Aug. 14, 1951 M. G. CLAY ET AL 2,564,096

VERTICAL AXIS RING AND WHEEL MILL

Filed Nov. 12, 1946 6 Sheets-Sheet 1

Fig 1

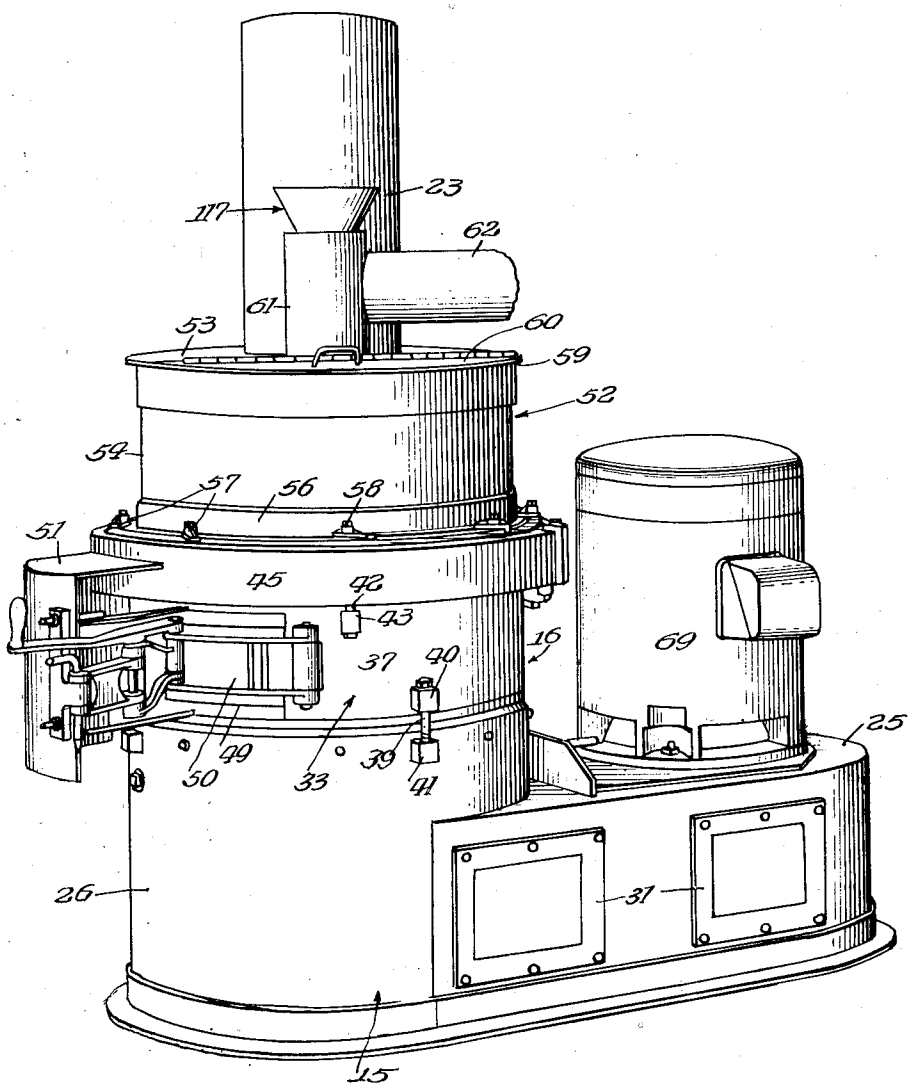

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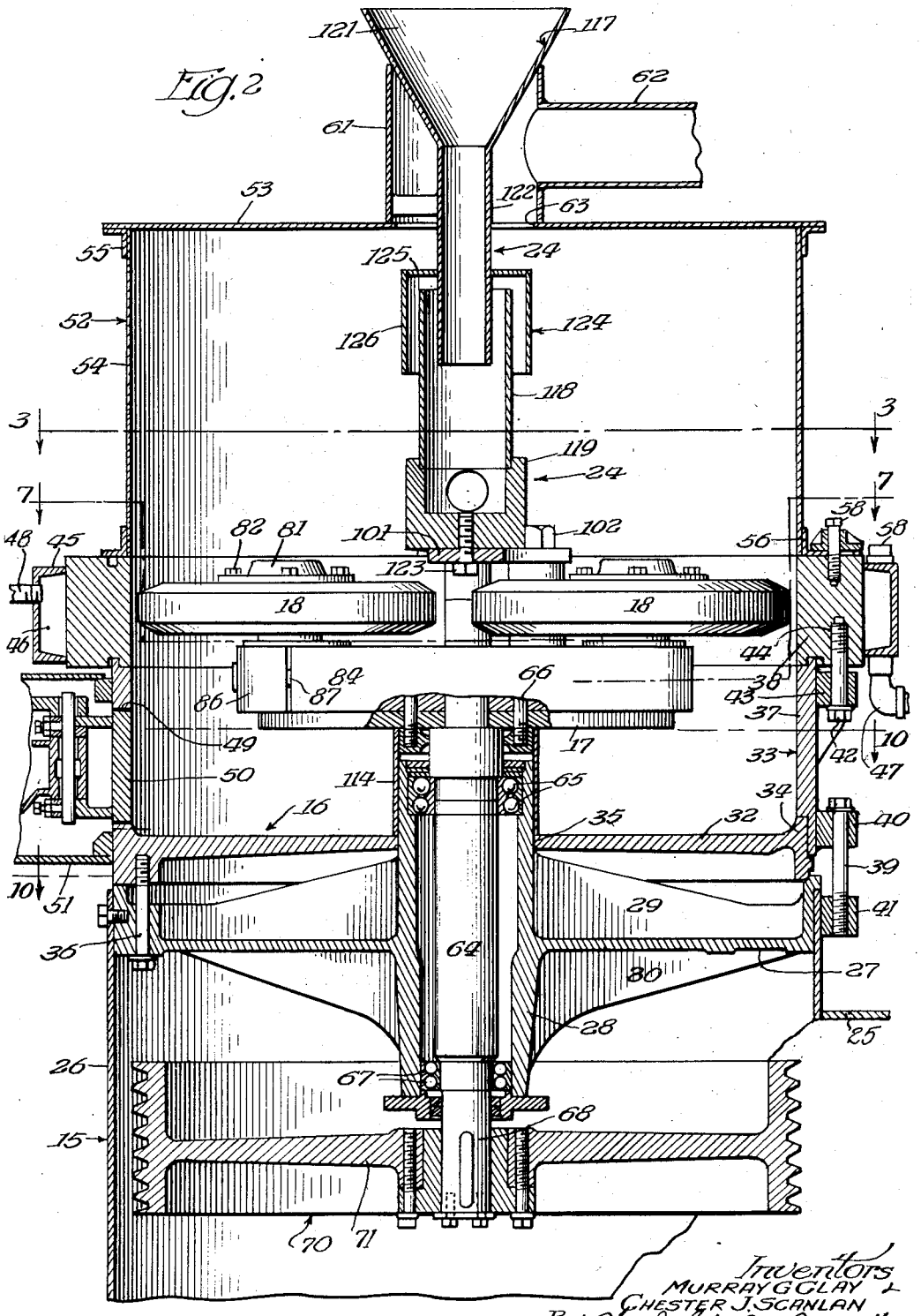
Fig. 2



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VERTICAL AXIS RING AND WHEEL MILL

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Fig. 3

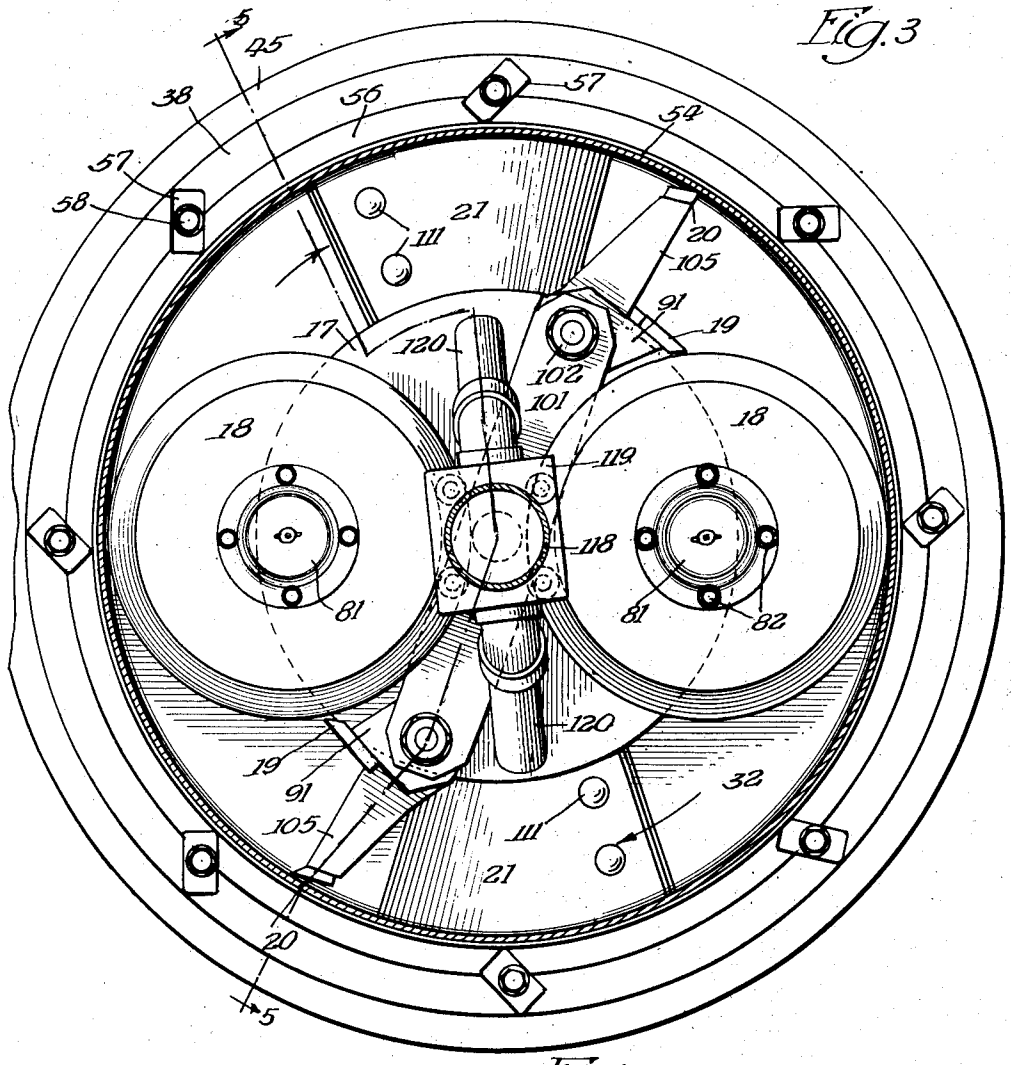

Fig. 4

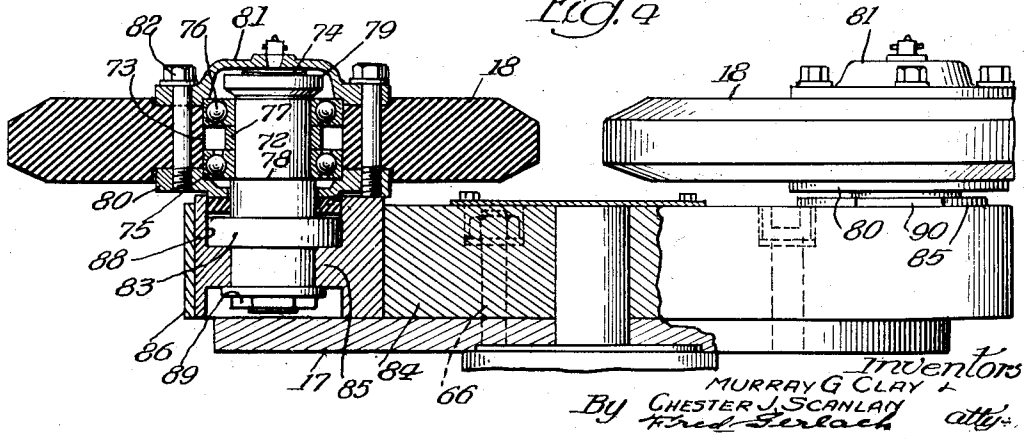

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Fig. 5

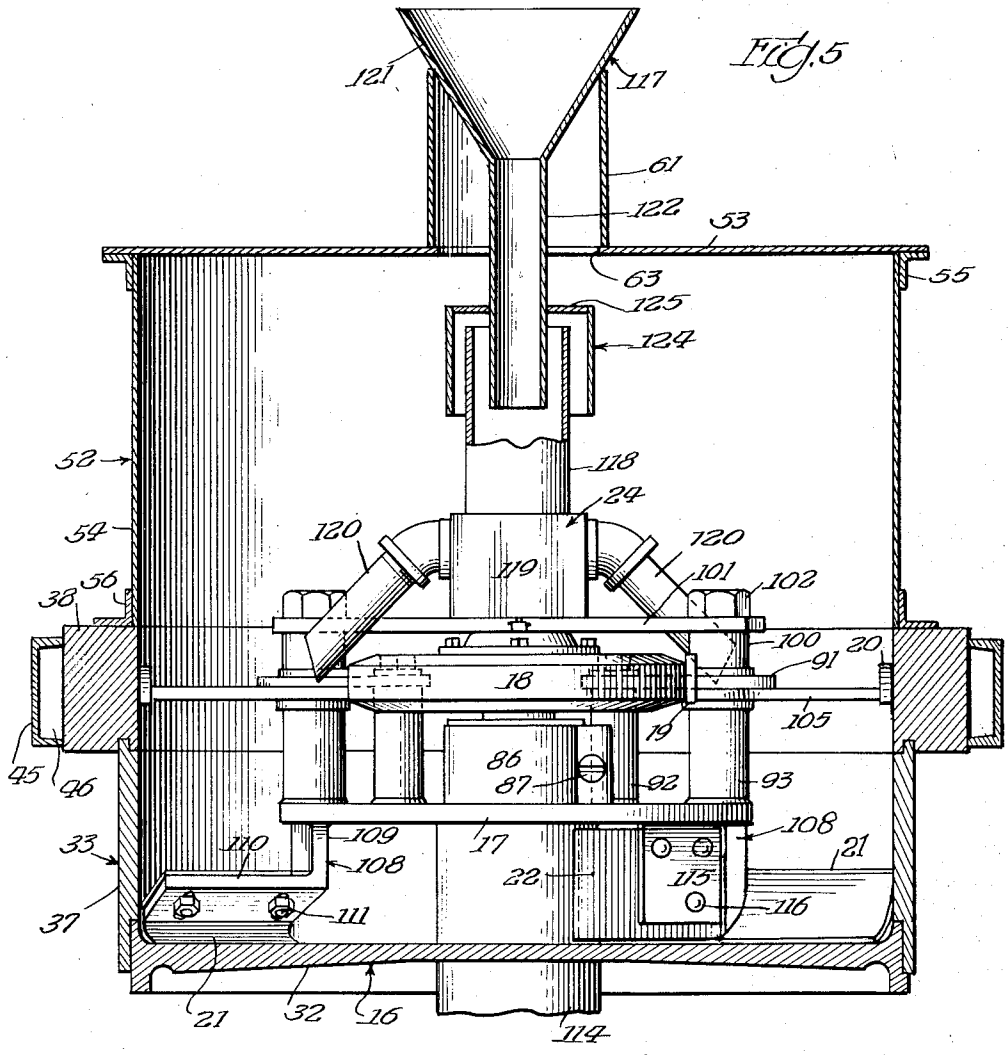
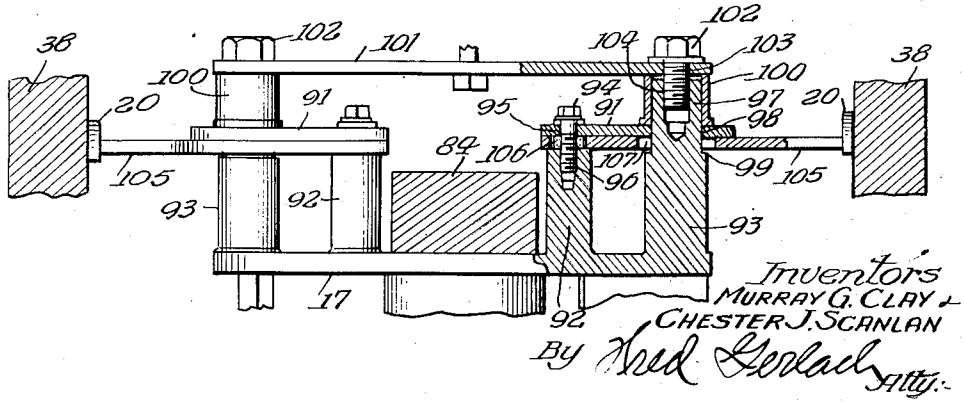


Fig. 6



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VERTICAL AXIS RING AND WHEEL MILL

Filed Nov. 12, 1946 6 Sheets-Sheet 5

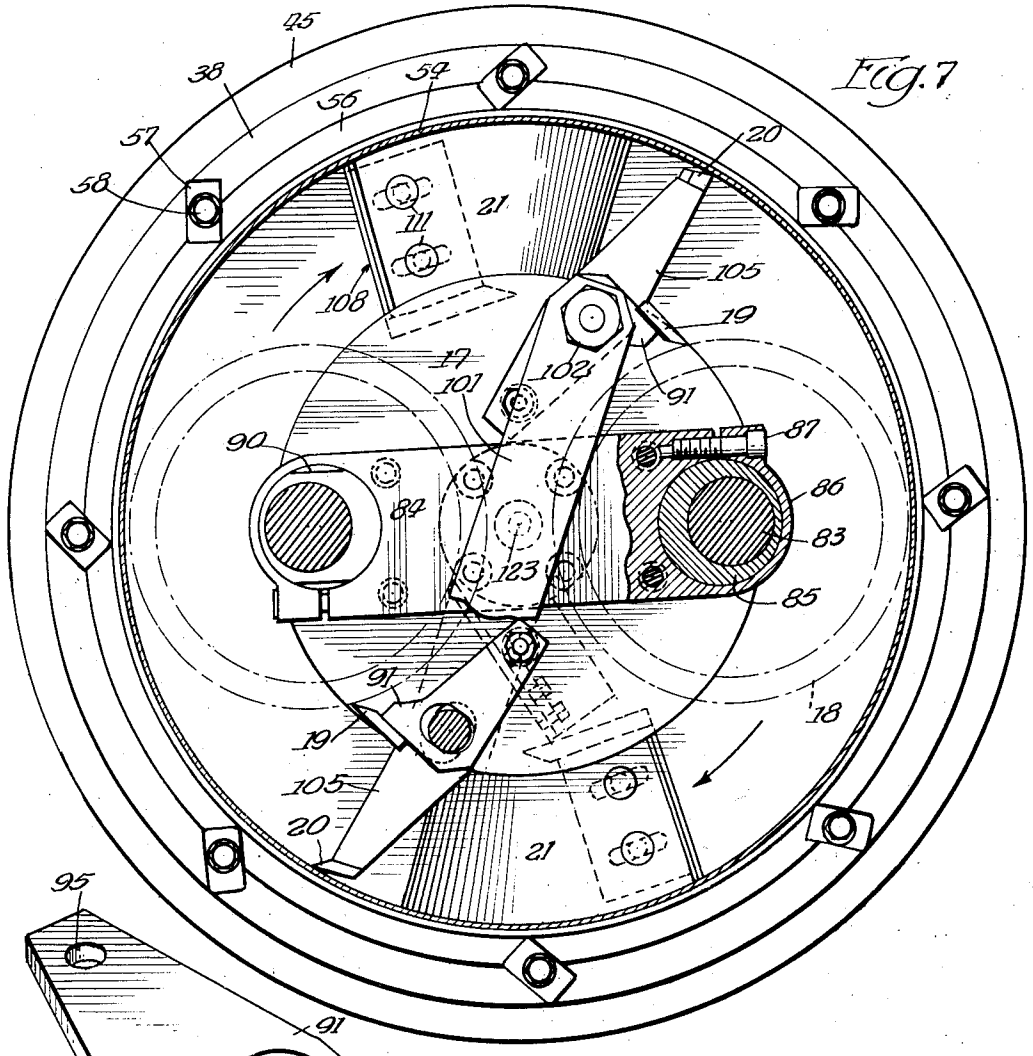

Fig. 7

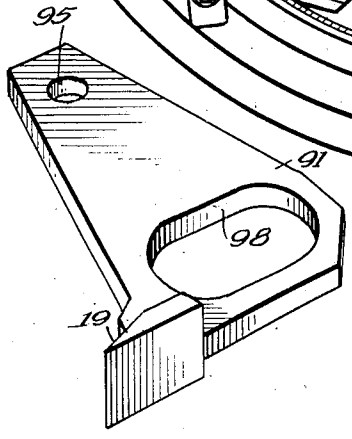

Fig. 8

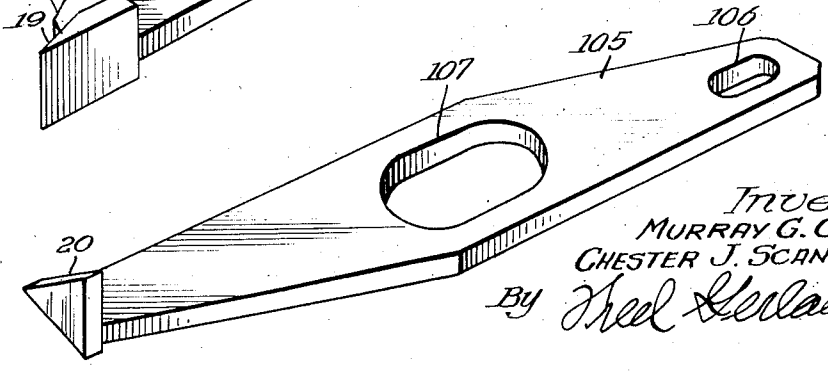

Fig. 9

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Fig. 10

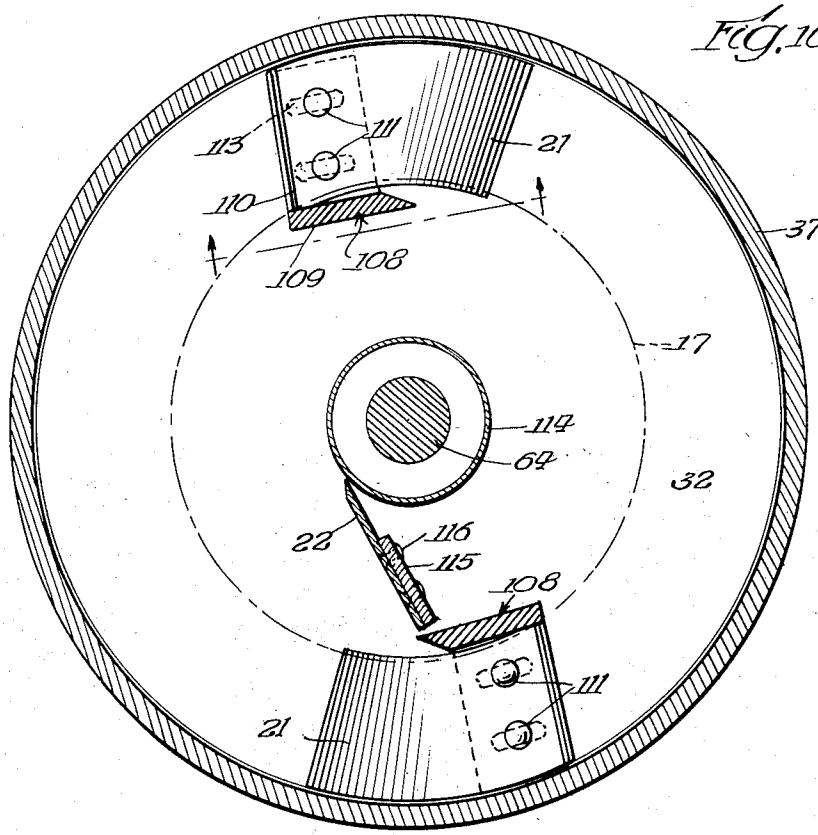


Fig. 11

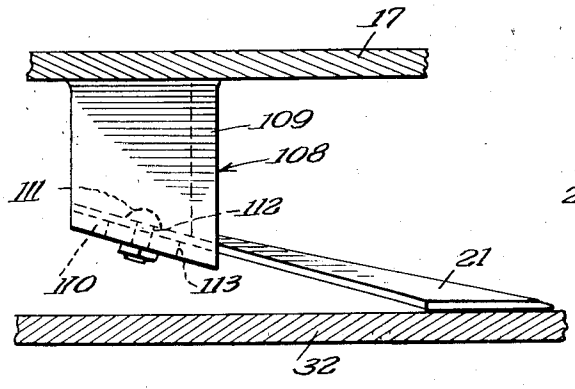
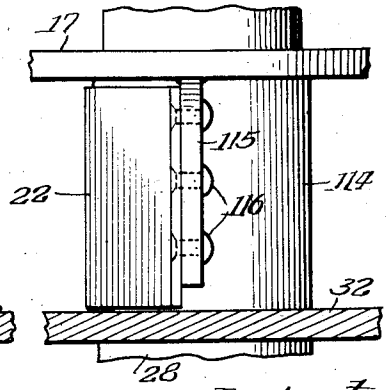


Fig. 12



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UNITED STATES PATENT OFFICE

2,564,096

VERTICAL AXIS RING AND WHEEL MILL

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Application November 12, 1946, Serial No. 709,162

14 Claims. (Cl. 241—66)

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The present invention relates generally to rotary mills. More particularly the invention relates to that type of mill which is primarily designed and adapted to process different materials by mixing them and compressing them and as its principal components or parts comprises: (1) a bowl shaped receptacle which is adapted to receive and contain a batch of the materials to be processed and embodies a circular bottom wall and a cylindrical upstanding side wall; (2) a rotary horizontally extending crosshead which is disposed in, and extends across the central portion of, the receptacle and is connected for drive by power means such, for example, as an electric motor; (3) a plurality of horizontally extending wheels which are rotatably mounted on upstanding axles on the crosshead and are arranged so that in response to drive of the crosshead they travel in a circular course or path around the receptacle interior and effect processing of the materials by squeezing them against the side wall of the receptacle; (4) scrapers which are mounted on, and rotate with, the crosshead and are arranged so that in connection with drive of the latter certain thereof serve to scrape the peripheries of the wheels and others serve to scrape the squeezed or processed materials from the portion of the receptacle side wall about which the wheels travel; and (5) plows which are mounted on, and are connected for travel with, the crosshead and are arranged so that they deflect scraped materials upwards into the path of travel of the wheels.

One object of the invention is to provide a mill of this type which is generally of new, improved construction and effectively and efficiently fulfills its intended purpose and is characterized by the fact that the parts are so designed, constructed and arranged that it has special usefulness or utility in mixing resinous material with filler material and at the same time compressing the mixture to the end that the latter, in connection with a single milling operation, is so processed that it is in condition to be used, after grinding thereof, to form by molding operation so-called "plastic" articles.

Another object of the invention is to provide a mill of the last mentioned character in which the axles for the rotary horizontally extending wheels are mounted on, and connected to, the crosshead in a novel manner and so that they may be adjusted laterally outwards or inwards in order to vary, as desired, the spacing of the wheels with respect to the adjacent portion of the side wall of the bowl shaped receptacle.

Another object of the invention is to provide a mill of the type and character under consideration in which the receptacle side wall consists of a plurality of superposed, clamped together ring shaped sections, one of which surrounds and

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is aligned with the horizontally extending rotary wheels, is so constructed that it forms a comparatively thick track around which the wheels travel in connection with operation of the mill, and has around its outer periphery an annular jacket through which may be circulated either a fluid heating medium or a fluid cooling medium, depending upon whether it is desired to heat the materials being processed in the mill or to remove and dissipate the heat that is created in connection with compression of the materials.

Another object of the invention is to provide a mill of the aforementioned character in which the scrapers for the peripheries of the horizontally extending rotary, laterally adjustable wheels are connected to the crosshead in a novel manner and so that they may be readily adjusted to and from the wheels in order properly to position them with respect to the latter.

Another object of the invention is to provide a mill of the type under consideration in which the scrapers for scraping the portion of the receptacle side wall around which the wheels travel, and the plows for deflecting upwards the scraped materials into the path of the wheels are mounted on the crosshead in a novel manner and so that they are readily adjustable in order to compensate for wear.

A further object of the invention is to provide a mill of the type and character under consideration which comprises novel means for so introducing the resinous material into the receptacle in connection with a receptacle charging operation that it coats and becomes intimately mixed with the filler material without appreciably accumulating on the bottom and side wall of the receptacle.

Other objects of the invention and the various advantages and characteristics of the present mill will be apparent from a consideration of the following detailed description.

The invention consists in the several novel features which are hereinafter set forth and are more particularly defined by claims at the conclusion hereof.

In the drawings which accompany and form a part of this specification or disclosure and in which like numerals of reference denote corresponding parts throughout the several views:

Figure 1 is a perspective of a mill embodying the invention;

Figure 2 is a vertical section illustrating in detail the construction and design of the receptacle and showing the manner in which the rotary horizontally extending crosshead in the central portion of the receptacle is mounted and connected for drive;

Figure 3 is a horizontal section taken on the line 3—3 of Figure 2 and showing in detail the

positioning and arrangement of the crosshead, wheels, scrapers and plows;

Figure 4 is an enlarged vertical section of the crosshead, illustrating in detail the manner in which the axles for the wheels are so mounted on, and connected to, the crosshead that they may be laterally adjusted outwards and inwards in order to vary the spacing of the wheels with respect to the cylindrical side wall of the receptacle;

Figure 5 is a vertical section taken on the line 5—5 of Figure 3 and showing the arrangement and design of the means for introducing the resinous material into the receptacle in connection with charge of the receptacle;

Figure 6 is an enlarged view partly in side elevation and partly in section, illustrating in detail the manner in which the scrapers for the wheels and the scrapers for the receptacle side wall are adjustably mounted with respect to the horizontally extending rotary crosshead;

Figure 7 is a horizontal section on the line 7—7 of Figure 2;

Figure 8 is a perspective of one of the wheel scrapers;

Figure 9 is a perspective of one of the scrapers for the receptacle side wall;

Figure 10 is a horizontal section on the line 10—10 of Figure 2;

Figure 11 is an enlarged side elevation of one of the plows for deflecting the materials upwards into the path of the rotary wheels; and

Figure 12 is a side view of the scraper which is located beneath the crosshead and serves to scrape the sleeve which extends between the crosshead and the receptacle bottom wall and surrounds the upper end of the vertically extending shaft for driving the crosshead.

The mill which is shown in the drawings constitutes the preferred form or embodiment of the invention and is essentially an instrumentality or apparatus for processing different materials by mixing and compressing them in order, preparatory to use, to produce a homogeneous mixture with less or reduced volume. Whereas the mill may be used so to process various materials it is primarily designed, constructed and adapted to mix resinous material with filler material and at the same time compress the filler material so as to produce by a single operation a product which may be molded, after grinding, to form "plastic" items or objects. As its principal parts the mill comprises a horizontally elongated housing-like supporting structure 15, a bowl shaped receptacle 16, a horizontally extending rotary crosshead 17, a pair of horizontally extending rotary wheels 18, a pair of wheel scrapers 19, a pair of receptacle scrapers 20, a pair of plows 21, a sleeve scraper 22, a chute 23 for introducing the filler material into the receptacle, and a pipe system 24 for introducing the resinous material into the receptacle.

The supporting structure 15 is adapted to rest on the floor of the establishment in which the mill is used. It is hollow and, as best shown in Figure 1, embodies at one end thereof a flat horizontal top wall 25 and at its other end an upstanding substantially cylindrical shell 26. The upper end of the shell is partially closed by way of a horizontal crosswall 27. The latter is circular and has its outer marginal portion suitably and fixedly secured to the upper end or marginal portion of the shell 26. Preferably the crosswall 27 is in the form of a one-piece metallic casting. The central portion of the crosswall 27 is provided with an integral, vertically extending tubular member 28. This member is so proportioned and arranged that its upper end projects above the crosswall and its lower end projects beneath the crosswall. A plurality of upper webs 29 and a plurality of lower webs 30 serve to reenforce the crosswall 27. The upper webs 29 are connected to, and radiate from, the portion of the tubular member 28 that is directly above the crosswall, and the lower webs 30 are connected to, and project radially outwards from, the portion of the lower end of the tubular member that is directly beneath the crosswall. The bottom marginal portions of the upper webs 29 and the top marginal portions of the lower webs 30 are formed integrally with the adjacent portions of the crosswall 27. The side portions of the supporting structure 15 are provided with openings whereby access may be had to the interior of the supporting structure as shown in Figure 1, such openings are normally closed by panels 31 which are removably mounted in place.

The receptacle 16 is located over the substantially cylindrical shell 26 of the supporting structure 15 and has the crosshead 17, the wheels 18 and the various scrapers and plows disposed therein. It is adapted to have batches of the filler and resinous materials to be processed introduced successively into it as hereinafter described more in detail, and consists of a circular bottom wall 32 and an upstanding cylindrical side wall 33. The bottom wall 32 is formed separately from the side wall of the receptacle and is preferably in the form of a one-piece casting and embodies at its outer margin an integral annular flange 34 and has in its central portion a circular hole 35 through which the upper end of the tubular member 28 extends (see Figure 2). The annular flange 34 on the outer marginal portion of the bottom wall 32 rests on the outer marginal portion of the crosswall 27. The bottom wall 32 is secured in place over the crosswall 27 by way of vertically extending bolts 36 which, as shown in Figure 2, extend upwards through the outer marginal portion of the crosswall 27 and into internally threaded sockets in the annular flange 34 on the circular bottom wall of the receptacle. The receptacle side wall 33 is of sectional design or construction and consists of a lower ring shaped section 37 and an upper ring shaped section 38. The lower section 33 rests on the upper portion of the annular flange 34 on the receptacle bottom wall 32 and is clamped in place by a plurality of vertically extending bolts 39, the upper ends of which extend through apertured lugs 40 and have polygonal heads for turning purposes, the lower ends of which are screw threaded and fit within internally threaded sockets in lugs 41. The lugs 40 are welded or otherwise fixedly secured to, and project outwards from, the lower end of the lower section 33 of the receptacle side wall and the lugs 41 are suitably secured to, and project outwards from the outer end or marginal portion of, the substantially cylindrical shell 26 constituting part of the supporting structure 15. The upper ring shaped section 38 of the receptacle side wall has the same internal diameter as the lower section and is arranged in concentric relation with said lower section. It is materially thicker than the lower section, surrounds the horizontally extending rotary wheels 18 and defines a track around which the wheels travel in connection with operation of the mill. Preferably the upper section 38 of the receptacle side wall is formed of steel in order that it is wear resistant. As shown in Fig-

ure 2, the upper section 38 rests on the upper end of the lower ring shaped section 33 and is clamped in place by means of vertically extending bolts 42, the lower ends of which extend through apertured lugs 43 and carry or embody polygonal heads for turning purposes and the upper ends of which are screw threaded and fit within internally threaded sockets 44 in the lower end of the upper section 38. The lugs 42 are welded or otherwise fixedly secured to, and project outwards from the upper end of, the lower section 33 of the receptacle side wall. When it is desired to remove the upper section 38 for repair or replacement purposes the bolts 42 are removed. Removal of the bolts 42 frees the upper section 33 so that it may be removed by shifting it upwards with respect to the lower section 37. The latter section may be removed from the bottom wall 32 of the receptacle 16 by removing the bolts 39. Upon removal of the bolts section 37 is released from clamped relation with the bottom wall 32 and hence may be removed by shifting it upwards relatively to the bottom wall. The upper track forming section 38 is surrounded by a ring shaped member 45 which is of channel shaped cross section and defines around the upper section 38 a circular jacket 46 through which either a fluid heating medium or a fluid cooling medium may be circulated. As shown in Figures 2 and 5 the ring shaped member 45 comprises a cylindrical web and a pair of inwardly extending annular flanges at the ends of the web. The flanges define with the web the circular jacket 46 and have the inner edges thereof welded to the adjacent portions of the outer periphery of the upper section 38 of the receptacle side wall. A supply pipe 47 serves to introduce the heating or cooling medium into the jacket 46 and a diametrically opposite discharge pipe 48 serves to discharge the medium from the jacket after it circulates therethrough. Such pipes are illustrated in Figure 2 of the drawings. If, in connection with operation of the mill, it is desired to heat the materials being processed a fluid heating medium, such as steam or hot water, is circulated through the jacket. On the other hand, if it is desired to reduce the temperature of the materials or remove or dissipate the heat that is created in connection with compression of the materials a fluid cooling medium, such as a refrigerant or water, is circulated through the jacket. A horizontally elongated doorway 49 is formed in the lower section 37 of the receptacle side wall and serves to permit discharge of the materials after processing. This doorway is normally closed by way of a door 50 which is hinged at one end thereof so that it is capable of being swung outwards into an open position. Any suitable mechanism, such, for example, as the toggle linkage shown in Figures 1 and 2, may be utilized to swing the door back and forth between its open and closed positions. It is contemplated that at the conclusion of a processing operation and while the mill is still in operation the door 50 will be swung into its open position. When the door is in such position the plows 21, as hereinafter described more in detail, operate to discharge the processed materials through the doorway 49. A hood-like deflector 51 is positioned adjacent the doorway and serves in connection with a discharging operation to deflect the discharged processed materials downwards into a hopper or other receptacle (not shown). The upper end of the receptacle 16 is closed by way of a hood 52. The latter consists of a circular top wall 53 and a depending cylindrical side wall 54. The side wall 54 is imperforate and has the same internal diameter as, and is arranged in concentric relation with, the receptacle side wall 33. The upper end of the side wall 54 of the hood is connected to the outer marginal portion of the top wall 53 by way of an angle bar type ring 55. The lower end of the hood side wall 54 is surrounded and reenforced by an externally disposed angle bar type ring 56 and this has an outwardly extending bottom leg which rests on the upper end of the upper track forming section 38 of the receptacle side wall 33 and is releasably clamped in place by means of an annular series of spaced apart clamp plates 57. The latter are connected to the upper side wall section 38 by vertically extending bolts 58 and arranged so that certain ends thereof rest on the bottom leg of the angle bar type ring 56 and the other ends bear against the upper side wall section 38. The bolts 58 extend through apertures in the central portions of the clamp bolts 57 and into internally threaded sockets or holes in the upper end of said upper side wall section 38. In order to provide access to the interior of the bowl shaped receptacle 16 the top wall 53 of the hood is provided with a segmentally shaped opening 59 which is normally closed by way of a hinged cover 60 (see Figure 1). A suction fan (not shown) is connected to withdraw water, vapor and other gases from the interior of the hood 52 by way of a vertically extending cylindrical shell 61 and a horizontally extending duct 62. The shell 61 rests on, and is suitably fixedly secured to the central portion of the hood top wall 53 and communicates with the interior of the hood by way of a circular hole 63 in said central portion of the top wall 53. The duct 62 extends laterally from the shell 61 and has the receiving end thereof in communication with the shell interior. It is contemplated that the suction fan will be operated in connection with operation of the mill to the end that it will remove from the interiors of the receptacle and hood water, vapor and other gases.

The crosshead 17 is in the form of a circular plate and is disposed within the central portion of the interior of the lower section 37 of the receptacle side wall 33. It is spaced a partial distance from the receptacle side wall 32, carries the wheels 18, the scrapers 19, 20 and 22 and the plows 21, and is provided with a centrally disposed, depending drive shaft 64. The latter, as shown in Figure 2, extends through the tubular member 28 on the crosswall 27 at the upper end of the shell 26 of the supporting structure 15. The upper end of the shaft 64 is rotatably supported by way of a ball bearing 65 and is fixedly secured to the central portion of the crosshead 17 by way of vertically extending bolts 66. The outer race of the ball bearing 65 extends around, and is suitably secured within the upper end of, the tubular member 28. The lower end of the drive shaft 64 is rotatably supported by way of a ball bearing 67 and is provided with a reduced stem 68 which projects beneath the lower end of the tubular member 28 into the interior of the shell 26. As shown in Figure 2 the outer race of the ball bearing 67 extends around and is mounted within the lower end of the tubular member 28. The crosshead 17 is driven by way of an electric motor 69 and a pulley and belt connection 70. The motor 69 is arranged so that the armature thereof extends vertically. It is mounted on the top wall 25 of the supporting structure 15 and has the lower end of the armature shaft thereof arranged so that it projects

into and is disposed within the interior of the supporting structure. The pulley and belt connection comprises a pulley (not shown) on the lower end of the armature shaft of the motor, a pulley 71 on the lower end of the drive shaft 64 and a plurality of spaced apart endless belts (also not shown) around the two pulleys. When the motor 69 is driven as the result of being supplied with electric current the pulley and belt connection 70 operates through the medium of the shaft 64 to rotate or drive the crosshead 17. As indicated by arrows in Figures 3 and 7 the crosshead is driven in a clockwise direction when viewed from the top. The pulley 71 is disposed and housed within the shell 26 of the supporting structure and has the hub thereof mounted on, and keyed to, the reduced stem 68 of the lower end of the drive shaft 64.

The horizontally extending wheels 18 overlie the crosshead 17 and are positioned one diametrically opposite the other and within the upper track forming section 38 of the receptacle side wall 33. They are located in the same horizontal plane and operate in connection with drive of the crosshead to travel in a circular course or path around the upper side wall section 38 and in conjunction therewith to compress the materials to be processed. Preferably the wheels are formed of steel or other hard wear resistant material and have flat or cylindrical outer peripheries. A pair of vertically extending axles 72 serves rotatably to support the wheels 18. The upper ends of the axles 72 are positioned or disposed concentrically within over-sized circular holes 73 in the central portions of the wheels 18 and embody at their upper extremities screw threaded stems 74. Lower ball bearings 75 and upper ball bearings 76 are interposed between the upper ends of the axles 72 and the central hole defining portions of the wheels 18 permit the wheels to rotate freely with respect to the axles. The inner races of the lower and upper ball bearings are spaced apart by sleeves 77. The inner races of the lower ball bearings abut against upwardly facing annular shoulders 78 on the central portions of the axles 72. Nuts 79 on the externally threaded stems 74 bear against the inner recesses of the upper bearing 76 and serve in conjunction with the shoulders 78 to hold the inner races of the upper and lower bearings and the sleeves 77 between such races in clamped relation. The outer races of the lower and upper ball bearings 75 and 76 fit snugly within the holes 73 and are confined between lower cover plates 80 and upper cover plates 81. The lower cover plates 80 are ring shaped and fit against the bottom end faces of the wheels 18 and the upper cover plates 81 are shaped to house the lock nuts 79 and bear or abut against the top end faces of the wheels. Vertically extending bolts 82 serve to clamp the cover plates 80 and 81 against the end faces of the wheels. These bolts, as shown in Figure 4, extend through aligned holes in the marginal portions of the lower and upper cover plates and other aligned holes in the portions of the wheels 18 that are directly outwards of the holes 73. The lower ends of the axles 72 extend through the central holes in the lower cover plates 75. They embody annular flanges 83 and have externally threaded lower extremities. The axles 72 are operatively connected to the crosshead 17 by way of a horizontally elongated block 84 and a pair of cylindrical members 85. The block rests on, and extends diametrically across the upper face of the crosshead 17 and is fixedly secured to the crosshead by way of the vertically extending bolts 66 (see Figures 2 and 4). The ends of the blocks are shaped to form single-split bearings 86 in which the cylindrical members 85 are mounted. The free ends of said bearings 86 are connected together by clamp bolts 87 which extend horizontally and are positioned and arranged as shown in Figure 7. When the bolts 87 are tightened they operate to contract the bearings 86 so that they secure the cylindrical members 85 against rotation or turning movement relatively thereto. When the clamp bolts 87 are loosened the members 85 are free and hence may be turned relatively to the bearings for purposes described hereinafter. The upper ends of the cylindrical members 85 are provided with open top eccentrically disposed cylindrical sockets 88 in which the flanges 83 fit snugly. The axles are fixedly secured to the cylindrical members 85 by way of nuts 89 which are mounted on the threaded lower extremities of the lower ends of the axles and serve to clamp the flanges 83 in place within the sockets 88. By reason of the fact that the axles are eccentrically positioned with respect to the cylindrical members 85 turning of the members relatively to the bearings 86 causes the axles to move laterally and thus vary the spacing of the wheels 18 with respect to the upper track forming section 38 of the receptacle side wall 33. When it is desired to adjust the wheels 18 towards the upper section 38 the cylindrical members 85 are turned so as to move the axles 72 outwards with respect to the block 84. Should it be desired to increase the spacing of the wheels with respect to the upper track forming section 38 the cylindrical members 85 are turned so as to cause the axles 72 to move laterally inwards relatively to the block 84. As previously pointed out rotative adjustment of the members 85 is permitted by loosening the clamp bolts 87. After the members 85 are adjusted so that the wheels 18 are spaced the desired distance from the upper section 38 of the receptacle side wall the clamp bolts 87 are tightened in order to contract the bearings 86 around the members and thus lock the members against turning movement in the bearings. The axles 72, the cylindrical members 85 and the block 84 constitute or exemplify simple means whereby the position of the wheels 18 with respect to the inner periphery of the upper track forming section 38 may be readily adjusted. The upper ends of the cylindrical members 85 project above the upper or top face of the block 84 and are provided with diametrically opposite flats 90 whereby the members may be gripped by a wrench or other turning tool in connection with rotative adjustment thereof.

The scrapers 19 serve by a scraping action to rid the outer peripheries of the wheels 18 of any material that adheres thereto and are located adjacent the trailing or, what may be termed, rear portions of the wheels. They are horizontally elongated and have bevelled or knife-like front ends. As best shown in Figure 7, the scrapers 19 are located above the horizontally extending rotary crosshead 17 substantially midway between the center of the crosshead and the inner periphery of the upper track forming section 38 of the receptacle side wall and are carried by flat horizontally extending bracket plates 91. The latter are substantially wedge shaped so far as contour or configuration is concerned and are arranged so that the small ends thereof extend inwards. The scrapers 19 are welded to the front

outer corners of the bracket plates 91 and the latter are supported above the crosshead by way of a pair of inner posts 92 and a pair of outer posts 93. As hereinafter described more in detail, the bracket plates are pivoted to swing horizontally about the inner or small ends thereof in order that the scrapers 19 may be properly adjusted with respect to the outer peripheries of the wheels 18. The inner posts 92 are formed integrally with, and project upwards from, the crosshead 17 and are arranged in straddled relation with the central portion of the bar 84, as shown in Figure 6. The inner ends of the bracket plates 91 overlie the upper ends of the inner posts 92. They are pivotally connected to the latter by way of vertically extending pivot bolts 94 which, as shown in Figure 6, have polygonal heads at their upper ends for turning purposes. The shanks of the bolts 94 extend through circular holes 95 in the inner ends of the bracket plates 91 and have the lower ends thereof mounted in internally threaded sockets 96 in the upper ends of the inner posts 92. When the pivot bolts 94 are loosened the bracket plates 91 may be swung horizontally to or from the wheels 18 in order to adjust the position of the scrapers 19 with respect to the wheels. Tightening of the pivot bolts 94 results in locking of the bracket plates 91 in their adjusted position. The outer posts 93 are formed integrally with, and project upwards from, the outer marginal portion of the circular or disc-like crosshead 17 and have reduced upper ends 97 which project above the upper ends of the inner posts 92 and extend through arcuate slots 98 in the outer or large ends of the bracket plates 91. The central portions of the outer posts 93 embody annular shoulders 99 which face upwards and underlie the slot defining portions of the bracket plates 91. The slots 98 are so curved or shaped that they permit the outer or large ends of the bracket plates to swing laterally with respect to the reduced upper ends 97 of the outer posts 93. Clamp sleeves 100 are mounted for vertical sliding movement on the reduced upper ends 97 of the outer posts 93 and have the lower ends thereof in abutment with the slot defining portions of the bracket plates 91 and their upper ends projecting above the upper ends of the outer posts 93. A bar 101 and a pair of vertically extending bolts 102 serve to urge the clamp sleeves 100 downwards in order to exert a clamping pressure on the outer or large ends of the clamp plates 91 and assist the pivot bolts 94 in locking the clamp plates in their various adjusted positions. The bar 101 extends horizontally and is arranged at an angle to the block 84. The ends of the bar 101 overlie and engage the upper end of the clamp sleeves 100 and have circular holes 103 therein. The clamp bolts 102 have polygonal heads for turning purpose at their upper ends. The shanks of the bolts extend downwards through the holes 103 into internally threaded sockets 104 in the upper reduced ends 97 of the outer posts 93. When the bolts 101 are tightened the bar 102 is shifted downwards and results in the clamp sleeves 100 exerting downward clamping pressure on the outer ends of the bracket plates 91. When it is desired to adjust the scrapers 19 with respect to the wheels 18 the pivot bolts 94 and the bolts 102 are loosened so as to release the bracket plates 91. Thereafter the bracket plates are swung horizontally in order to bring the scrapers into proper or desired position with respect to the outer peripheries of the wheels. After properly adjusting the scrapers the pivot bolts 94 and the bolts 102 are tightened for purposes of locking the bracket with the plates 91 in place. The arcuate slots 98 of such plates are positioned concentrically with respect to the circular holes 95 at the inner or small ends of the bracket plates. In connection with drive of the crosshead 17 the wheels 18 travel in a circular path in a clockwise direction as heretofore mentioned. In addition they rotate in a counterclockwise direction about the axles 72 therefor. As the wheels rotate about their axles the scrapers 19 operate to scrape from the wheels any material which adheres to the outer peripheries of the wheels.

The scrapers 20 are located outwards of the scrapers 19 and behind the wheels 18 and serve during operation of the mill to scrape the inner periphery of the upper track forming section 38 of the receptacle side wall so as to preclude accumulation thereon of the filler material that is compressed against said upper section 38 by the wheels 18. As shown in Figure 8, the scrapers 20 are triangular in order that they effect scraping with a wedge action. A pair of horizontally extending bracket plates 105 constitute the carrying or supporting means for the scrapers 20. These bracket plates extend substantially radially outwards with respect to the axis of the drive shaft 64 for the rotary crosshead 17 and have the scrapers 20 welded to their outer ends. The inner portions of the bracket plates 105 underlie and support the bracket plates 91 for the wheel scrapers 19. The inner ends of the bracket plates 105 rest on the upper ends of the inner posts 92 and have horizontally extending slots 106 through which the shanks of the bolts 94 extend. The central portions of the bracket plates 105 rest on the upwardly facing annular shoulder 99 on the central portions of the outer posts 93 and have longitudinally extending slots 107 through which the reduced upper ends 97 of the posts 93 extend. The slots 106 and 107 permit the bracket plates 105 to be adjusted longitudinally outwards or inwards in order properly to position the scrapers 20 with respect to the inner periphery of the upper track forming section 38 of the receptacle side wall 33. Tightening of the pivot bolts 96 and the bolts 102 results in clamping of the bracket plates 105 in place. When it is desired longitudinally to adjust or shift such plates for purposes of adjusting the scrapers 20 with respect to the upper track forming section 38 the bolts 94 and 102 are loosened. When such bolts are loosened the bracket plates 91 as well as the bracket plates 105 are released and hence the scrapers 19 and the scrapers 20 may be adjusted. Tightening of the bolts 94 and 102 results in conjoint clamping in place of the bracket plates 91 and 105. Tightening of the pivot bolts 94 results in the inner ends of the bracket plates 91 and 105 being clamped together against the upper ends of the inner posts 92 and tightening of the bolts 102 operates through the medium of the bar 101 and the clamp sleeves 100 to clamp the outer ends of the bracket plates 91 and the central portions of the bracket plates 105 together against the annular shoulder 99 on the central portions of the outer posts 93. The mounting means for the scrapers 19 and 20 are comparatively simple and permit ready and conjoint adjustment of the scrapers upon loosening of the bolts 94 and 102.

The plows 21 are located in front of the wheels 18 and serve during operation of the mill to deflect upwards into the path of the wheels the filler and resinous materials being processed.

They are disposed one diametrically opposite the other and are in the form of arcuate metallic plates. As best shown in Figures 10 and 11, the plows 21 are arranged beneath and circumferentially with respect to the rotary crosshead 17, directly overlie the bottom wall 32 of the receptacle 16, and are rearwardly and upwardly inclined. The width of the plows substantially corresponds to the width of the annular space between the crosshead and the side wall of the receptacle. The outer side edges of the plows are curved conformably to the inner periphery of the receptacle side wall and are disposed directly inwards thereof. The front edges of the plows are located directly over the outer marginal portion of the receptacle bottom wall 32. A pair of L-shaped brackets 108 serves to connect the plows so that they revolve or rotate bodily with the crosshead. As shown in the drawings the brackets 108 comprise vertically extending legs 109 and laterally extending legs 110. The vertically extending legs are welded to, and depend from, the marginal portion of the crosshead 17. The other legs, i. e., the legs 110, are connected to the lower ends of, and project outwards from, the vertical legs 109 and underlie the rear ends of the plows 21. As shown in Figure 11, the legs 110 are inclined or canted upwards and rearwards in the same manner as the plows 21. Bolts 111 extend through circular holes 112 in the rear ends of the plows and slots 113 in the laterally extending legs 110 of the L-shaped brackets 108 and serve to connect the plows to the brackets. The slots 113 extend transversely of the bracket legs 110 and upon loosening of the bolts permits the plows to be adjusted forwards or rearwards in order to bring their front or leading edges into proper spaced relation with respect to the outer marginal portion of the receptacle bottom wall 32. Preferably the brackets 108 are of one-piece character. When it is desired to bring the front edges of the plows 21 nearer the receptacle bottom wall in order to compensate for wear the bolts 111 are loosened and thereafter the plows are shifted or adjusted forwards. To increase the space of the front or leading edges of the plows the plows are adjusted rearwards after loosening of the bolts 111. The plows are so arranged and inclined that in connection with operation of the mill they, as previously pointed out, deflect upwards and rearwards into the circular path of travel of the wheels the materials being processed.

The scraper 22 has a twofold purpose in that it serves to scrape a sleeve 114 around the upper end of the tubular member 28 and also to flex outwards into the path of the plows 21 any material that accumulates under the rotary crosshead 17. The sleeve 114 is fixedly secured in any suitable manner to the upper end of the tubular member 28 and extends between the crosshead 17 and the bottom wall 32 of the receptacle 16. The scraper 22 is in the form of a vertically extending horizontally elongated plate and extends substantially tangentially with respect to the sleeve 114. The inner end edge of the scraper is tapered so that it is knife-like in character in order that it serves effectively to scrape the outer periphery of the sleeve 114. The head of the scraper 22 corresponds substantially to that of the space between the crosshead 17 and the bottom wall 32 of the receptacle. The arrangement or positioning of the scraper 22 is such that it extends outwards in a direction opposite to the direction of rotation of the crosshead. A vertically extending plate-like bracket 115 serves to support the scraper 22 and connect it for conjoint rotation with the crosshead. This bracket is welded to, and depends from, the crosshead 17, as shown in Figure 2 and fits against the outer end portion of the scraper 22. Rivets 116 extend through said rear end portion of the scraper and also through the bracket 115 and serve fixedly to connect the scraper to the bracket. When the mill is in operation the scraper 22, as previously pointed out, operates to scrape the sleeve 114 against the accumulation thereon of material and also deflects outwards into the path of the plows 21 any material that tends to collect on the portion of the receptacle bottom wall 32 that is under the rotary crosshead 17.

The chute 23 for introducing the filler material into the receptacle is in the form of a vertically extending duct which overlies the top wall 53 of the hood 52. The upper end of the chute is provided with a gate or slide valve (not shown) and leads to a hopper or other receptacle (also not shown) for the filler material. The lower end of the chute is connected to the top wall of the hood and communicates with the interior of the hood by way of a hole in said top wall of the hood. It is contemplated that in connection with charging of the mill the aforementioned valve will be opened so as to permit of a downward discharge of a predetermined quantity of the filler material. The filler material falls by gravity through the interior of the dust hood and into the receptacle interior where it is subjected to the action of the wheels 18, the scrapers 19, 20 and 22 and the plows 21.

The pipe system for introducing the resinous material into the receptacle comprises a funnel 117, a tube 118, a cup-shaped header 119 and a pair of discharge pipes 120. The funnel 117 comprises a cone shaped part 121 and a tube part 122 and for the most part extends centrally through the cylindrical shell 61 on the central portion of the top wall 53 of the dust hood 52. The cone shaped part 121 of the funnel rests on and serves to seal the upper end of the shell 61, as shown in Figures 1, 2 and 5. The tube part 122 is of materially less diameter than the shell 61 and extends downwards through the shell and into the upper central portion of the dust hood 52. The tube 118 of the pipe system 24 extends vertically within the central portion of the hood and is arranged so that the upper end surrounds and is free from the lower end of the tube part of the funnel. The lower end of the tube 118 is fixedly connected to, and communicates with the interior of, the header 119. The latter rests on the central portion of the bar 101 and is fixedly secured thereto by way of a vertically extending bolt 123 which, as shown in Figure 2, extends upwards through a hole in the central portion of the bar 101 into an internally threaded socket in the bottom wall of the header 119. As a result of the fact that the header 119 is connected to the bar 101 the header together with the tube 118 rotates with the crosshead 17 during drive of the latter.

The discharge pipes 120 are disposed one diametrically opposite the other and are connected to, and radiate from, opposed portions of the side wall of the header 119. The inner ends of the pipes 120 are suitably secured to such side portions of the header side wall and communicate with the interior of the header. The outer portions of the pipes 120 extend downwards as shown in Figure 5 and have the outer ends or

extremities thereof disposed over the plows 21. In connection with charging of the mill the resinous material that is to be mixed and processed with the filler material is introduced into the funnel 117. The material falls first downwards into and through the tube 118, then into the header 119, and thence outwards and downwards through the discharge pipes 120. After falling through the discharge pipes the resinous material is discharged over the plows 21 and comes in contact with the filler material that is being deflected by the plows into the circular path of travel of the wheels 18. As the result of the arrangement or positioning of the outer or discharge ends of the pipes 120 the resinous material is introduced into the filler material while the latter is in suspension adjacent the side wall of the receptacle. To prevent entry of dust into the upper end of the tube 118 an inverted cup-shaped shield 124 is provided. This shield comprises a centrally apertured top wall 125 which surrounds and is welded to the central portion of the tube part 122 of the funnel 117. It also comprises a depending cylindrical skirt 126 which surrounds the upper end of the tube 118, as shown in Figures 2 and 5.

In connection with use of the mill the electric motor 69 is first started in order to effect drive of the crosshead 17 through the medium of the pulley and belt connection 70 and the vertically extending drive shaft 94. During rotation of the crosshead the wheels 18 travel in a circular course or path around the upper track forming section 38 of the receptacle side wall 33. After starting of the mill a predetermined amount of filler material is introduced into the receptacle via the valve controlled chute 23 which, as previously pointed out, has its lower end in communication with the interior of the hood 52. After the filler material is introduced into the receptacle a predetermined quantity of the resinous material that is to be mixed with the filler material is delivered into the receptacle by way of the pipe arrangement consisting of the funnel 117, the tube 118, the header 119, and the discharge pipes 120. As heretofore pointed out the resinous material enters the receptacle interior directly over the plows 21 and contacts the filler material as the latter is deflected upwards by the plows into the path of the wheels. In connection with operation of the mill the filler material with the resinous material intermixed therewith is compressed by the wheels 18 against the upper section 38 of the side wall of the receptacle. After being compressed against the upper section 38 the mixture of filler and resinous materials is scraped from the inner periphery of the upper side wall section 38 and drops by gravity toward the bottom wall of the receptacle. As soon as the mixture drops to a certain extent it is engaged by the plows and thrust upwards into the path of the wheels so that it is again subjected to compression by the wheels. Successive compressing and deflecting operations effect a thorough mixing of the resinous material with the filler material as well as compression of the mixture. The mixture is permitted to remain in the mill until it is processed to the desired or proper degree. At the conclusion of the mixing and compressing operation the door 59 is swung outwards into its open position to the end that the plows 21, in connection with swinging thereof past the doorway 41, effect discharge of the processed mixture through the doorway. The mixture as it leaves the mill is in a so-called precured or partially polymerized state and, after grinding, is in readiness or condition to be used to form, by a molding operation, "plastic" articles. During operation of the mill suction is applied to the duct 62 in order to remove from the receptacle and hood interiors water, vapor and other gases. Also during operation of the mill either a fluid heating or cooling medium is circulated through the jacket 46 in order to effect heating or cooling of the materials during processing thereof within the receptacle of the mill. If the resinous material is in powdered form so that heat is required to bring it into the proper condition for application to the filler material a fluid heating medium, such as steam or hot water, is circulated through the jacket. On the other hand, if the resinous material is in a different form, such as liquid form and requires no above atmospheric temperature, a cooling medium, such as a refrigerant or cold water, is circulated through the jacket with the view of dissipating or absorbing the heat that is created in connection with compression of the filler and resinous materials by the wheels against the upper track forming section 38 of the receptacle side wall. It is contemplated that the crosshead will be driven by the electric motor at a speed of approximately 267 R. P. M. At such speed the plows serve to maintain the materials being processed in suspension within the receptacle.

The herein described mill effectively and efficiently fulfills its intended purpose and is so designed and constructed that it has a comparatively long life and requires but little, if any, servicing. It is essentially simple in design and serves, when used to process filler and resinous materials, to process such materials in a single operation. Because of the manner in which the wheels 18, the scrapers 19 and 20 and the plows 21 are mounted they may be readily adjusted.

Whereas the mill has been described as being primarily for use in processing filler and resinous materials for purposes of forming in one operation thermosealing mixture that is capable of being molded into "plastic" articles it is to be understood that the mill may be used for other purposes, such, for example, as milling therein plastic materials, rubber, etc. It is also to be understood that the invention is not to be restricted to the details set forth since these may be modified within the scope of the appended claims without departing from the spirit and scope of the invention.

Having thus described the invention what we claim as new and desire to secure by Letters Patent is:

1. In a mill of the character described, the combination with a bowl shaped receptacle adapted to retain a batch of material to be processed and embodying a bottom wall and a continuous upstanding side wall, and a horizontally extending cross head disposed in the central portion of the receptacle, mounted to rotate about a vertical axis and provided with power means for driving it, of a block-like member mounted fixedly on the crosshead and provided at one side of the axis of the crosshead with an integral vertically extending cylindrical split bearing with a single horizontal clamp bolt for drawing together the free end portions thereof, a cylindrical member clamped within the bearing, adapted to be turned upon loosening of the

clamp bolt and provided with a fixed vertically extending eccentrically disposed axle, and a horizontally extending wheel mounted rotatably on the axle and adapted during drive of the crosshead to travel in a circular course around the receptacle side wall and compress the material against the side wall.

2. In a mill of the character described, the combination with a bowl shaped receptacle adapted to retain a batch of material to be processed and embodying a bottom wall and a continuous upstanding side wall, and a horizontally extending disc-like crosshead disposed in the central portion of the receptacle, mounted to rotate about a vertical axis and provided with power means for driving it, of an elongated block-like member mounted fixedly on the top face thereof, and extending diametrically across, the crosshead and provided at its ends with integral cylindrical split bearings with horizontal clamping bolts for drawing together the free end portions thereof, a pair of cylindrical members clamped within the bearings, adapted to be turned upon loosening of the clamping bolts and provided with fixed upwardly extending eccentrically disposed vertical axles, and a pair of horizontally extending and aligned wheels mounted on the axles and adapted during drive of the crosshead to travel in a circular course around the receptacle side wall and compress the material aganist said side wall.

3. A mill of the character described comprising a bowl shaped receptacle adapted to retain a batch of material to be processed and embodying a circular bottom wall and a cylindrical upstanding sectional side wall comprising a rigid lower section having the lower end thereof connected to the outer marginal portion of the bottom wall and embodying outwardly extending apertured lugs at its upper end and a separately rigid upper section resting on the upper end of the lower section, having materially greater thickness than, but the same inside diameter as, the lower section and forming an annular track of appreciable thickness, bolts extending upwards through the apertured lugs and into the upper portion of the outer section and serving removably to secure said upper and lower sections together, a horizontally extending crosshead disposed centrally within the receptacle mounted to rotate about a vertical axis and provided with power means for driving it, and a horizontally extending rotary wheel carried by the crosshead so that it is disposed adjacent the track and adapted during drive of the crosshead to travel around the track and to compress the material thereagainst.

4. A mill of the character described comprising a bowl shaped receptacle adapted to retain a batch of material to be processed and embodying a circular bottom wall and a cylindrical upstanding sectional side wall comprising a rigid lower section having the lower end thereof connected to the outer marginal portion of the bottom wall and embodying fixedly outwardly extending apertured lugs at its upper end and a separately formed metallic upper section resting on the upper end of the lower section, having materially greater thickness than, but the same internal diameter as, the lower section and forming an annular track of appreciable thickness, bolts extending upwards through the apertured lugs and into the outer portion of the upper section and serving removably to connect said upper and lower sections together, a metallic ring shaped member of channel shaped cross section extending around, and connected to the upper section of the receptacle side wall, arranged to form an annular jacket around said upper section, provided with means whereby a fluid medium may be circulated around the jacket and consisting of a cylindrical web of greater internal diameter than the diameter of the outer periphery of the upper section and horizontal flanges formed integrally with, and extending inwards from, the ends of the web and having the inner edges thereof welded to said outer periphery of the outer section, a horizontally extending crosshead disposed centrally within the receptacle, mounted to rotate about a vertical axis and provided with power means for driving it, and a horizontally extending rotary wheel carried by the crosshead so that it is disposed adjacent the track and adapted during drive of the crosshead to travel around the track and to compress the material thereagainst.

5. A mill of the character described comprising a bowl shaped receptacle adapted to retain a batch of material to be processed and embodying a circular bottom wall and a cylindrical upstanding sectional side wall comprising a rigid lower section having the lower end thereof connected to the outer marginal portion of the bottom wall and a separately formed rigid upper section resting on, and removably secured to, the upper end of the lower section, having materially greater thickness than, but the same inside diameter as, the lower section and forming an annular track, an inverted cup-shaped dust hood disposed above the receptacle and comprising a circular top wall and a cylindrical side wall connected to, and depending from, the marginal portion of the last mentioned top wall, having substantially the same internal diameter as the upper section of the receptacle side wall, and embodying at its lower end an outwardly extending annular flange resting on the upper end of said upper section, vertically extending bolts extending downwards through the flange and into the outer portion of the upper section and serving removably to secure the dust hood to said upper section, a horizontally extending crosshead disposed centrally within the receptacle mounted to rotate about a vertical axis and provided with power means for driving it, and a horizontally extending rotary wheel carried by the crosshead so that it is disposed adjacent the track and adapted during drive of the crosshead to travel around the track and to compress the material thereagainst.

6. A mill of the character described comprising a bowl shaped receptacle adapted a retain a batch of material to be processed and embodying a bottom wall and a continuous upstanding side wall, a horizontally extending crosshead disposed in the central portion of the receptacle, mounted to rotate about a vertical axis and provided with power means for driving it, a rotary horizontally extending wheel disposed above the crosshead and adjacent the side wall of the receptacle and carried by the crosshead so that in connection with drive of the latter it travels in a circular course around the receptacle side wall and compresses the material against said side wall, and a horizontally extending bracket plate disposed over the crosshead and adjacent the trailing portion of the wheel, provided with a scraper for the wheel and mounted on the crosshead so that it is bodily rotatable therewith while at the same time it is adjustable horizontally to

and from the wheel in order to vary the position of the scraper with respect to the wheel.

7. A mill of the character described comprising a bowl shaped receptacle adapted to retain a batch of material to be processed and embodying a bottom wall and a continuous upstanding side wall, a horizontally extending crosshead disposed in the central portion of the receptacle, mounted to rotate about a vertical axis and provided with power means for driving it in one direction, a rotary horizontally extending wheel disposed above the crosshead and adjacent the side wall of the receptacle and carried by the crosshead so that in connection with drive of the latter it travels in a circular course around the receptacle side wall and compresses the material against said side wall, a horizontally extending bracket plate disposed over the crosshead and adjacent the trailing portion of the wheel, provided with a scraper for the wall and mounted on said crosshead so that it is bodily rotatable therewith and is also capable of being swung horizontally to and from the wheel in order to vary the position of the scraper with respect to said wheel, and releasable means for locking the bracket plate against swinging movement relatively to said crosshead.

8. A mill of the character described comprising a bowl shaped receptacle adapted to retain a batch of material to be processed and embodying a bottom wall and a continuous upstanding side wall, a horizontally extending crosshead disposed in the central portion of the receptacle, mounted to rotate about a vertical axis and provided with power means for driving it in one direction, a rotary horizontally extending wheel positioned so that it is spaced above the crosshead and is adjacent the side wall of the receptacle and mounted on the crosshead so that it is adapted during drive of the latter to travel in a circular course around the receptacle side wall and to compress the material against said side wall, an elongated horizontally extending bracket plate disposed above the crosshead and adjacent the trailing portion of the wheel and provided at its outer end with an arcuate slot and in addition a scraper for the wheel, and a mount whereby the bracket plate is carried by the crosshead so that it is bodily rotatable therewith and is also capable of swinging to and from the wheel in order to vary the position of the scraper with respect to said wheel, said mount comprising an inner post connected to, and projecting upwards from, the crosshead and having the upper end thereof underlying and pivotally connected to the inner end of the bracket plate, an outer post connected to, and extending upwards from the crosshead and having its upper end extending through said arcuate slot in the outer end of said bracket plate, and clamp means associated with the posts and operative releasably to lock the bracket plate against swinging movement relatively to the crosshead.

9. A mill of the character described comprising a bowl shaped receptacle adapted to retain a batch of material to be processed embodying a bottom wall and a continuous upstanding side wall, a horizontally extending crosshead disposed in the central portion of the receptacle, mounted to rotate about a vertical axis and provided with power means for driving it in one direction, a rotary horizontally extending wheel disposed above the crosshead and adjacent the receptacle side wall and mounted on the crosshead so that during drive of the latter it travels in a circular course around the receptacle side wall and compresses the material against said side wall, a horizontally elongated bracket plate disposed adjacent the trailing portion of the wheel and so that it overlies and extends substantially radially with respect to the crosshead, provided with a triangular scraper for the receptacle side wall and having associated therewith a mount whereby it is supported with respect to the crosshead so that it is bodily rotatable therewith while at the same time longitudinally slidable to and from the receptacle side wall in order to vary the position of the scraper with respect to said receptacle side wall, and releasable means for locking the bracket plate against sliding movement relatively to the crosshead.

10. A mill of the character described comprising a bowl shaped receptacle adapted to retain a batch of material to be processed and embodying a bottom wall and a continuous upstanding side wall, a horizontally extending crosshead disposed in the central portion of the receptacle mounted to rotate about a vertical axis and provided with power means for driving it in one direction, a rotary horizontally extending wheel disposed above the crosshead and adjacent the receptacle side wall and mounted on the crosshead so that during drive of the latter it travels in a circular course around the receptacle side wall and compresses the material against said side wall, a horizontally elongated bracket plate disposed adjacent the trailing portion of, and in horizontal alignment with, the wheel, positioned so that it extends over and substantially radially with respect to the crosshead, and provided at its outer end with a scraper for the receptacle side wall, and a mount whereby the bracket plate is carried by the crosshead so that it is bodily rotatable therewith and is also longitudinally adjustable to and from the receptacle side wall in order to vary the position of the scraper with respect to said receptacle side wall, said mount comprising an inner post connected to, and extending upwards from, the crosshead and having its upper end underlying the inner end of the bracket plate and provided with a bolt extending through a longitudinal slot in said inner end of said bracket plate, and an outer post connected to, and extending upwards from, the crosshead and having its upper end extending through a longitudinal slot in the central portion of said bracket plate.

11. A mill of the character described comprising a bowl shaped receptacle adapted to retain a batch of material to be processed and embodying a bottom wall and a continuous upstanding side wall, a horizontally extending crosshead disposed in the central portion of the receptacle, mounted to rotate about a vertical axis and provided with power means for driving it in one direction, a rotary horizontally extending wheel carried by the crosshead adjacent the side wall of the receptacle and adapted during drive of the crosshead to travel in a circular course around the receptacle side wall and compress the material against said side wall, a bracket plate disposed adjacent the wheel, provided with a scraper for the wheel and having associated therewith a mount whereby it is supported on the crosshead so that it is bodily rotatable therewith while at the same time it is adjustable horizontally to and from the wheel in order to vary the position of the scraper with respect to said wheel, a second bracket plate positioned in side by side relation with the first mentioned bracket

plate, provided with a scraper for the side wall of the receptacle and supported by said mount so that it is bodily rotatable with the crosshead while at the same time it is adjustable to and from the receptacle side wall in order to vary the position of its scraper with respect to said side wall, and common releasable means for locking the two bracket plates in their adjusted positions.

12. A mill of the character described comprising a bowl shaped receptacle adapted to retain a batch of material to be processed and embodying a bottom wall and a continuous upstanding side wall, a rotary horizontally extending crosshead disposed in the central portion of the receptacle, mounted to rotate about a vertical axis and provided with power means for driving it in one direction, a rotary horizontally extending wheel disposed above the crosshead and adjacent the side wall of the receptacle and carried by the crosshead so that during drive of the latter it travels in a circular course around the receptacle side wall and compresses the material thereagainst, a horizontally extending bracket plate disposed over the crosshead and adjacent the trailing portion of the wheel, provided with a scraper for the wheel and having associated therewith a mount whereby it is supported on the crosshead so that it is bodily rotatable therewith while at the same time it is capable of being swung laterally to and from the wheel in order to adjust the position of the scraper with respect to said wheel, a horizontally elongated second bracket plate fitting against the first mentioned bracket plate extending substantially radially with respect to the crosshead, provided at its outer end with a scraper for the receptacle side wall and supported by said mount so that it is bodily rotatable with the crosshead while at the same time it is longitudinally shiftable to and from the receptacle side wall in order to vary the position of its scraper with respect to said side wall, and common releasable means for locking the two bracket plates in their various adjusted positions.

13. A mill of the character described comprising a bowl shaped receptacle adapted to retain a batch of material to be processed and embodying a bottom wall and a continuous upstanding side wall, a rotary horizontally extending crosshead disposed in the central portion of the receptacle, mounted to rotate about a vertical axis and provided with power means for driving it in one direction, a rotary horizontally extending wheel disposed above the crosshead and adjacent the side wall of the receptacle and carried by the crosshead so that during drive of the latter it travels in a circular course around the receptacle side wall and compresses the material thereagainst, a horizontal bracket plate disposed over and substantially radially with respect to the crosshead and adjacent the trailing portion of the wheel and provided at its outer end with a scraper for the wheel, a horizontally elongated second bracket plate disposed in abutting relation with the first mentioned bracket plate and substantially radially with respect to the crosshead and provided at its outer end with a scraper for the receptacle side wall, and a mount whereby the two bracket plates are connected for conjoint rotation with the crosshead, the first mentioned bracket plate is capable of being swung to and from the wheel in order to adjust the position of its scraper with respect to said wheel and the second bracket plate is slidable longitudinally to and from the receptacle side wall in order to adjust its scraper with respect to said receptacle side wall, said mount embodying an inner post connected to, and extending upwards from, the crosshead and having at its upper end a vertically extending bolt extending through a longitudinal slot in the inner end of said second bracket plate and a pivot hole in the inner end of the first mentioned bracket plate, and an outer post connected to, and extending upwards from the crosshead and having its upper end extending through a longitudinal slot in the central portion of said second bracket plate and through an arcuate slot in said first mentioned bracket plate.

14. A mill of the character described comprising a bowl shaped receptacle adapted to retain a batch of material to be processed and embodying a bottom wall and a continuous upstanding side wall, a horizontally extending disc-like crosshead disposed in the receptacle and above the central portion of the receptacle bottom wall, mounted to rotate about a vertical axis, provided with power means for driving it, embodying adjacent its outer marginal portion a pair of diametrically opposite upstanding axles and also embodying a pair of depending L-shaped brackets connected to, and depending from, said outer marginal portion of the crosshead, positioned diametrically opposite one another and at right angles to the axles and having the lower legs thereof extending outwards in the direction of the receptacle side wall, a pair of rotary horizontally extending wheels mounted on the axles and adapted in connection with drive of the crosshead to travel in a circular course around the circular side wall and compress the material against said side wall, and a pair of arcuate plows disposed directly above the outer marginal portion of the receptacle bottom wall and between the wheels, inclined downwards in the direction of drive of the crosshead, having the rear ends thereof connected to the bottom legs of the brackets and adapted in connection with drive of the crosshead to deflect the material upwards into the path of the wheels.

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