Jan. 18, 1938. O. J. FEIGHT 2,105,764

APPARATUS FOR BREAKING DOWN MATERIALS

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Fig. 1

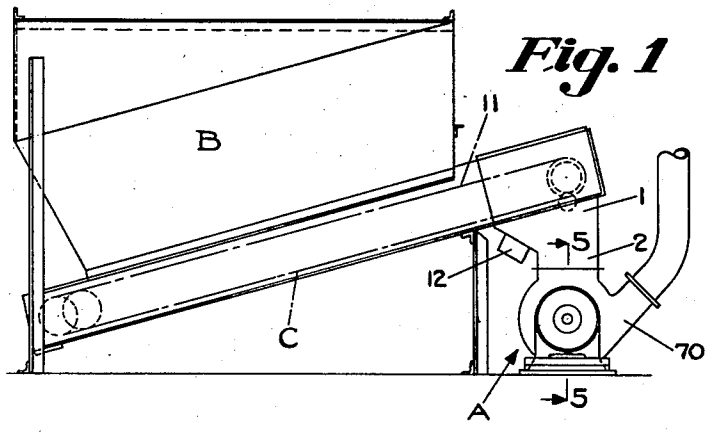

Fig. 2

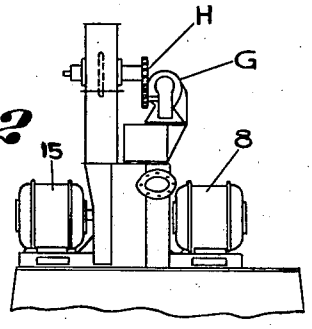

Fig. 6

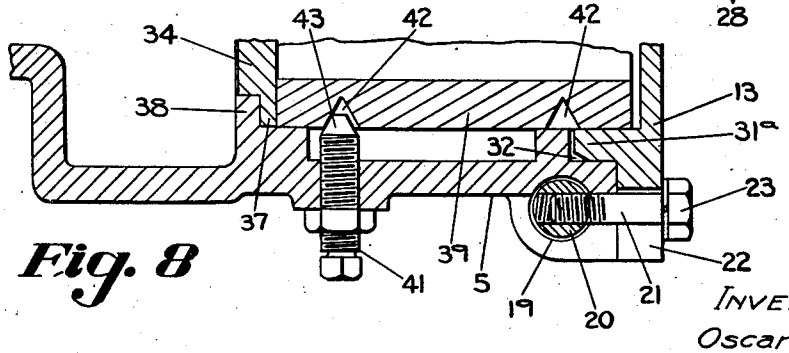

Fig. 8

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APPARATUS FOR BREAKING DOWN MATERIALS

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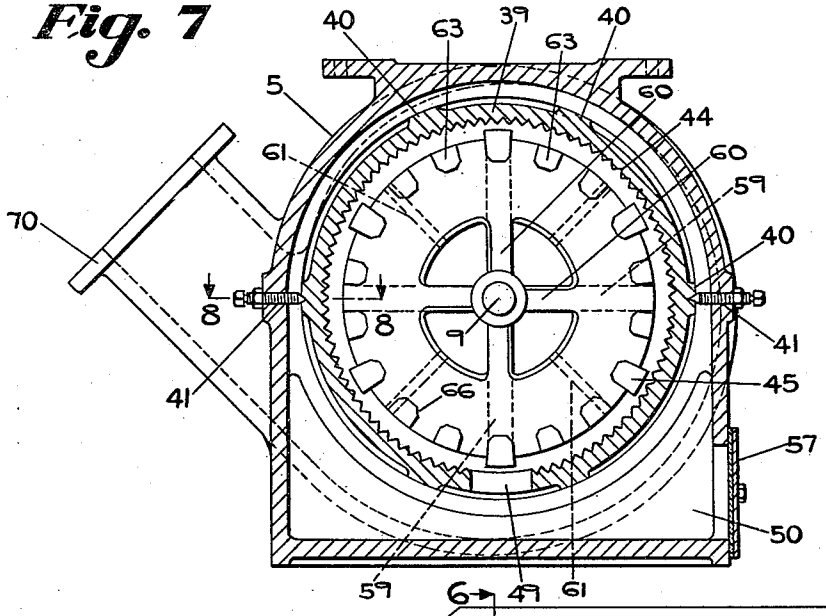
Fig. 7



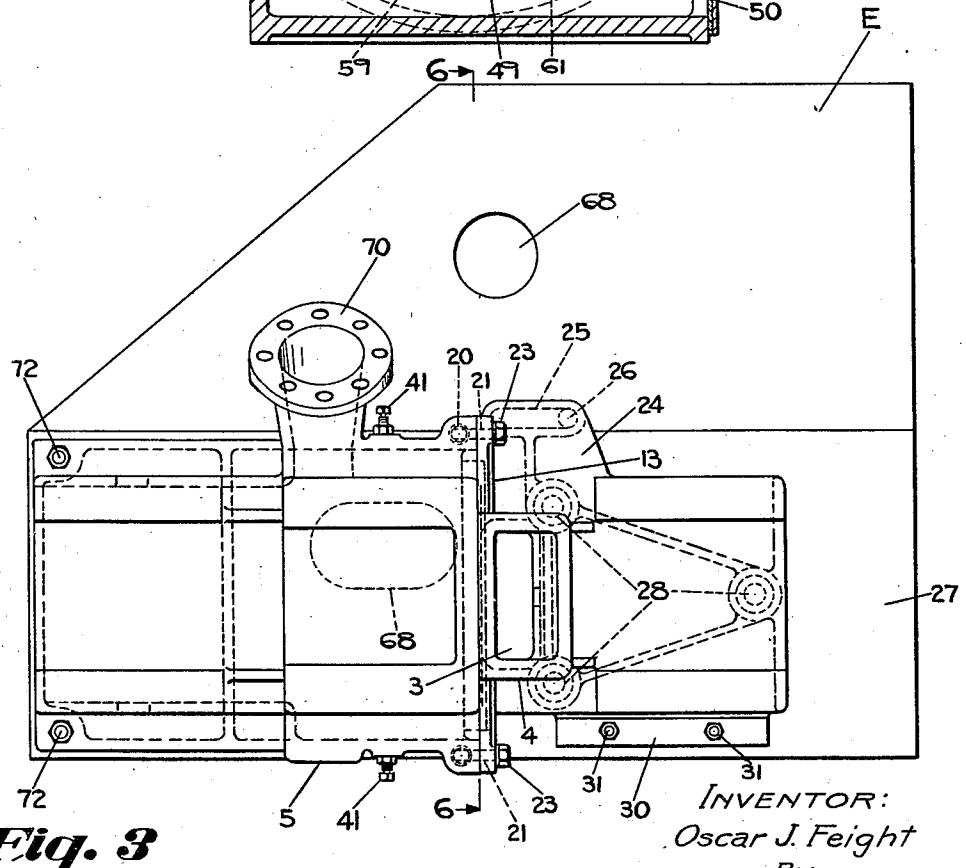


Fig. 3

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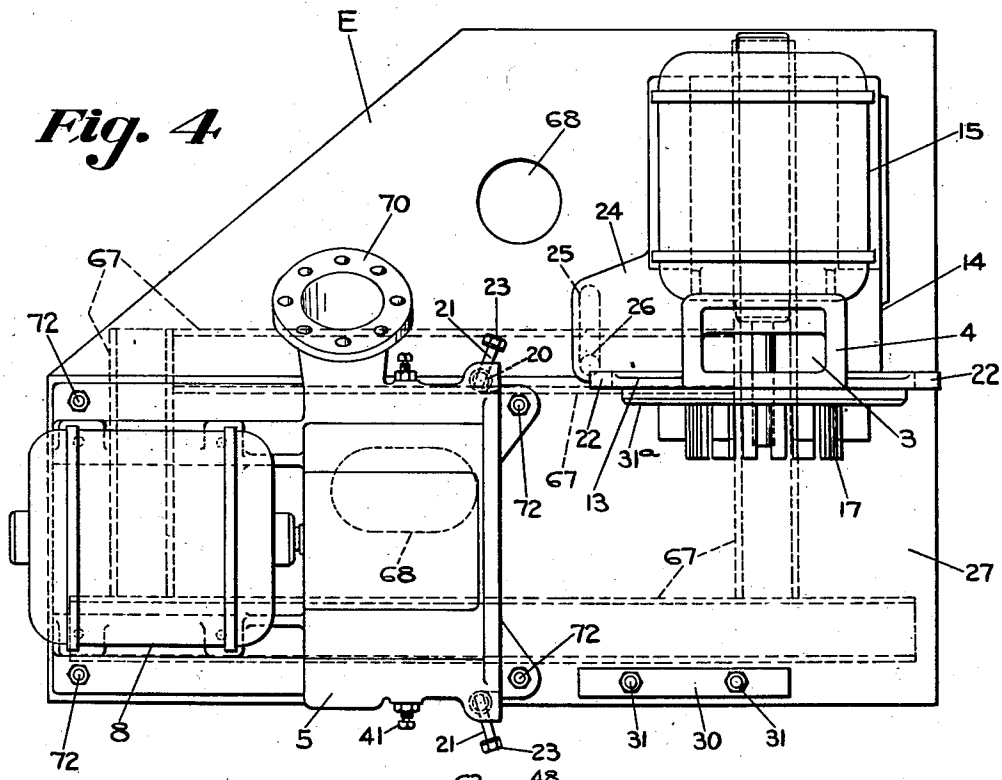
Fig. 4



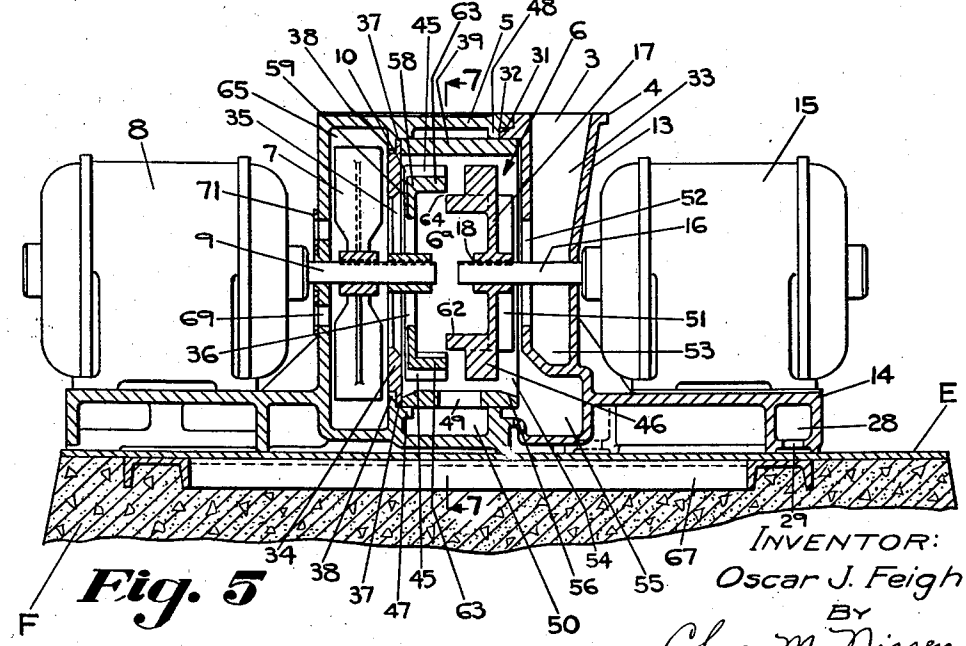


Fig. 5

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UNITED STATES PATENT OFFICE

2,105,764

APPARATUS FOR BREAKING DOWN MATERIALS

Oscar J. Feight, Columbus, Ohio, assignor to The Jeffrey Manufacturing Company, a corporation of Ohio

Application June 28, 1933, Serial No. 678,009

2 Claims. (Cl. 83—11)

The improvements represented by this invention deal principally with the construction of a housing for mechanism of widely diversified kinds, the housing being designed with the more particular purpose of enabling a convenient access to be had to the mechanism within the housing.

The invention, for purposes of clarity and simplicity of description, will be illustrated and described in connection with a grinding or pulverizing machine equipped with a pair of oppositely rotating grinding and pulverizing rotors working in conjunction with each other, and with a removable liner for the housing, which liner is provided with a grinding surface adjacent the said rotors, the housing being provided with means enabling it to be readily opened with the minimum of effort for enabling a convenient access to be had to the interior of the housing and to the mechanism contained therein. It is desired that it be distinctly understood that the novel features of this invention are not limited in any way to the illustrated mechanism, nor necessarily even to the general type of mechanism illustrated herein, but is of an entirely general application.

The details of the construction of the present invention will be readily understood from a consideration of the description, which follows, when taken in connection with the accompanying drawings, the features of novelty constituting the present improvements being set forth in the appended claims.

In the drawings forming the subject matter of this invention:

Fig. 1 is an elevational view of a pulverizing machine assembly embracing the features of the present invention;

Fig. 2 is a view similar to Fig. 1, taken at right angles to Fig. 1;

Fig. 3 is a plan view of the improved housing, the drive motors for the mechanism being omitted, the housing being closed;

Fig. 4 is a plan view of the housing, showing the motors in place, and the housing opened for access to the interior mechanism;

Fig. 5 is a sectional view taken on line 5—5 of Fig. 1, the motors being shown in elevation for purposes of clarity;

Fig. 6 is a sectional view taken on the line 6—6 of Fig. 3;

Fig. 7 is a sectional view taken on line 7—7 of Fig. 5, the base plate of Fig. 5 being omitted; and

Fig. 8 is a sectional view taken on the line 8—8 of Fig. 7.

As applied to a pulverizing machine, the invention embraces the unit A comprising the improved housing forming the principal part of this invention. The unit A receives material to be pulverized, which material is delivered thereto from a storage hopper B and conveyor C, or any equivalent supply mechanism. As installed, the unit A is mounted on a base plate E and a concrete or similar foundation F. Drive instrumentalities including a motor G, which operates gears H, are employed for driving the endless feed conveyor C.

The conveyor C receives the material from the storage hopper B, and discharges the material into the feed hopper 1 of unit A. This feed hopper 1 has the throat 2 communicating with the interior of the unit A on the feed side thereof through feed opening 3, and is mounted on a flange 4 which is substantially flush with the top of the casing 5 in which the pulverizer 6 and fan 7 are enclosed. The casing 5 is supported on the bed plate or base E, which also supports the motor 8 for driving the fan shaft 9. The inner end of shaft 9 carries the fan side rotor element 10 of the pulverizer 6.

The endless conveyor 11 enters the hopper 1 and discharges the material into the feed side of unit A, as previously stated. In the path of the discharging material is a permanent magnet 12 which is designed to remove tramp iron from the material. If desired, an electromagnet may be substituted for the permanent magnet and arranged in a well-known manner so as to be energized whenever the feeding mechanism is operated.

A hollow circular closure 13 for the feed side of the casing 5 is provided with an integral platform 14 on which is mounted the motor 15. The shaft 16 of the latter extends inwardly and carries at its inner end the feed side rotor element 17. In the mechanism illustrated in the drawings, when the motor 15 is operated, the rotor 17 is rotated relatively to the casing 5 and the closure 13 in a direction opposite to the direction of rotation of the fan side rotor element 10, which is driven by the motor 8. The rotor 17 is keyed to the shaft 16 as indicated at 18.

The closure 13 is hinged relative to the housing 5, so that the closure 13, platform 14, motor 15, shaft 16 and rotor 17 may be moved axially of the shaft 16 away from the casing 5, and then swung laterally on vertical hinge instrumentalities so that both rotors will be freely accessible for inspection, repair or replacement, while being normally locked in position. From Figs. 3 and 8 it will be seen that the casing 5 is provided with sockets 19 for the reception of pins 20 which are loosely fitted into the sockets and which are

provided with a threaded, transversely extending bore which receives the threaded lock bolts 21 which are held between outstanding pairs of lugs 22 and locked thereagainst by the provision of the heads 23 on the bolts. A lateral extension 24 of the platform 14 is slotted, as indicated at 25, to receive a pin 26 extending upwardly from the base plate E and welded, or otherwise permanently mounted to the base plate. When the lock bolts 21 are loosened, the closure 13 and associated parts may be moved axially of the shaft 16 away from the casing 5 until the pin 26 engages the end of the slot 25, which is sufficient to enable the rotor 17 to clear the casing 5, whereupon the closure 13 and its associated parts may swing laterally upon pin 26 as a pivot or hinge, to take the open position shown in Fig. 4, whereby the interior of the unit A becomes freely accessible. To facilitate this movement, the surface 27 of base plate E is perfectly smooth and the platform 14 is provided with pockets 28 adapted to receive oily waste for lubricating the surface 27 by drainage of oil through openings 29 in the bottom of the pockets, thereby enabling the platform 14 to slide more easily over the base plate and to prevent the smooth surface of the latter from rusting. Reverse movements enable closure 13 to be brought back into interfitting relation with the casing 5. For the purpose of properly guiding the return movement of closure 13, a guide bar 30 is suitably secured to the surface 27 of the plate, as by bolts or equivalent securing members 31, this bar being engaged by the platform 14 on its return and causing the platform to be properly directed into closing position of the closure 13, with the flange 31a thereof snugly fitting into a recess 32 in the casing 5. It will be seen that the closure 13 when in closed position provides a feed chamber 33 for the material dropped from the endless conveyor 11.

A partition 34 located in casing 5 is provided with an opening 35 which registers with the openings 36 through the central portion of the fan side rotor element 10. The partition 34 is formed with an annular flange 37 closely engaging a shoulder 38 of the casing 5. A removable cylindrical liner 39 abuts against the flange 37 of the partition 34, thereby holding the latter in place. The removable liner 39 is provided with circumferentially spaced projections 40 arranged in substantially diametrical opposition, and which extend parallel to the axis of the shafts 9 and 16. Through the casing 5 are diametrically opposed openings through which are passed set screws 41. The openings aforesaid are adapted to register with projections 40 of the liner in which projections are provided the tapered recesses 42 adapted to receive the tapered ends 43 of the set screws 41. The liner 39 is reversible, so that the recesses 42 are arranged in pairs, the individual members of which are symmetrically disposed relatively to each other. When assembled, the recesses 42 are slightly offset relative to the set screws 41, as is clearly shown in Fig. 8, the set screws thereby acting, when tightened, to force the liner 39 against the partition 34 in the manner illustrated in Fig. 8, thereby clamping the partition tightly in position while at the same time securing the liner 39 in adjusted position.

The inner cylindrical wall of the liner 39 is provided with a multiplicity of grooves parallel to the shafts 9 and 16 to form a serrated inner cylindrical grinding wall 44, closely adjacent which the radial grinding lugs 45 and 46 on the rotors travel along circumferential paths. Circular shoulders or supporting surfaces are provided on the annular flanges 47 and 48 for engagement by the radial projections 40 of the liner 39 to center the liner or to hold the same concentric with the axis of the shafts 9 and 16. The circumferentially distributed points of support at 40, 40, lessen the frictional contact to facilitate removal of the liner when desired, but nevertheless the frictional mounting of the liner, coupled with the clamping action of the set screws, is sufficient to hold the same in clamping position against the partition 34, and to maintain the opening 49 on its lowermost side in communication with the tramp pocket 50 in the base of casing 5.

It will be seen from Fig. 5 that the feed side rotor element 17 is provided with a plurality of radially extending blades 51. These blades are adjacent the intake opening 52 which opening extends through the inner wall of closure 13, and is concentrically disposed around shaft 16. The blades 51 act as suction fan blades, in conjunction with fan 7 to draw material through the intake 52 into the pulverizing zone 6, and to impart to the material a preliminary fracture by impacting the material against the liner 39.

When the material to be pulverized falls to the bottom 53 of the chamber 33, it will tend to accumulate therein. If there is any tramp iron, the larger pieces will remain in the bottom 53 of the chamber 33 and may be removed when the closure 13 is opened. Smaller pieces of tramp material that may pass with the other material into engagement with the blades 51 will be ejected through opening 54 into pocket 55 in the bottom of closure 13. To facilitate this ejection the bottom portion of the liner 39 is beveled, as shown at 56. Still smaller pieces of tramp material that may pass the crusher lugs 46 will escape through the opening 49 into pocket 50 whence it may be withdrawn by removal of the door 57 of the pocket.

Inasmuch as the rotor disc 17 is closed, the material to be pulverized must find its way peripherally of the disc 17 between the grinding lugs 46 into the pulverizing zone. This passage is facilitated by the cooperative action of blades 51 with the fan 7. During such passage the material is ground by impact against the leading sides of the lugs 46 and the serrated cylindrical wall 44.

The fan 7 driven by motor 8 is adapted to produce a current of air from the feed side of the disc 17 into the hollow chamber between the rotor elements 17 and 58. Whatever material passes to the peripheral space surrounding the rotor 58 will be further crushed by impact against the radial spaced lugs 45, 45, and by being thrown by the latter against the serrated cylindrical wall 44.

While the suction of air through the opening 36 tends to draw the crushed material through the peripheral space between the lugs 45 and the serrated wall 44, and radially to the left of the rotor 58 as viewed in Fig. 5, this tendency is counteracted by the radial fins 59, 59 which are formed in radial continuation of the spider arms 60, 60, and by the auxiliary radial fins 61, 61 intermediate the fins 59, 59, which are formed in radial continuation of the spider arms 60, 60, and by the auxiliary radial fins 61, 61 intermediate the fins 59, 59, as shown in Fig. 7. The faces of the fins 59 and 61 adjacent the inner wall of the partition 34 are approximately in the same

vertical plane which is closely adjacent such inner wall, consequently an effective seal will be produced to prevent the passage of coarse material between the back of the rotor 58 and the adjacent wall of the partition 34.

The rotor 17 is provided with parallel spaced-apart pulverizing lugs 62 which may be integral with the grinding lugs 46, 46, but the spacing between the latter is shorter than the spacing between the grinding lugs 46. The rotor 58 is provided with parallel spaced-apart pulverizing lugs 63, 63 which overlap the lugs 62, 62 so as to leave only a small cylindrical space 64 between the paths of travel of the adjacent faces. It is preferred to arrange the parallel lugs 62 and 63 so that the path of travel of the feed side rotor pulverizing lugs 62 will be of smaller diameter than the path of travel of the fan side rotor pulverizing lugs 63. This arrangement enables the grinding lugs 46 to be placed adjacent to the serrated wall 44 while providing sufficient space between the lugs 46 for entrance of material into the pulverizing zone, and moreover the entrance to the ring space between the paths of travel of the pulverizing lugs 62 and 63 will be nearer the lugs 46 to lessen the tendency of the material to pass between the back of the rotor 58 and the adjacent wall of the partition 34.

It should be particularly understood that the rotors when operating are driven at high speed in opposite directions and therefore the lugs 62 and 63 act as ejectors to prevent coarse particles from passing between the same into the hollow chamber 6a. The centrifugal forces acting on the material, moreover, are in opposition to the inward air current produced by the fan 7. The oppositely rotating rotors therefore act to separate automatically the fine particles from the coarse, the coarse particles being continually thrown outwardly against the serrated wall 44 while only the finest or pulverized material flows with the air through the opening 36 into the fan chamber 65.

The coarse particles continue to be pulverized by impact and attrition around the circumferences of the rotors until they are so fine that the centrifugal forces of the rotors no longer eject them outwardly. Only the extremely fine material is pulled through the ring space 64, by the air currents produced by the fan 7, into the fan chamber 65. Pulverization is completed in the ring space 64 or between the overlapping adjacent faces of the pulverizing lugs 62 and 63 because actual tests show that maximum wear takes place at such adjacent faces and at the leading corners as illustrated at 66 in Fig. 7. The same is true with respect to the wear on the lugs 62 of the feed side rotor 17.

The unit A is mounted on a foundation F, conveniently of concrete. A plurality of channels 67, 67, disposed as indicated in Fig. 4 are welded to the underside of the base plate E, and are embedded in the top surface of the concrete foundation F, the base plate E being level. These channels prevent displacement of the unit during service.

The base plate E is provided with grout holes 68, 68, through which additional concrete may be poured to maintain the base plate level.

As the fan discharges the pulverized material, additional air is drawn through openings 69 into the fan chamber 65. The quantity of air thus entering port 69 is controlled by damper 71. The housing 5 with motor 8 is fixedly attached to the base plate E by bolts 72. The pulverized material is ejected through outlet 70.

Obviously those skilled in the art may make various changes in the details and arrangement of parts without departing from the spirit and scope of the invention as defined by the claims hereto appended, and I wish therefore not to be restricted to the precise construction herein disclosed.

Having thus described and shown an embodiment of my invention, what I desire to secure by Letters Patent of the United States is:

1. Apparatus for breaking down materials comprising the combination with power driven grinding and pulverizing mechanism, of a casing defining a pulverizing zone containing the said mechanism, a discharge compartment for withdrawing pulverized material from the pulverizing zone, a removable partition between the pulverizing zone and discharge compartment, a removable cylindrical grinding liner within the casing and engaging the partition at one end for securing the partition in position, a closure for the casing engaging the liner at the other end thereof, a tramp material collecting pocket in the lower portion of the body of the closure offset from the pulverizing zone laterally, the liner having its lower edges adjacent to said offset pocket beveled for guiding tramp material laterally from said pulverizing zone into said pocket.

2. Apparatus for breaking down materials comprising the combination with power driven grinding and pulverizing mechanism, of a casing defining a pulverizing zone containing said mechanism, a discharge opening for withdrawing pulverized material from the pulverizing zone, a removable cylindrical grinding liner within the casing having a tramp material opening adjacent its bottom leading to a tramp bin, said casing having another tramp bin positioned laterally of said pulverizing zone adjacent the bottom of said casing, the liner having its inner edge tapered adjacent said tramp bin for guiding tramp material to said bin.

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