No. 798,255. PATENTED AUG. 29, 1905.

G. A. BELL.

GRINDING MILL.

APPLICATION FILED FEB. 29, 1904.

2 SHEETS—SHEET 1.

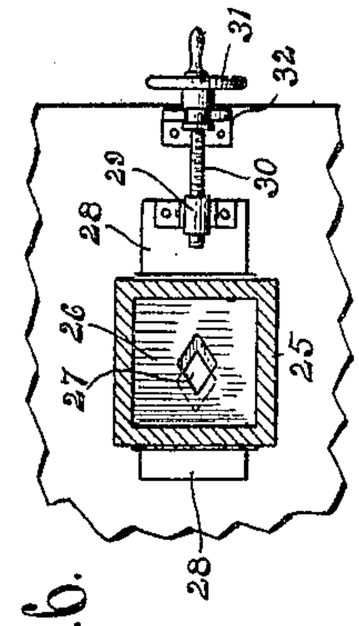

Fig. 6.

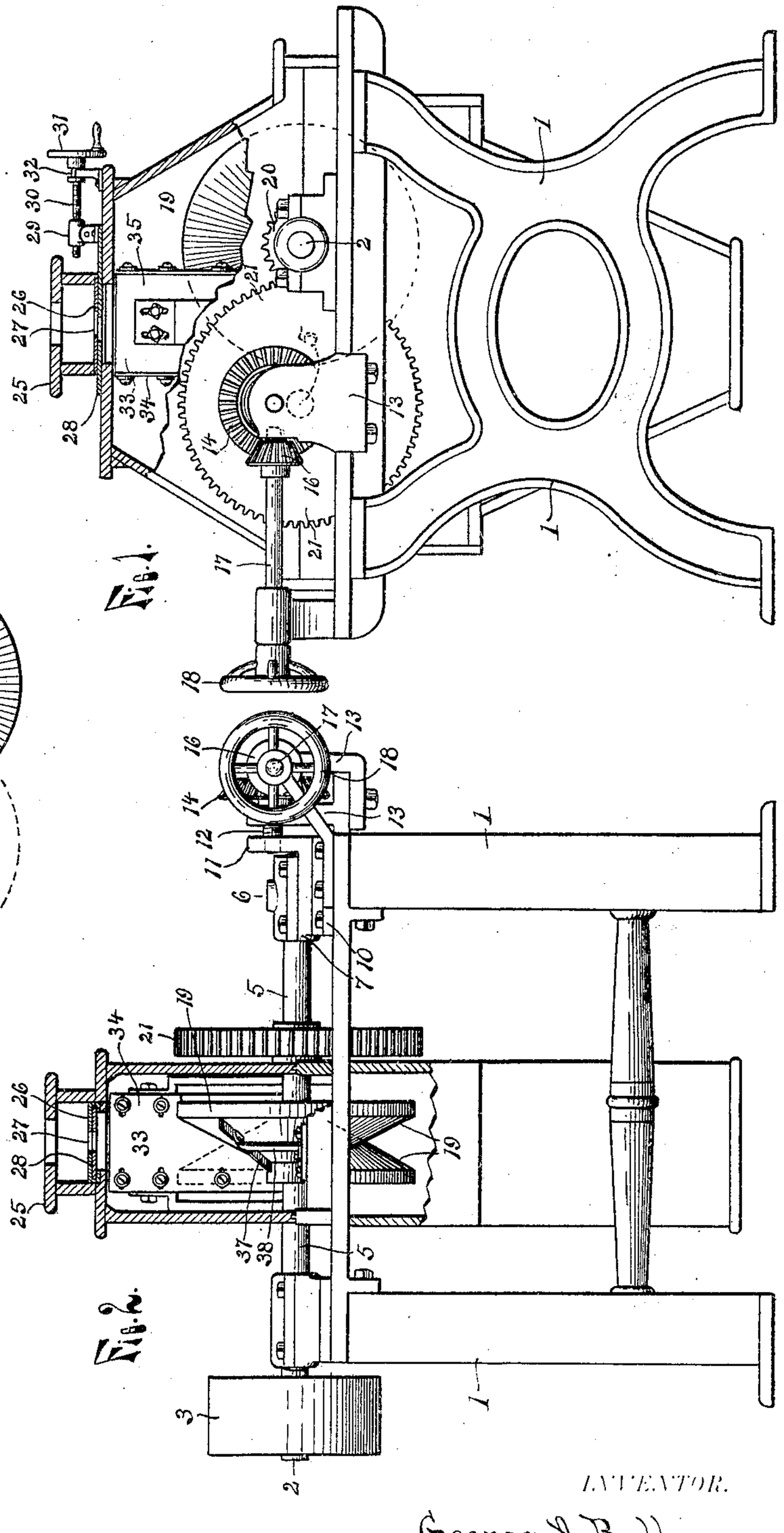

Fig. 1.

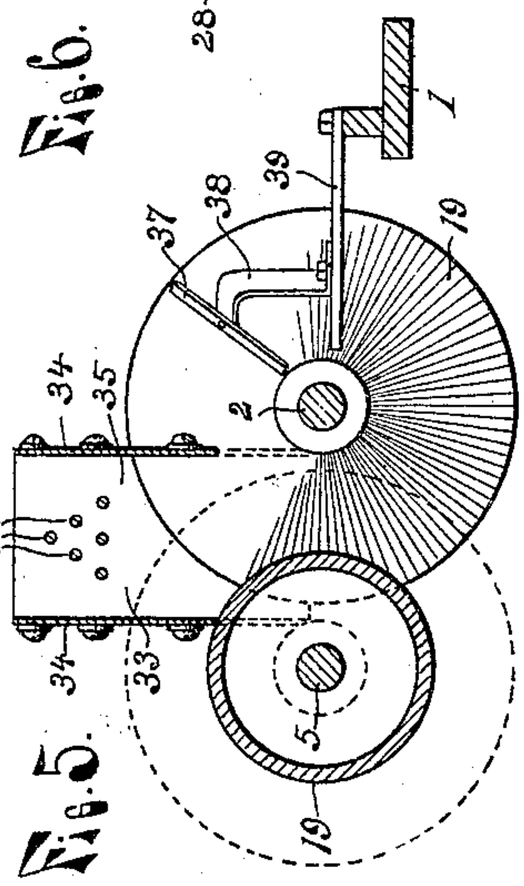

Fig. 5.

Fig. 2.

WITNESSES.

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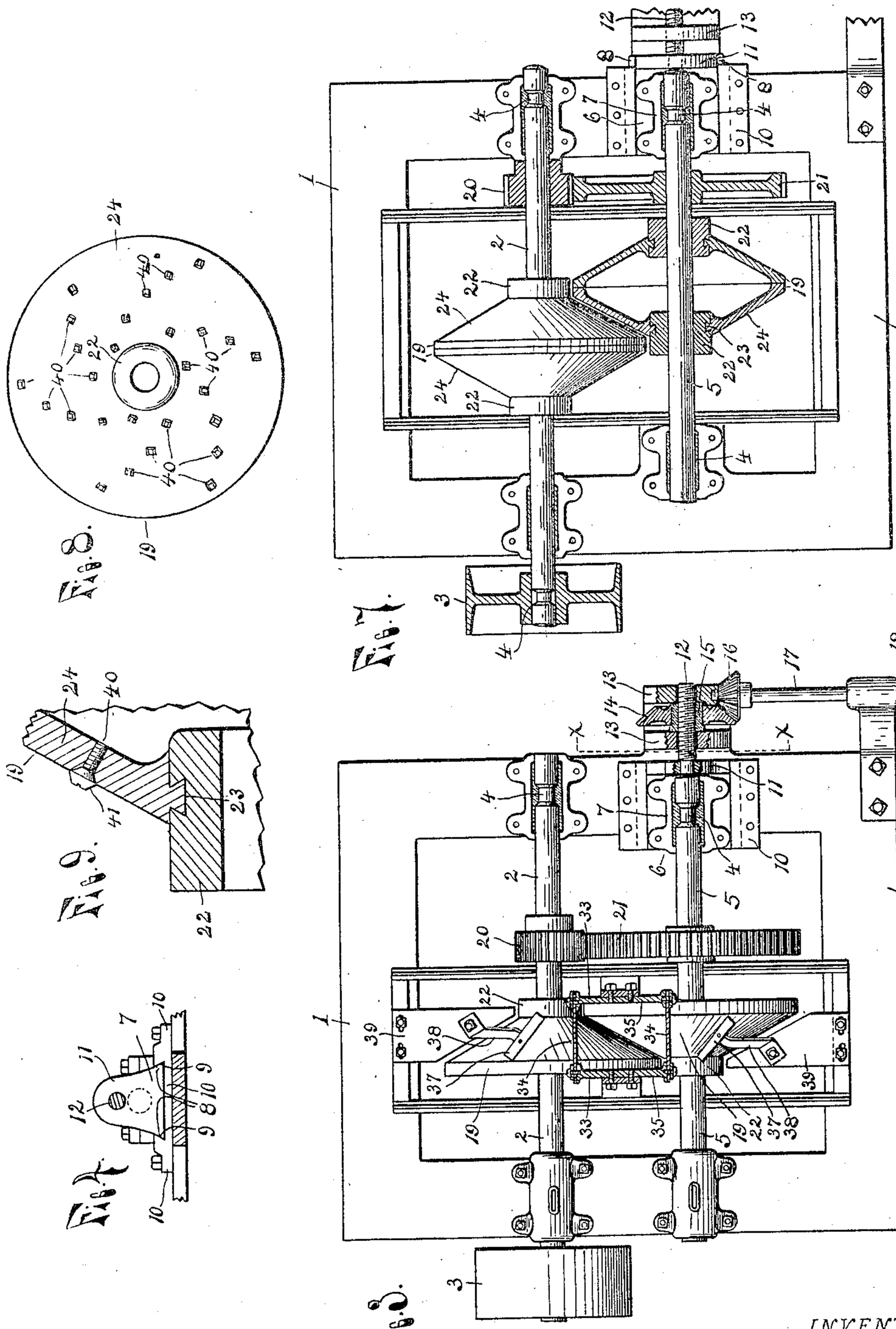

Fig. 1.

Fig. 8.

Fig. 9.

Fig. 4.

Fig. 2.

Fig. 3.

WITNESSES.

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UNITED STATES PATENT OFFICE.

GEORGE A. BELL, OF YPSILANTI, MICHIGAN.

GRINDING-MILL.

No. 798,255. Specification of Letters Patent. Patented Aug. 29, 1905.

Application filed February 29, 1904. Serial No. 195,833.

To all whom it may concern:

Be it known that I, GEORGE A. BELL, a citizen of the United States of America, residing at Ypsilanti, in the county of Washtenaw and State of Michigan, have invented certain new and useful Improvements in Grinding-Mills, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to improvements in grinding or crushing mills adapted to grind grain or similar material and also adaptable for use in crushing stone or like substances; and its object is to provide a machine of this character with certain new and useful improvements and having the particular construction, arrangement, and combination of parts whereby a cheap, durable, and efficient construction is obtained, all as hereinafter more fully described, and particularly pointed out in the claims, reference being had to the accompanying drawings, in which—

Figure 1 is an end elevation of a device embodying the invention with parts of the casing broken away to show the construction; Fig. 2, a side elevation of the same with the casing partly in section; Fig. 3, a plan view with the upper casing removed and showing parts of the machine in section. Fig. 4 is a sectional detail of the movable bearing on the line *x x* of Fig. 3. Fig. 5 is a detail showing a transverse section through the hopper and one of the cones and also showing their relation to each other. Fig. 6 is a detail of the feed-slide and means for operating the same. Fig. 7 is a plan view showing a modified form of grinding disks or cones. Fig. 8 is a detail showing a face view of one of the disks, provided with crushing-teeth; and Fig. 9 is a detail showing the manner in which the disks are constructed and also showing one of the teeth in place.

As shown in the drawings, 1 represents the machine-frame, upon which is supported in suitable bearings the shaft 2, provided at one end with the driving-pulley 3 and held against longitudinal movement by forming a groove 4 therein within one or both of its bearings, into which groove the Babbitt metal of the bearings is run, thus forming a rib in the bearing engaging the groove and preventing the longitudinal movement of said shaft 2. A shaft 5, extending parallel with shaft 2, is mounted at one end in a plain bearing within which it is free to move longitudinally, there being no groove provided in this end of the shaft, and at its opposite end said shaft is mounted in a movable bearing 6, within which it is secured to move longitudinally therewith by forming a groove near its end within said bearing similar to the groove 4.

The bearing 6 consists of a bearing-block 7, provided with tongues 8 to engage an undercut groove 9 in the bearing-plate 10, bolted to the machine-frame, and on the bearing-block is an upwardly-extending lug 11, to which is secured one end of a screw-shaft 12, which extends longitudinally from the end of the bearing through openings in lugs 13 on the machine-frame. Said screw passes freely through the openings in said lugs, and mounted on the screw between the lugs is a beveled gear 14, having a center or hub 15 of wood or similar material, which is screw-threaded to receive the screw-shaft and firmly secured in the center of the gear in any suitable manner. Engaging the gear 14 is a bevel-pinion 16 on the end of a shaft 17, supported at one end on the outer lug 13 and at its opposite end in a bearing at the corner of the machine-frame, a hand-wheel 18 being provided on its outer end to turn the same, which motion is transmitted by the pinion to the gear 14 to turn the same on the screw-shaft, and thus move the shaft 5 longitudinally by moving its bearing 6.

On each of the shafts 2 and 5 is secured a conical-faced disk 19, the beveled faces of the disks being inclined at the same angle and adapted to be brought close together to crush or grind anything put between, and on the shaft 2 is secured a small gear 20 in mesh with a large gear 21 on the shaft 5 to transmit motion from one shaft to the other and revolve the same at different speeds. The gear 14 is provided with the wooden hub, so that should an iron bar or any other unyielding substance get between the disks the wooden threads of this hub will be stripped off before the other parts will be broken, thus allowing the bearing 6, shaft 5, and its disk to move sufficiently to permit the obstruction to pass through, and no damage will be done further than to require the replacing of the hub, which may be quickly done by detaching the outer lug 13, which is secured to the frame by bolts. These disks are in form hollow truncated cones and are preferably

made by first casting the hub portion 22 with a dovetail groove 23 in its outer surface, then casting the flange portion 24 around the hub, allowing the metal to flow into the groove of the hub to unite the parts together, the flange being chilled in the mold to make a hard grinding-surface, and the hub portion being left soft, so that it may be easily bored to fit the shaft. If desired, these disks may be arranged as shown in Fig. 7, two disks being secured on each shaft and facing in opposite directions with their peripheries in contact, thus forming a hollow grinder having grinding-surfaces at each side. With this arrangement when one surface of the grinder has become worn it is only necessary to remove the shafts from their bearings and turn each end for end, thus bringing the other surface of each grinder into operative position, the shafts being suitably grooved at both ends to provide for such turning. The shaft 5 is secured, however, by means of said grooves at but one end in the box 7 only, the bearing at the opposite end being a plain bearing within which the grooved end of the shaft may move longitudinally. The dead-air space thus formed in each grinder greatly aids in keeping it cool.

Inclosing the grinding-disks is a casing the upper half of which is removable to give access to the disks, and on the top of the casing is a rectangular box 25, covering an opening in said top and having an opening in its top for a suitable grain-chute or other means for conveying the material to be worked to the machine. The bottom of the box is formed by a plate 26, provided with a diamond-shaped feed-opening 27 near its center and having downwardly and inwardly turned side flanges to form ways for a plate or slide 28, movable in said ways, and also provided with a diamond-shaped opening near its center to register with the similar opening in the plate 26. Pivoted between ears on the rear end of the slide is a block 29, having a screw-threaded opening to receive a small screw-shaft 30, provided with a hand-wheel 31 at one end, and on the casing is an open or U-shaped support 32 to engage a groove in the hub of said wheel. By turning the hand-wheel while at rest in the support 32 the slide may be very accurately adjusted, and by lifting the hand-wheel out of engagement with the support the slide may be quickly moved to shut off the feed without turning the hand-wheel, and thus losing the adjustment.

Supported within the casing directly below the feed-opening is the feed-hopper 33, which is of such a size that the grain is directed to the contacting faces of the disks between the adjacent sides of their hubs, and the lower end of the hopper is cut away at each corner to conform to the curvature of the periphery of the disks and the incline of their faces. The sides of the hopper are formed by plates 34, secured to the end portions 35 by screws passing through slots in the plates, so that when the disks are adjusted toward or from each other these plates may be adjusted, and the hopper is supported by brackets secured to the frame and to which the end portions 35 are secured by bolts passing through vertical slots in said brackets, so that the hopper may be adjusted vertically. Rods 36 extend across the hopper near its upper end to spread and scatter the grain, said rods being arranged so that they together form in outline a triangular spreader having its apex toward the upper end of the hopper.

To remove any material which may adhere to the disks, scrapers 37 are provided, each consisting of a metal strip held against the face of the disk at its outer side by a spring-supporting arm 38, adjustably secured to a support 39, which is secured to the frame by bolts passing through slots in said support.

When the machine is constructed for crushing stone or for similar purposes, it is desirable to provide the disks with teeth or projections, as shown in Fig. 8. These teeth consist of screw-bolts 40, having heads 41, formed with conical lower sides to fit countersinks in the face of the disk and squared faces to project from the face of the disk and form the teeth. These bolts are set in spiral rows in the disk and may be secured in place by screw-threading the openings, as shown, or nuts may be provided on the bolts to engage the inner side of the disk.

Having thus fully described my invention, what I claim is—

1. In a grinding or crushing mill, the combination with a supporting-frame, parallel shafts, means for revolving said shafts, and grinding or crushing disks secured on said shafts; of means for holding one of said shafts against longitudinal movement, a screw-threaded shaft to oppose the longitudinal movement of the other shaft, and a member formed of wood or similar material having an internal screw-thread to engage the thread on said shaft and adapted to be turned to adjust the shaft and to break to permit the shaft to move longitudinally.

2. In a grinding or crushing mill, the combination with a supporting-frame, of parallel shafts, grinding or crushing disks secured on said shafts, means for holding one of said shafts against longitudinal movement, a movable bearing within which the other shaft is mounted to move therewith, means for revolving said shafts, a screw-threaded shaft secured at one end to the movable bearing, lugs on the frame having openings through which the screw-shaft extends, a bevel-gear having a wooden hub internally screw-threaded to engage the screw-shaft and lo-

cated between said lugs, and means engaging said gear to turn the same to adjust the movable bearing with its shaft and disk.

3. In a grinding or crushing mill, the combination with the supporting-frame, parallel shafts supported in bearings on the frame, a conical disk secured on each shaft, and means for revolving said shafts; of means for adjusting said disks toward and from each other, brackets secured to the frame, and a hopper of a width less than the distance between the shafts to direct the material to the point of contact between the disks and consisting of ends adjustably secured to the brackets and side plates adjustably secured to the ends, whereby the hopper may be raised or lowered and its side plates adjusted toward or from the faces of the disks when the same are adjusted.

4. In a grinding or crushing mill, the combination with the supporting-frame, of parallel shafts supported in bearings on the frame one of said shafts being held against longitudinal movement, means for opposing the longitudinal movement of the other shaft, disks on said shafts having opposing conoidal contact-faces, brackets on the frame, and a hopper supported by the brackets between the disks and consisting of ends adjustably secured to said brackets and each cut away at one lower corner to conform to the curve of the periphery of the adjacent disk, plates provided with horizontal slots and each cut away at one of its lower corners to conform to the slant of the contact-face of its adjacent disk, and bolts passing through the slots in the plates to adjustably secure the same to the ends.

5. In a grinding or crushing mill, the combination with the grinding or crushing disks and a hopper to feed the material to said disks having a feed-opening, of a slide to close said opening, a screw-shaft pivotally attached to one end of said slide, a hand-wheel on said shaft and an open support to receive the shaft and engage the hub of the hand-wheel, whereby when the shaft is supported by the support and the hand-wheel turned the slide will be moved and when the shaft is raised from the support, the slide may be moved independently of the hand-wheel.

6. In a grinding or crushing mill, the combination with the supporting-frame, of parallel shafts supported in bearings on the frame and each shaft formed alike at each end, and a disk secured on each shaft at an equal distance from each end thereof and having a conoidal contact-face at each side, whereby the shafts may be turned end for end to bring the new contact-faces of the disks into operative position.

7. In a grinding or crushing mill, the combination with the supporting-frame, parallel shafts supported in bearings on the frame, and means for driving said shafts; of a hollow grinding or crushing disk secured to each shaft and made in halves, each half formed with a conoidal grinding-face and a concave side and the halves secured together with their concave sides toward each other and their peripheries in contact.

8. In a grinding or crushing mill, the combination with the supporting-frame, shafts mounted in bearings on the frame, and means for rotating said shafts; of a hub portion formed with a circumferential dovetail groove secured on each shaft, and a flange portion having an inclined grinding-face and formed with a dovetail tongue at its inner edge to engage the said groove in the hub and unite the parts to form a conoidal grinder.

9. In a grinding or crushing mill, the combination with the supporting-frame, of parallel shafts supported in bearings on the frame, means for rotating said shafts, truncated conical disks secured on the shafts and having openings provided with countersinks in the face of the disks, and teeth each consisting of a shank portion to engage the openings and a head formed conical at the back to fit the countersinks and having a projecting squared face.

10. In a grinding or crushing mill, the combination with the supporting-frame, a shaft mounted in bearings on said frame and provided with a groove within one of said bearings adapted to be engaged by a rib in the bearing to prevent the longitudinal movement of said shaft, a second shaft mounted in a bearing at one end to move longitudinally thereon and provided with a groove near its opposite end, a plate secured to the frame and having an undercut groove, a bearing-block having a rib to engage said groove and movable thereon, and a rib in the bearing to engage the groove in the shaft, a lug on the bearing-block, a screw-shaft secured at one end to said lug, lugs on the frame having openings through which the screw-shaft freely passes, a bevel-gear on the screw-shaft between the lugs on the frame, a wooden hub for said gear internally screw-threaded to engage the screw-shaft, a shaft extending at right angles to the screw-shaft, a hand-wheel on one end of said shaft and a bevel-pinion on the opposite end thereof in mesh with said bevel-gear, truncated conical disks secured on the shafts mounted in bearings on the frame, gears on said shaft to transmit motion from one to the other, and means for turning said shafts.

11. In a grinding or crushing mill, the combination with the supporting-frame, of parallel shafts mounted in bearings on the frame, means for holding one of said shafts against longitudinal movement, a movable bearing for the other shaft to which it is secured to move therewith, means for adjusting said bearing, truncated conical disks on said

shafts, gears on said shafts to transmit motion from one to the other, brackets on the frame, a hopper adjustably supported by said brackets and having portions of its lower end cut away to conform to the curve of the periphery of the disks and the slant of their faces, a casing inclosing said disks and hopper and having a feed-opening in its top above the hopper, a box on the casing inclosing the opening and having an opening in its top, a plate to close the bottom of the box and formed with ways and a diamond-shaped feed-opening, a slide in said ways having a similar shaped opening, means for adjusting said slide to regulate the feed, supports secured to the casing by bolts passing through slots in the supports and extending inward adjacent to the outer side of each disk, a spring-arm secured to each of said supports and extending upward therefrom, and strips secured to the upper ends of said arms and held against the disks thereby.

In testimony whereof I affix my signature in presence of two witnesses.

GEORGE A. BELL.

Witnesses:

CALEB R. MCCULLOUGH,

OTTO F. BARTHEL.