No. 805,933. PATENTED NOV. 28, 1905.

H. C. ROBINSON.

GRINDING MILL.

APPLICATION FILED FEB. 27, 1903.

2 SHEETS—SHEET 1.

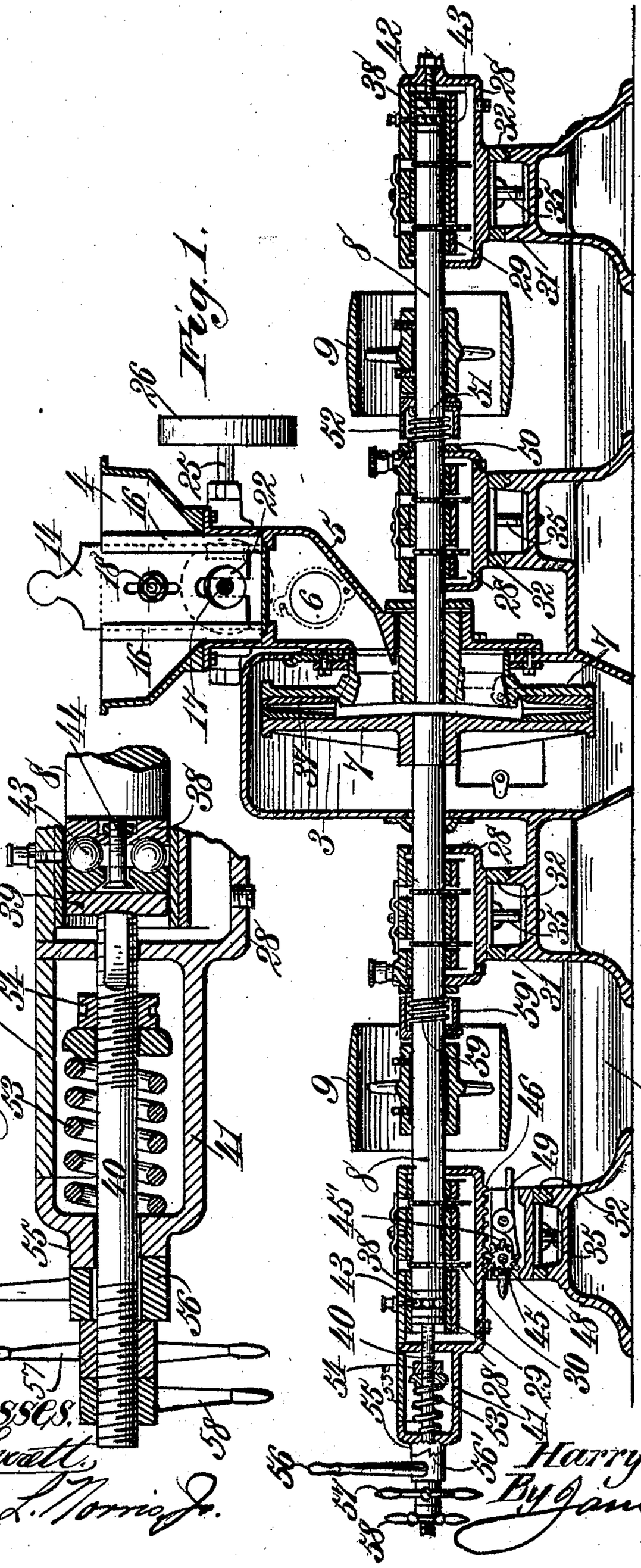
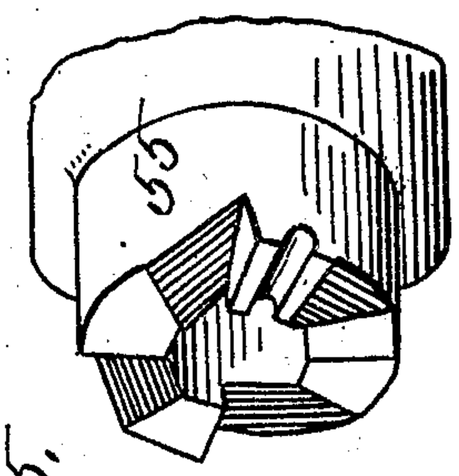


Fig. 1.

Fig. 2.



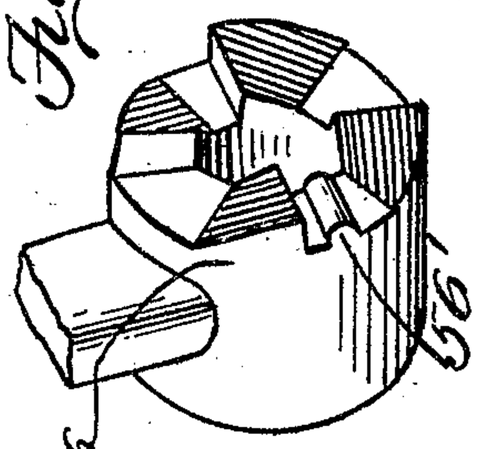


Fig. 5.

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2 SHEETS—SHEET 2.

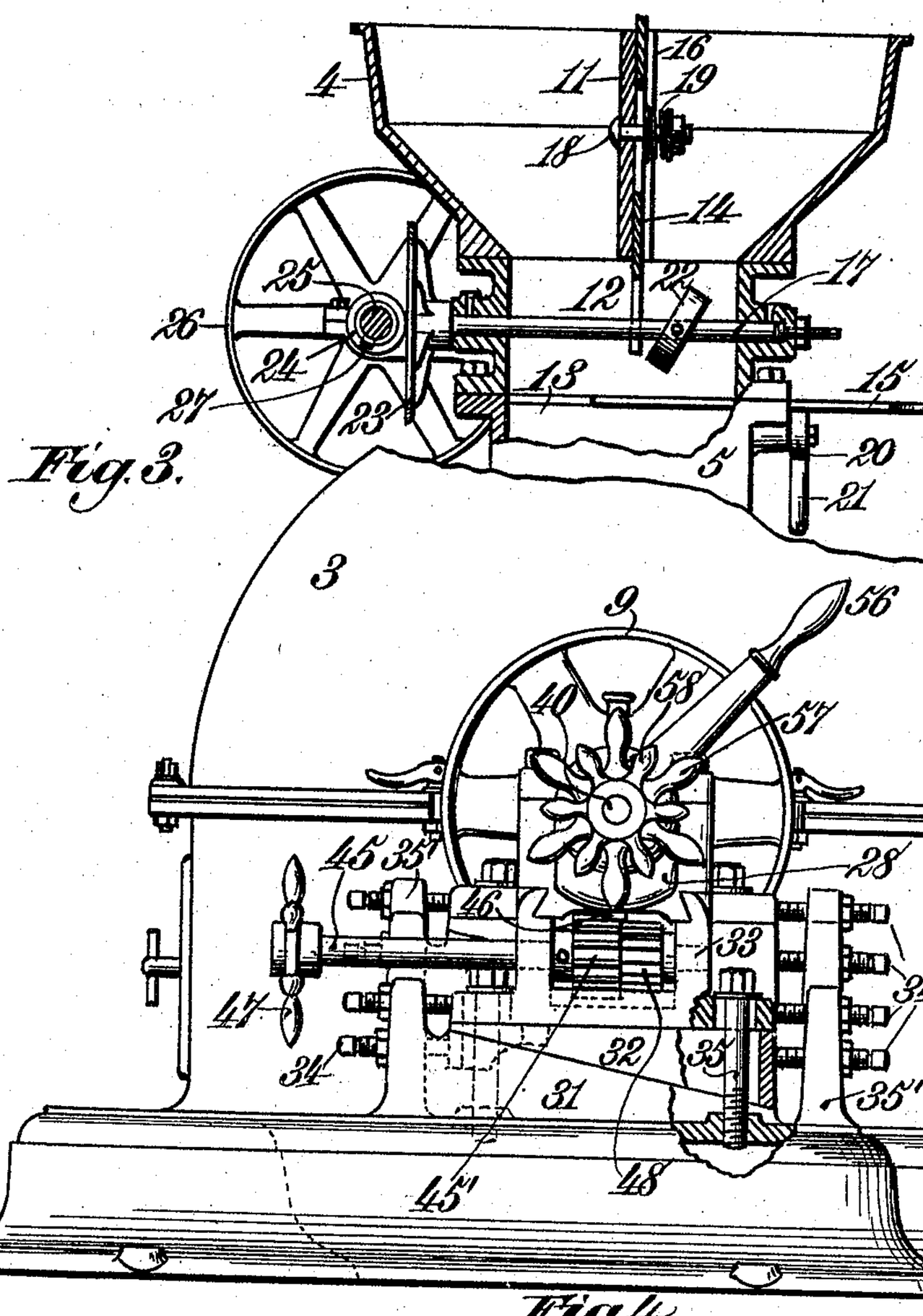
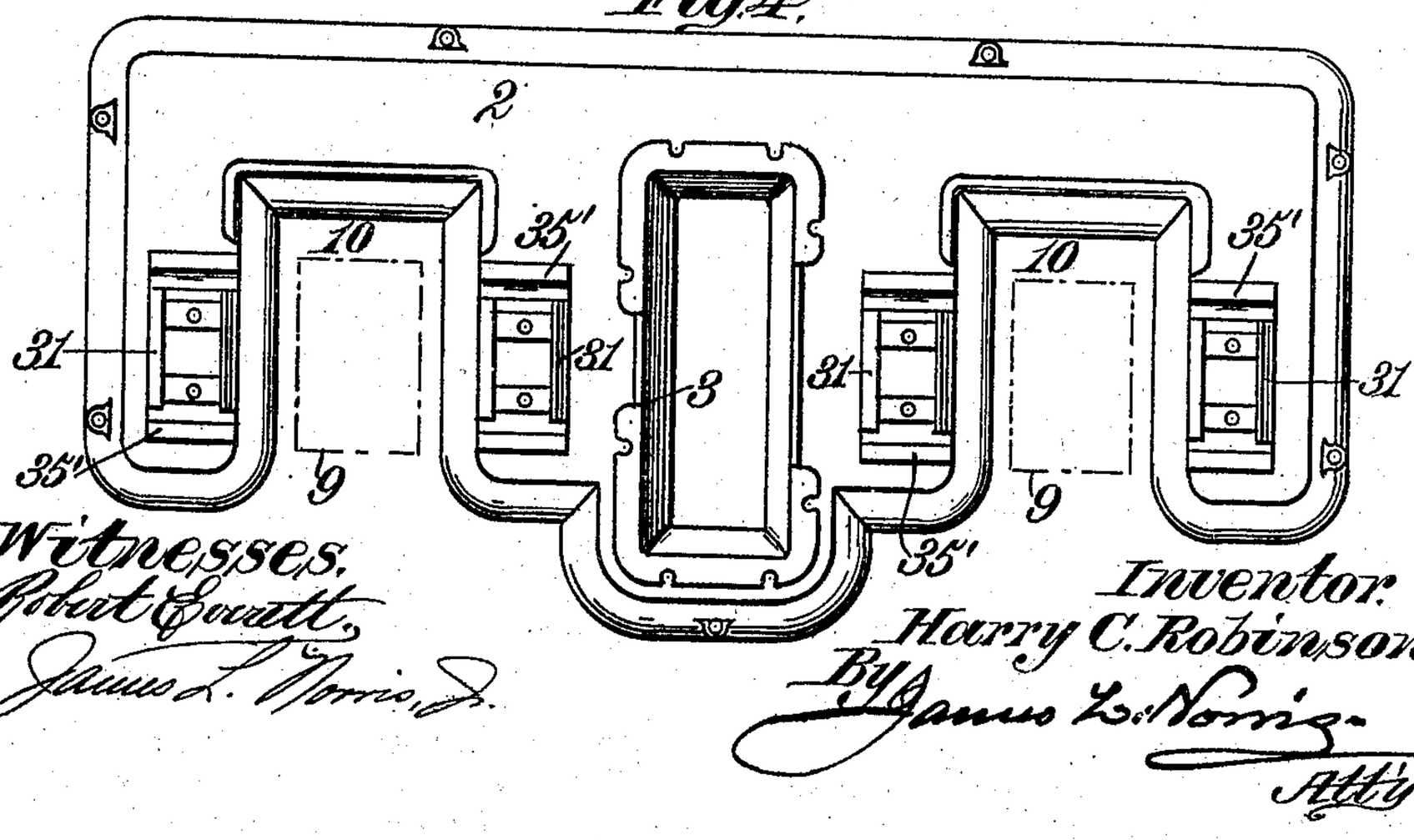


Fig. 3.

Fig. 4.



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UNITED STATES PATENT OFFICE.

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GRINDING-MILL.

No. 805,933. Specification of Letters Patent. Patented Nov. 28, 1905.

Application filed February 27, 1903. Serial No. 145,386.

To all whom it may concern:

Be it known that I, HARRY C. ROBINSON, a citizen of the United States, residing at Muncy, in the county of Lycoming and State of Pennsylvania, have invented new and useful Improvements in Grinding-Mills, of which the following is a specification.

This invention relates to grinding-mills, the improvements being of particular utility in connection with those known as "attrition-mills;" but it is not my intention to limit the invention in this respect.

The objects and advantages of the invention will be set forth at length in the following description, while the novelty of said invention will constitute the basis of the claims succeeding such description.

The invention is shown in one simple and convenient embodiment in the accompanying drawings, forming a part of this specification, and in which—

Figure 1 is a longitudinal central sectional elevation of the improved mill. Fig. 2 is a sectional elevation, on an enlarged scale, of the adjusting throw-out mechanism for the laterally-shiftable disk. Fig. 3 is a sectional elevation of the mill, and Fig. 4 is a plan view of the base. Fig. 5 is a detail hereinafter more particularly described.

Like characters refer to like parts in the several figures.

The framing for sustaining the different parts of the mill may be of any suitable character. That which I prefer to employ, however, is illustrated in the accompanying drawings, and it involves in its construction a base or bed 2, which may consist of a casting.

The mill includes a casing containing the grinding members, which in the present instance, as will hereinafter appear, are oppositely-rotated disks. Said casing is denoted by 3, the lower part thereof being usually made integral with the base or bed 2 and the upper part being removable or in the nature of a hood.

The numeral 4 designates a supply-hopper into which the material to be ground is initially placed, and this material may be of any suitable character. The spout 5 depends from the under side of the hopper 4 and is fastened in some suitable manner—say by bolting—to the lower section of the casing 3. It will be observed that the upper section or hood of the casing 3 is not integral with the hopper or spout which constitutes a part of the same, by reason of which said upper part of the casing or hood can be freely removed without dismounting or otherwise disturbing said supply-hopper. Upon one side of the spout 5 is a hand-hole normally covered by a gate 6, by opening which the hand may be introduced into the spout for the purpose of removing any obstruction therein.

The grinding members are each denoted by 7, and they are represented as consisting of disks set face to face and fastened in some suitable way to the oppositely-rotative shafts 8, a means for operating which will be hereinafter described. The grinding member or disk 7 on the right is shown as having the usual eye through which the material passes after leaving registering openings in the spout and casing, respectively, for treatment by the working surfaces of the oppositely-rotative disks. As a suitable means for operating said shafts they are provided with pulleys 9, fastened thereto in some convenient way—say by set-screws—and which pulleys are adapted to be operated by the usual belts. (Not shown.)

It will be seen that the base or bed 2 has near its opposite ends the inwardly-extending apertures 10, open at their outer sides, and which apertures, it will be seen, vertically aline with the respective shaft-driving members or pulleys 9, so that the bands or belts will not come in contact with the frame, by reason of which only ordinary care need be exercised in mounting the machine relatively to the driving-belts. Heretofore the machine had to be placed with considerable precision with respect to the driving bands or belts either by raising or lowering it or by moving it back or forth in order that the bands or belts would not strike the framing or other part of the machine. By virtue of the improved base these disadvantages are wholly overcome.

The hopper 4 is divided into two compartments of approximately equal area by the vertical dividing-wall 11, the material being delivered into one compartment and flowing into the other through the aperture or opening 12 in said dividing-wall, passing through the bottom of the hopper by way of the outlet 13 therein into the spout 5, from which it passes to the grinding-disks 7 in the manner hereinbefore described. In order to provide for the regulation of the material passing through the hopper 4, I employ the gates or valves 14 and 15, respectively, which are illustrated as being of the sliding type, although this is not essential. The dividing-wall 11 is provided

with the vertical guide strips or cleats 16, arranged at opposite sides of and in proximity to the aperture 12 and adapted to overlap the opposite sides of the vertically-slidable gate 14. A shaft 17 extends through the hopper 4 above its bottom, and the purpose of the same will hereinafter appear. In order that the gate or valve 14 may be fully closed, if necessary, or partially closed without hindrance from said shaft, the lower end of the gate 14 is bifurcated to straddle said shaft when said lower end passes below the shaft. A bolt 18 extends through the dividing-wall 11 and through a longitudinal slot in the gate 14, a coiled spring 19 surrounding the bolt and bearing against the nut thereof and also against the gate. The spring serves to frictionally hold the gate in an adjusted position, and such friction may be regulated by means of the nut of the bolt. It will therefore be understood that the gate may be readily raised or lowered, and when it is in its adjusted position it is held frictionally in place. The gate 16 is horizontally slidable in a plane below the lower end of the vertically-slidable gate 14, and it controls the outlet 13 of the hopper, it moving back and forth in suitable ways in the bottom of the hopper. The horizontally-slidable gate is held in an adjusted position by the eccentric 20, pivoted at a suitable point upon the spout 5 and held in its effective position by the weighted arm 21, constituting a part of the same. By manipulating this arm the eccentric may be moved out of engagement with the gate 15, whereby the latter can be moved inward or outward in order to adjust the effective area of the outlet 13, and when this is done the weighted arm 21 will be freed, so that it can drop to move the eccentric into its working position for holding the gate.

The shaft 17, which, it will be remembered, extends through the hopper, carries a disk 22, located in that compartment of the hopper into which the material is initially delivered and the function of which is to agitate or loosen up such material, thereby to insure its ready and uniform feed through the outlet 13. The shaft extends centrally through the disk, the parts being united in some suitable manner, and the disk is set diagonally or angularly with respect to the shaft, whereby it thoroughly loosens up the material at opposite sides of the shaft as it is rotated. The sides and periphery of the agitator or disk 22 are preferably smooth, by reason of which such foreign substances as strings cannot adhere to or wind upon the same, as in case they did the clogging of the hopper would in all probability result. By increasing the effective sizes of the aperture 12 and the outlet 13, which I do by the adjustment of the gates 14 and 15, I adapt the hopper for the effective passage of coarse material, the sizes of said aperture and outlet respectively being reduced when finer material is under treatment. In some cases the gate 15 may be opened to its full limit, thus wholly uncovering the outlet 13.

Upon the outer end of the shaft 17 is a friction-disk 23, driven by the driving-wheel 24 upon the shaft 25, carried by suitable bearings upon the hopper and operated in any convenient manner—for example, by means of the pulley 26, fastened thereto and operated by suitable belting. (Not shown.) The wheel 24 is adjustable toward and from the center of the disk 23 in order to vary the speed of the agitator or disk 22, and it is held in a desired position by suitable means, as the set-screw 27, tapped through the hub of said friction-wheel and adapted to engage said shaft 25. It will be understood that when the pulley 26 is operated the agitator or disk 22, through the intermediate friction-gearing, is actuated in order to effect the proper feed of the material from the hopper, the axis of the cylindrical agitator or disk being inclined to the axis of its shaft 17 for such purpose.

The shafts 8 of the grinding members are so supported as to be readily adjusted in order to bring the working portions of the disk absolutely in correct relation with each other, as will hereinafter appear. Said shafts are sustained by bearings, preferably two in each case, and these bearings are represented as consisting of boxes 28, the shafts extending through the innermost boxes and into the outermost boxes, said boxes being adjustable both vertically and horizontally, so that corresponding movements may be applied to the grinding-disks to thereby tram or set the same in proper working relation with each other. The internal construction of the boxes is a familiar one in machine art, and hence a detailed description of the same is unnecessary. These boxes are adapted to contain a lubricant which can be supplied to the journal portion of the shaft by the usual chains 30.

The several shaft bearings or boxes 28, as previously stated, are adjustably supported, and as the supports are the same in each case a detailed description of one will suffice for them all. A pair of vertical parallel flanges 31 rise from the base of the machine, being made in the present case integral with said base. The upper faces of these flanges are inclined to receive the corresponding inclined faces of the skeleton wedge 32. Therefore as the wedge 32 is moved crosswise of the machine it will be raised or lowered in accordance with the direction in which it is moved. Said wedge 32 carries a slide 33, movable transversely of the machine and with which the shaft bearing or box 28 moves laterally of the machine.

Superposed screws arranged in pairs and each denoted by 34 are tapped through vertically-disposed walls or flanges 35′, constituting a part of the base or bed, the lower screws

bearing against the opposite ends of the wedge 32, while the upper screws bear against the opposite ends of the slide 33. It will be assumed that the several screws are in engagement with the slide 33 and wedge 32 and that it is desired to raise or elevate the shaft. To do this, the following operation takes place. The lower screw 34 on the left is backed out and the lower screw on the right run in, so as to move the said wedge 32 to the left, and thereby raise the shaft, the slide 33 during this action being held stationary by the upper screws abutting against the same. When the wedge 32 has been properly adjusted, the lower left screw is run inward until it strikes the reduced end of the wedge 32. To lower the shaft, an opposite manipulation of the lower screws will take place. Vertically-disposed screws 35 extend through longitudinal slots near the opposite end of the slide 33 and are tapped into the upper side of the base or bed 2. In adjusting the slide 23 crosswise of the machine the heads of the screws 35 are initially freed from engagement with the upper face of said slide, after which one of the upper screws—say that on the left—is backed out and the one on the right run in, so as to move said slide toward the left, the shaft 8 being carried in the corresponding direction, and when said shaft is properly located the screws 36 and the upper screw 34 on the left are then tightened up. During the adjustment of the shaft by the lateral motion of the slide 33 with respect to the bed 2 the upper screws 34 prevent movement sidewise of the slide, although they should not bind against said slide with a pressure sufficient to interfere with the ready elevation of the same. In tramming the grinding-disks the several adjustable supports, it will be evident, will be simultaneously adjusted.

The grinding-disks have, as is usual, removable working portions or plates 37, fastened upon the inner sides thereof, so that they can be removed when worn out and new ones substituted therefor. With existing machines it is a laborious and difficult matter to accomplish this result, as practically the entire machine has to be dismantled to do so. I avoid this labor and time by simple means, which I will now describe.

The outermost bearing of the shaft shown at the left is mounted for movement in the direction of the length of said shaft, whereby said bearing can be moved in a direction away from the casing 3 in order that the said shaft at the left can be slid in the corresponding direction to carry the disk at the left away from the companion disk a distance sufficient to permit the introduction of the hands into the space between said disks to remove the working portions or plates 37 thereof. The said outermost box or bearing 28 at the left is supported for sliding movement upon the adjacent transversely-movable slide 33, and I provide mechanism, hereinafter described, for moving said sliding box or bearing back and forth. The outer ends of the shafts bear against end bearings 38, inclosed by the outermost boxes and which are in the nature of antifriction-bearings and which receive the end thrust of the two shafts. The end bearing at the left is held in place by the head 39 of a rod 40, extending through the outer wall of the box and also through a tubular projection 41 thereon. The end bearing at the right is held in place by a disk or circular plate 42, having an outwardly-extending stem tapped through the outer wall of its box and held in an adjusted position by a nut on said stem.

The end bearings 38 consist of disks having complemental grooves upon their inner sides to receive antifriction-balls 43, the disks being held a proper distance apart by a pin 44, rigidly secured to one of them concentrically thereof and passing freely centrally through the other one. This pin serves simply to hold the antifriction-balls in place when the end bearing is moved away from the shaft or when the said end bearing is removed from place for the purpose of cleaning.

A shaft 45 is mounted rotatively upon the outermost slide 33 at the left and carries fixedly at a suitable point the pinion 45′, meshing with the teeth of the rack 46, carried by the adjacent and slidable box 28. By turning the shaft 45 the box in question may be moved back and forth. Said shaft is provided at its outermost end with a hand-wheel 47, by which it can be readily rotated, and is also provided with a ratchet-wheel 48, adapted to be engaged normally by the gravity-pawl 49 upon the cross-slide 33. By moving the point or toe of the pawl out of engagement with the ratchet-wheel the pinion may be operated by the hand-wheel 47 to move the coöperating slide back and forth. By moving said slide at the left outward by the manipulation of the mechanism just described the corresponding end bearing 38 will be carried away from the end of the shaft 8. When said sliding bearing or box has been adjusted the proper distance, the shaft 8 sustained thereby can be also moved outward to thereby carry the disk at the left away from the coacting disk in order to reach the plates 37. This operation of the slide in addition to providing ready access to the working parts of the disk serves another important function. In grinding cracked corn or common hominy it has heretofore been the custom to maintain one of the grinding-disks at rest, which necessitated removing the belt from the pulley from which the particular disk received its motion and also in locking the disk against rotation, whereby such material will not be ground too fine. By reason of my improvements this stoppage of the disk is not necessary, as the same results can be secured by adjusting the disk at the left away from the companion

disk a distance sufficient to assure proper grinding which, as previously indicated, is secured by moving the outermost bearing or box 28 at the left outward by means of the hand-wheel 47 acting through the intermediate mechanism, the casing 3 in which the two disks are housed being made of sufficient width to allow for ample movement of the adjustable disk.

I hold the disk at the right in its working position by means which I will now describe.

The box or bearing 28 adjacent the casing 3 at the right is engaged by the ring or washer 50, surrounding the shaft 8 on the right, having in its outer face an indentation to receive an offset in the inner terminal coil of the spring 51, surrounding said shaft, the outer terminal coil having a similar offset fitted in a like indentation in the bottom of the collar 52, fixed to said shaft and practically inclosing the spring. This spring, it will be understood, serves to prevent the disk on the right being carried too far toward the companion disk.

The rod 40 has adjacent to the head 39 a polygonal portion which fits a similarly-shaped aperture in the outer head or wall of the box inclosing the same, said rod having been described as extending outward through a tubular extension 41 upon said box. A strong coiled spring 53 surrounds the rod 40 in the tubular extension and bears against the outer wall of the latter and also against an adjustable stop 54 on said rod, which stop is shown as consisting of a nut, a collar or washer surrounding the rod between the nut and the spring and being channeled on its outer face to receive the inner terminal coil of said spring. By running the nut back or forth the tension of the spring can be regulated. The spring by acting against the nut serves to hold the disk at the left yieldingly to its work, so that on the passage of obstacles of unusual size through the space between the disks the one on the left can give or yield outward in order to prevent injury to or breakage of the mill or any of its parts. The nut 54 is of course threaded onto the rod 4 and is engaged by a washer, against one end of which the spring 53 bears, the other end of the spring bearing against the tubular extension 41. By moving the nut to the left the tension of the spring 53 will be increased. By moving the nut to the right the opposite result will follow. The tubular extension of course has a lid 53ª, by lifting which the nut can be passed into the tubular extension to be applied to the rod.

The rod 40 extends through a hub 55 at the outer end of the tubular extension 41 and is surrounded adjacent to said hub by the body of a hand-lever 56, said body being notched on its inner face and the projecting portions or teeth fitting in similar notches on the hub 55. The purpose of this hand-lever will be hereinafter set forth; but at this point it should be stated that during the normal operation of the mill the projecting portions or teeth of the body of the hand-lever snugly fit in the notches of the hub, positive means being provided to assure this result. An adjusting hand-wheel 57 is threaded upon the rod 40 near its outer end, while a locking or check hand-wheel 58 is threaded onto the outer end of said rod, the adjusting-wheel being located between the body of the hand-wheel 56 and the hand-check or locking-wheel 58. The adjusting-wheel 57 is for the purpose of changing the space between the disks 7 by moving the one at the left toward or from the companion disk, this being necessary in order to adapt the machine to different kinds of work. To adjust the left grinding-disk outward, the check hand-wheel 58 is first set back the requisite distance, after which the adjusting hand-wheel is moved in a corresponding direction, thereby moving the head 39 of the rod 40 away from the adjacent end of the shaft 8, whereby the disk in question may be moved away from the coacting disk by the material passing between the two. To adjust the adjustable disk inward, the opposite operation takes place—that is to say, the head 39 is run inward by the manipulation of the hand-wheel 57—and when the parts are set they are held in such position by running in the check or locking wheel 58 until it abuts against the hand-wheel. In some cases it becomes necessary to throw the laterally-movable disk or the one at the left rapidly away from its companion. For example, if a heavy metallic object should pass between the disks this fact will be indicated to the miller by the sound of the same, and in order to rapidly free such object the disk at the left must be quickly moved away from the other one. This operation is accomplished through the agency of the hand-lever 56, freely carried by said rod. The teeth on the body of the hand-lever are wedge or cam shaped, the teeth of the hub 55 being similarly shaped. The teeth of the respective parts are united by straight faces, as shown, and one of the straight faces of the body of the hand-lever is furnished with a protuberance 56′ to fit into one of the sockets in the similar faces of the hub in order to stop the lever in proper position after its manipulation. The body of the lever, it will be understood, abuts against the adjusting hand-wheel 57.

It will be assumed that it becomes necessary to quickly move the shiftable disk, as set forth hereinbefore. To do this, the hand-lever is grasped and swung toward or from the operator in order to cause the inclined faces of the teeth on the hand-lever to ride along the corresponding faces of the teeth on the hub 55. This will result in moving the lever outward, which presses against the hand-wheel 57, so as to move the rod 40, and conse-

quently its head 39, in the corresponding direction, whereby any obstruction between the disks can force the adjustable one, or that at the left, outward. When the hand-lever has made the requisite movement, the protuberance 56′ on the body thereof will enter a socket in the hub 55. This protuberance is in the nature of a stop and prevents the movement of the hand-lever a distance exceeding one tooth, for this distance is all that is requisite to free an unusually large or metallic object. This shifting of the disk at the left may be also utilized when the mill is not grinding, as the one disk may be moved away from the other one to prevent the working relation between the same during such time. To facilitate the separation of the said laterally-movable disk, I provide the spring 59, bearing against a collar 59′ on the shaft carrying said disk and also against the relatively fixed and adjacent bearing or box 28.

It will be seen that the mechanism which provides for the quick throwing of the head 40 out of contact with the coöperating end bearing 38 is supported independently of the shaft 8, by reason of which there is no friction between these parts, as would be the case if such mechanism were sustained by said shaft, as has heretofore been done.

In the foregoing description I have referred to the disk at the left in several places. This applies particularly to Fig. 1.

The invention is not limited to the exact construction hereinbefore described, for many variations may be adopted within the scope of my claims.

Having thus described the invention, what I claim is—

1. In a grinding-mill, a bed provided with a stationary casing, a pair of grinding-disks in said casing, provided with oppositely-extending shafts, projecting from the casing, and a plurality of bearings for supporting the shafts, one of the bearings being movable in the direction of the length of its shaft, and the other bearings being fixed against such movement, and the shaft supported by the movable bearing being longitudinally movable.

2. In a grinding-mill, a pair of grinding members and their shafts combined with bearings for said shafts, one of said bearings being movable in the direction of the length of its shaft and the latter being longitudinally movable and said movable bearing having a rack, a manually-operable shaft having a pinion for engaging the rack, a ratchet-wheel on said shaft, and a pawl coöperative with the ratchet-wheel.

3. In a grinding-mill, a pair of grinding-disks set face to face, shafts to which the grinding-disks are fastened, extending outward from said disks, one of the disks being adjustable toward and from the companion disk, and its shaft being longitudinally movable, bearings for supporting said shafts the bearing for the longitudinally-movable shaft being movable in the direction of the length of its shaft, an end bearing for the longitudinally-movable shaft carried by said movable shaft-supporting bearing, a threaded rod provided with a head for holding said end bearing against the coöperating shaft and supported by said movable shaft-supporting bearing, an adjusting device in threaded engagement with said rod, a lever freely carried by said rod between said adjusting member and said movable shaft-supporting bearing, the latter having an annular series of teeth provided with angular faces and the lever having similar teeth coöperating with the other teeth, and manually-controlled means for shifting the said movable shaft-supporting bearing.

4. In a grinding-mill, a pair of grinding-disks set face to face, shafts to which the grinding-disks are fastened, extending outward from said disks, one of the disks being adjustable toward and from the companion disk, and its shaft being longitudinally movable, bearings for supporting said shafts the bearing for the longitudinally-movable shaft being movable in the direction of the length of its shaft, an end bearing for the longitudinally-movable shaft, carried by said movable shaft-supporting bearing, a threaded rod provided with a head for holding said end bearing against the coöperating shaft and supported by said movable shaft-supporting bearing, an adjusting device in threaded engagement with said rod, a lever freely carried by said rod between said adjusting member and said movable shaft-supporting bearing, the latter having an annular series of teeth provided with angular faces and the lever having similar teeth coöperating with the other teeth, manually-controlled means for shifting the said movable shaft-supporting bearing, and means for limiting the movement of said lever.

5. In a grinding-mill, a pair of grinding-disks set face to face, shafts to which the grinding-disks are fastened, extending outward from the respective disks and one of the shafts being longitudinally movable, whereby its disk is adjustable toward and from the companion disk, boxes for supporting said shafts, the box for the longitudinally-movable bearing having a tubular extension, an end bearing in the said last-mentioned box, a threaded rod extending through said tubular extension and having a head at its inner end to engage said end bearing for holding the latter against the coöperating shaft, a nut threaded upon the rod in said tubular extension, a coiled spring surrounding the rod in the tubular extension and bearing against the latter and also against said nut, an adjusting device threaded onto the outer end of said rod, and a lever free on the rod between said adjusting device and the tubular extension, the latter having a hub

provided with angular teeth and the lever having similar teeth to coöperate with said other teeth.

6. In a grinding-mill, a pair of grinding-disks set face to face, shafts to which the grinding-disks are fastened, extending outward from the respective disks and one of the shafts being longitudinally movable, so that disk is adjustable toward and from the companion disk, boxes for supporting said shafts, the box for the longitudinally-movable bearing having tubular extensions, an end bearing in said last-mentioned box, a threaded rod extending through said tubular projection and having a head at its inner end to engage said end bearing for holding the latter against the coöperating shaft, a nut threaded upon the rod in said tubular extension, a coiled spring surrounding the rod in the tubular extension and bearing against the latter and also against said nut, an adjusting device threaded onto the outer end of said rod, a lever free on the rod between said adjusting device and the tubular extension, the latter having a hub provided with angular teeth and the lever having similar teeth to coöperate with said other teeth, and said lever having a rounded protuberance upon one of its teeth adapted to engage any one of a series of sockets in the teeth on said hub to thereby limit the throw of the lever.

7. In a grinding-mill, the combination of a bed, a pair of grinding members and their shafts, adjustable supports for said shafts each support including a wedge and vertical flanges in parallelism with each other integral with and rising from the bed, the upper sides of the flanges being inclined to receive the correspondingly-inclined portions of the wedges, a slide supported upon the top of said wedges and provided with a shaft-bearing, means for actuating the wedge, and independent means for actuating the slide carried thereby.

8. In a grinding-mill, the combination of a bed, a pair of grinding members and their shafts, wedges, slides supported on the tops of said wedges provided with bearings for said shafts, vertical flanges rising from the bed and integral therewith and having inclined upper sides to receive the wedges, and screws arranged above each other for engaging the opposite ends of said slide and said wedge.

9. In a grinding-mill, the combination of grinding mechanism, a supply-hopper for delivering material to the grinding mechanism, a rotary shaft extended into said hopper, and a cylindrical disk in the hopper, fixed to and disposed diagonally of said shaft, the axis of the disk being inclined to the axis of the shaft.

10. In a grinding-mill, the combination of grinding mechanism, a supply-hopper for delivering material to the grinding mechanism, a shaft in the hopper provided with an agitator for the material, a vertical dividing-wall in the hopper having an orifice for the passage of said material, a vertically-slidable gate for controlling the flow of such material through said orifice, bifurcated at its lower end to straddle said shaft when said gate is lowered, and a horizontally-movable gate for controlling the discharge of material from the outlet of the hopper.

11. In a grinding-mill, the combination of a base or bed having inwardly-extending open-ended slots or apertures formed in the forward edge of said bed, a pair of grinding members and their shafts, bearings for the shafts on the upper side of said bed and alined longitudinally of said bed and located at opposite sides of the respective slots, and band-driven members fixed to the shafts approximately in vertical line with and above said open-ended slots or apertures, the latter being situated at opposite sides of said grinding members.

12. In a grinding-mill, the combination of grinding mechanism, a supply-hopper for delivering the material to the grinding mechanism, a dividing-wall vertically disposed in the hopper, having an aperture for the passage of such material, a vertically-slidable gate upon said dividing-wall for controlling the passage of material through said orifice, and a horizontally-slidable gate for controlling the discharge of material from the hopper.

13. In a grinding-mill, the combination with a casing, of a pair of oppositely-rotative disks in said casing, one of the disks having an eye, a supply-hopper for delivering material through said eye to the disks, a rotary shaft projected into said hopper, and a cylindrical disk in the hopper, fastened to and disposed diagonally of said shaft, the axis of the disk being inclined to the axis of the shaft.

14. The combination in a grinding-mill of a frame, a rotatable shaft carrying a grinding-disk, a fixed thrust-box on the frame adjacent to the end of the disk-shaft, a laterally-movable thrust-shaft mounted in the thrust-bearing, a spring operating on the thrust-shaft to move it toward the disk-shaft, a manually-operatable rocking plate or disk mounted on the thrust-shaft and having cam projections or faces engaging the end of the thrust-bearing, and means for adjustably locating the rocking disk on the thrust-shaft, substantially as set forth.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

HARRY C. ROBINSON.

Witnesses:
HEATH SUTHERLAND,
GEO. W. REA.