same. It is an object of the  
25 present invention to provide a satisfactory machine for this purpose.

Other objects and advantages of the invention will appear hereinafter.

30 A preferred embodiment of the invention selected for purposes of illustration is shown in the accompanying drawings, in which,

Figure 1 is a vertical section through the machine.

35 Figure 2 is a section on the line 2-2 of Figure 1.

Figure 3 is a section on the line 3-3 of Figure 2.

Figure 4 is a section on the line 4-4 of Figure 1.

40 Figure 5 is a section on the line 5-5 of Figure 4.

Figure 6 is a section on the line 6-6 of Figure 3.

45 Figure 7 is a section on the line 7-7 of Figure 1.

Referring to the drawings, the apparatus comprises a casing 1 which forms a receptacle 2 for the material to be ground. The said casing is preferably cylindrical in form and is closed at  
50 its upper end by a cover 3 having a locking connection of any suitable form such as the lug 4 which engages a suitable groove in the upper edge of the casing so that the casing may be tightly sealed.

55 Mounted within the casing 1 is a grinding member 5, preferably in the form of a disk having grinding teeth 6 on its upper surface, and having its outer periphery 7 positioned closely adjacent the inner wall of the cylinder casing 1  
60 in order to prevent passage of unground ma-

terial between the grinding disk and the wall of the casing. In order to permit egress of ground material, the grinding disk itself is provided with a plurality of apertures, said apertures 8 being preferably of progressively increasing diameter  
5 from the grinding face of the disk to the opposite face in order to prevent any possibility of the said apertures becoming clogged with ground material. Preferably, the said apertures and  
10 teeth may be formed as illustrated in Figure 7, each tooth having an aperture associated therewith adjacent the cutting edge 9 in order that  
15 ground material may pass through the cutting disk immediately after being cut.

The grinding teeth and apertures illustrated 15 may be conveniently formed by casting substantially cone-shaped projections on the grinding face and then drilling the cone-shaped apertures 8, the axes of the conical apertures being off-  
20 set somewhat from the axes of the conical projections in order that the cutting edge of each tooth may be near the apex of the cone-shaped  
25 projection illustrated in Figure 7.

It is desirable to prevent the teeth from grinding in fixed grooves, and it is possible of course  
30 to prevent this by distributing the teeth at random over the surface of the grinding disk. It is desirable, however, to clean the grinding teeth continuously during the grinding operation, and accordingly, rather than arrange the teeth at  
35 random it is preferable, for reasons which appear hereinafter, to arrange them in concentric circles, but about a center which is off-set from the center of rotation of the disk. This provides  
40 an eccentric motion of the grinding teeth which prevents any grooving of the material being ground.

As a convenient means of cleaning the grinding teeth, the scraper 11 (see Figures 2, 3, and  
45 6) is provided having prongs 12 projecting between the rows of teeth and extending nearly to the surface of the disk and adapted to dislodge any material tending to collect in the  
50 grooves between the teeth. As an additional cleaning means, the wire brush 13 may be secured to the scraper 11 to remove any material  
55 not removed by the prongs 12.

The scraper 11 is held against rotation, but is permitted to reciprocate in order to accommodate  
60 itself to the eccentricity of the grinding teeth. For this purpose the wall of the casing 1 is provided with a longitudinal groove 15 having a slide member 16 therein provided with a slot 17 adapted to receive the lug 18 of the scraper. The  
65 other end of the scraper 11 is slidably mounted in the bevelled gibs 19 of the pivot member 20, and the said member is rotatably secured to the grinding disk by means of the screw 21. It will  
70 be observed that as the grinding disk is rotated, the scraper is held from rotation by the slide 16

but is permitted to reciprocate as necessary to accommodate itself to the eccentricity of the grinding teeth. The scraper also moves longitudinally of the receptacle with the grinding disk 5 as the latter moves longitudinally as hereinafter explained.

In order to rotate the grinding disk 5 a drive shaft 23 is provided which has a screw thread engagement with the disk 5, and the said shaft is turned by a gear 24 driven by a worm 25 secured to the shaft 26 which may be rotated by any suitable source of power such as an electric motor (not shown).

In order to grind all of the material within the receptacle 2 and in order to maintain the desired grinding pressure thereon it is desirable to permit relative movement between the grinding disk and the casing, and this relative movement may be secured conveniently by permitting longitudinal movement of the grinding disk and the drive shaft. For this purpose the shaft 23 is preferably a square shaft, as illustrated, and is permitted to slide through the packing 28, through the hub of the gear 24 and through the packing 29, the packings 28 and 29 being permitted to rotate as the shaft rotates. The packing 28 is held in place by the washer 31 and nut 32, while the packing 29 is held in place by bushings 33 and 34. The gear wheel 24 and worm 25 may be conveniently enclosed within a casing 36 which may be connected to the casing 1 by means of a plurality of brackets 37.

In order that the grinding disk may travel all the way to the top of the receptacle, so that all of the material therein may be ground, a groove 38 is cut in the cover 3 and is shaped to receive the scraper 11 and the member 20. If desired the upper edge of the scraper may be serrated as at 39 to cut through any material which may tend to lodge in the groove 38.

Means are provided for reciprocating the grinding disk and shaft 23 and for applying pressure to the material being ground during the grinding operation. In this connection, it is pointed out that the grinding of refuse material, such as garbage, presents an unusual problem in that many different kinds of material and materials differing greatly in hardness and toughness must be ground. For example, soft material such as bread or potato grind easily and quickly so that a grinder or cutter may be fed quickly through them. On the other hand, materials such as bones are much harder to grind so that a grinder or cutter can be fed through them but slowly. The feeding means for the grinder or cutter should meet all these conditions in a satisfactory manner, being fed forward in any instance at a rate depending upon the nature of the material being acted upon. I have found that a fluid pressure feed has substantial advantages in the grinding of a material such as garbage, since it feeds the grinding or cutting means forward at a speed responsive to the character of the material being ground. Also, fluid pressure is advantageous because it is always conveniently available.

In the preferred embodiment illustrated such fluid pressure means comprises a cylinder 40 which may depend from the casing 36 in position to receive the lower end of the shaft 23. A piston 41 is mounted in the cylinder and is secured to the lower end of the shaft 23 by means of grooved packing 42 which is held in place by the bushing 43. A thrust bearing 44 is mounted on the upper face of the piston 41.

The upper end space 45 of the cylinder and the lower end space 46 are connected to a pressure supply line 47 by pipes 48 and 49 respectively and a four-way valve 50 is interposed in said connection. The pipe 51 is also connected to said valve and leads to a suitable drain. The four-way valve 50 is provided with passages 52 and 53 so that when it is in the position illustrated in Figure 1, the chamber 45 is connected to the supply line 47 so that pressure is exerted on the upper face of the piston thus tending to depress the same. At the same time, the chamber 46 is connected through the pipe 49 and passage 52 to the drainage pipe 51, thus permitting the escape of fluid contained in the chamber 46.

If now the valve 50 is turned a quarter turn in counter-clockwise direction, the passage 52 will connect the pipe 49 with the supply line 47 thus exerting pressure on the lower side of the piston 41 and tending to raise the same. At the same time, the pipe 48 will be connected with the drain pipe 51 thus permitting the fluid contained in the chamber 45 to escape.

If desired, in order to prevent application of excessive pressures to the grinding disk during the grinding operation, a pressure relief valve 55 of any standard construction may be inserted in the pipe 49 in order that the pressure to be applied to the piston during its upward travel may be set at any desired maximum. If this maximum pressure is exceeded, the pressure will be relieved through the pipe 56 which may also be connected to a drain.

In order to provide fluid for flushing the ground material out of the lower part of the casing 1, a spray nozzle 60 may be provided which may be connected through the pipe 61 to the supply line 47. The ground material and the flushing fluid may pass from the casing 1 through the outlet 62 which may be connected to a suitable drain.

It may be desirable to provide automatic shut-off mechanism in order that operation of the grinder may be stopped when the grinding operation is completed. For this purpose a collar 63 may be secured to the shaft 23 in position to engage the trigger 64 when the grinding disk approaches its upper limit of motion. The trigger 64 is connected to a shaft 65 which extends through the wall of the cylinder into proximity with the electric switch 66 which controls the driving motor. As will be understood, a partial rotation of the shaft 65 will be sufficient to open the switch, thus stopping the electric motor. At the same time, it may be desirable to automatically shut off the flushing spray, and accordingly, a valve 67 is interposed in pipe 61 and has a valve stem 68 which is also connected with the shaft 65. The said valve is so arranged that a partial rotation of the shaft 65 will close the valve 67 thus shutting off the supply of water. As will be understood, after the machine is thus automatically shut off, it cannot again be operated until the valve 50 is operated to restore the grinding disk to its lower position.

It will be understood that the invention may be variously modified and embodied within the scope of the subjoined claims.

I claim as my invention:

1. A garbage grinding machine comprising a cylindrical receptacle for the reception of material to be ground, a grinding means in said cylinder mounted for rotation in a plane perpendicular to the axis of the cylinder, and mounted for reciprocation along a line parallel to the axis of the cylinder, means for rotating said grinding

means, means for moving said grinding means lengthwise of the cylinder, means controlled by said means for moving the grinding means for automatically stopping the rotation of said grinding means upon completion of its lengthwise travel in grinding direction, means for flushing the grinding means, and controlling means for the flushing means actuated by the means for moving the grinding means.

2. A grinding machine comprising a cylindrical receptacle for the reception of material to be ground, a grinding means in said cylinder, means for rotating said grinding means, means for moving said grinding means lengthwise of the cylinder, a water spray for flushing the ground material out of the bottom of the receptacle, and means controlled by said means for moving the grinding means for automatically stopping the rotation of said grinding means upon completion of its lengthwise travel in grinding direction and for simultaneously automatically shutting off said water spray.

3. A grinding machine for grinding garbage or the like comprising a receptacle, grinding means of an area equal substantially to the cross sectional area of the receptacle movable longitudinally of the receptacle whereby it compresses material to be ground against an end of the receptacle, a discharge opening for the receptacle, means for turning the grinding means, fluid pressure actuated means for effecting longitudinal movement of the grinding means, flushing means for the grinding means, and valve means controlling the supply of fluid to the fluid pressure actuated means and to the flushing means.

4. A grinding machine for grinding garbage or the like comprising a receptacle for the material to be ground, grinding means of an area equal substantially to the cross sectional area of the receptacle movable from one end of the receptacle to the other whereby it compresses material to be ground against an end of the receptacle, a cylinder supported in fixed relation to the receptacle, a piston in the cylinder, a rod connecting the piston to the grinding means, means for turning the grinding means, means for supplying water to the cylinder for feeding the cutting means axially into the cylinder, means for simultaneously supplying water to the grinding means for flushing it, and a conduit connected to the receptacle for carrying away ground material.

5. A grinding machine for grinding garbage or the like comprising a cylindrical receptacle, grinding means of an area equal substantially to that of the receptacle which moves longitudinally of the receptacle and compresses the material to be ground against an end wall of the receptacle, said grinding means having openings through which ground material passes from the front of the grinding means to the rear thereof, and fluid pressure actuated means for forcing the grinding means against the material to be cut with a substantially constant pressure whereby movement of the grinding means is adapted to the varying nature of the material being ground.

6. A grinding machine for grinding garbage or the like comprising a cylindrical receptacle, grinding means of an area equal substantially to that of the receptacle which moves longitudinally of the receptacle and compresses the material to be ground against an end wall of the receptacle,

said grinding means having openings through which ground material passes from the front of the grinding means to the rear thereof, fluid pressure actuated means for forcing the grinding means against the material to be ground with a substantially constant pressure whereby movement of the grinding means is adapted to the varying nature of the material being ground, and means for supplying flushing water to the rear surface of the grinding means for flushing away ground material.

7. A grinding machine for grinding garbage or the like comprising a receptacle, grinding means movable longitudinally of the receptacle, a discharge opening for the receptacle, means for turning the grinding means, fluid pressure actuated means for effecting longitudinal movement of the grinding means, flushing means for the grinding means, valve means controlling the supply of fluid to the fluid pressure actuated means and to the flushing means, and automatic means controlled by movement of the grinding means for stopping the rotation of the grinding means and cutting off the flushing means.

8. A grinding machine for grinding garbage or the like comprising a receptacle for the material to be ground, grinding means movable from one end of the receptacle to the other, said grinding means having an area equal substantially to the cross sectional area of the receptacle whereby it serves to compress material to be ground against an end of the receptacle, a cylinder supported in fixed relation to the receptacle, a piston in the cylinder, a rod connecting the piston to the grinding means, means for turning the grinding means, means for supplying fluid pressure to one end of the cylinder for feeding the grinding means axially into the cylinder, and means for supplying fluid pressure to the other end of the cylinder for effecting return movement of the cutting means.

9. In a grinding machine for garbage or the like including substances of different hardness, the combination of a cylinder for the material to be ground, a grinding disk in the cylinder of a diameter equal substantially to that of the cylinder, fluid pressure means for moving the disk along the axis of the cylinder to compress material to be ground between the disk and an end wall of the cylinder, rows of outwardly projecting cutting teeth on the front side of said disk, and holes through the disk adjacent to said teeth for passage of ground material to the rear of the disk whereby the fluid pressure means causes relatively rapid axial movement when soft material is ground and slow movement when hard material is ground.

10. In a grinding machine for garbage or the like, the combination of a cylindrical receptacle, circular grinding means of an area equal substantially to the cross sectional area of the receptacle and movable longitudinally of the receptacle whereby it serves to compress material to be ground against an end of the receptacle, said grinding means being provided with openings for passage of ground material to the rear of the grinding means, fluid pressure actuated means for moving the grinding means longitudinally of the receptacle whereby a substantially constant pressure is maintained for compressing the material to be ground against the end of the receptacle and means for rotating the grinding means.

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