(No Model.) 2 Sheets—Sheet 1.

J. F. WINCHELL.

CRUSHING AND GRINDING MILL.

No. 365,717. Patented June 28, 1887.

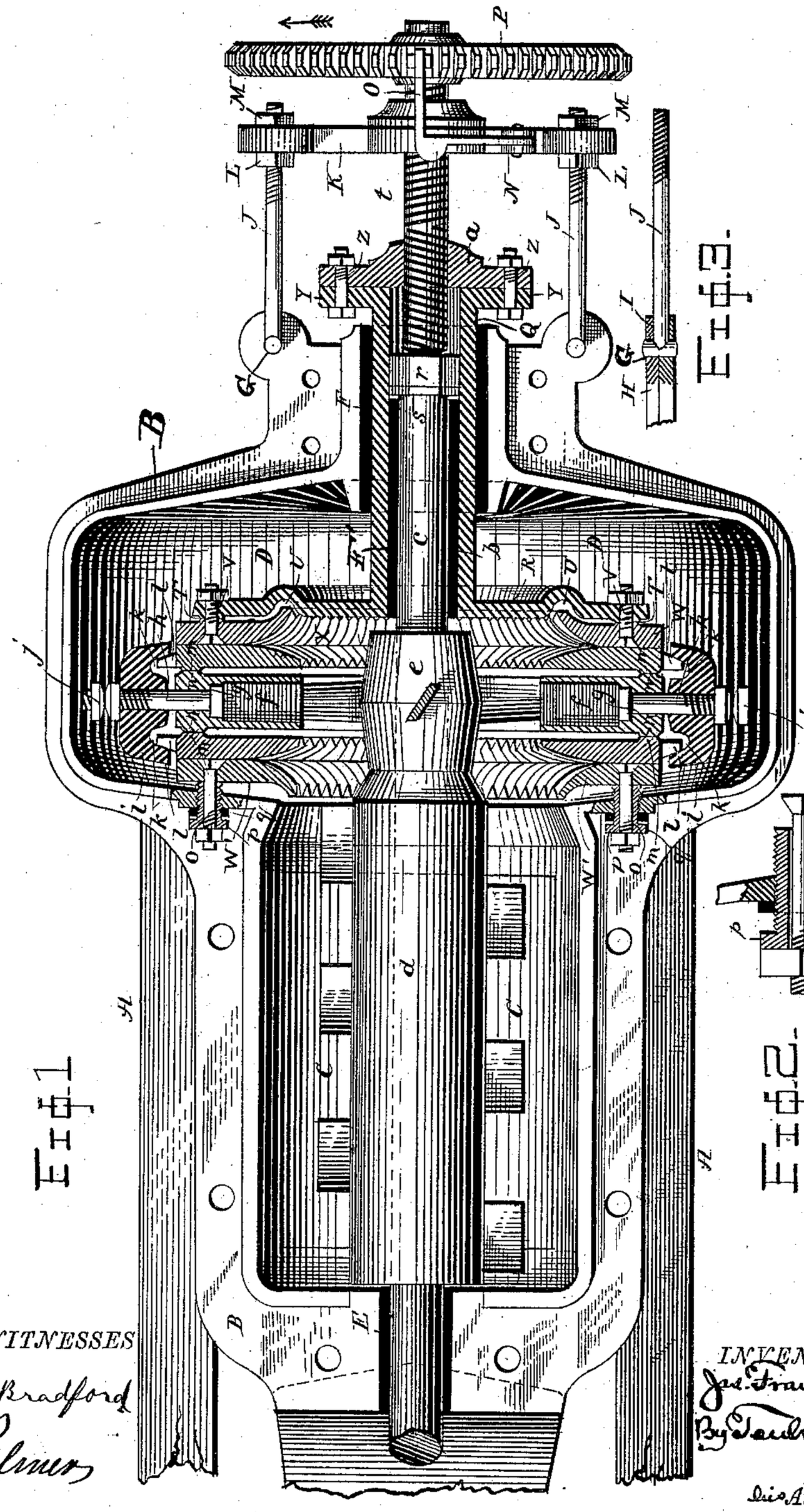

Fig. 3.

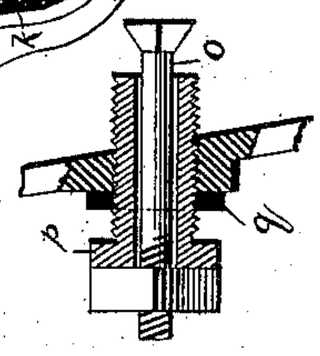

Fig. 2.

Fig. 1.

WITNESSES

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 4.

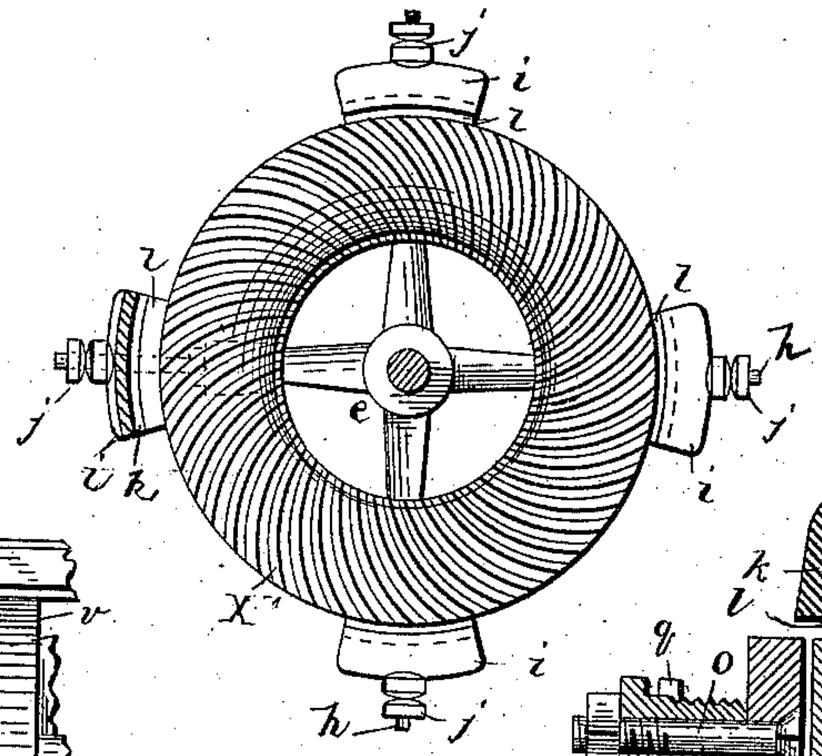


Fig. 7.

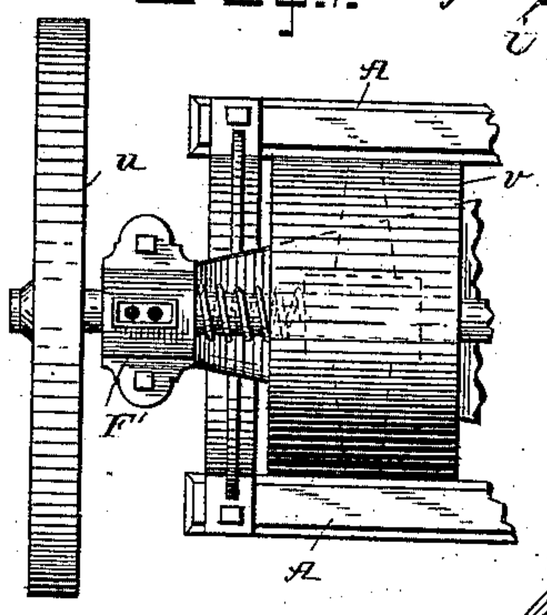


Fig. 8.

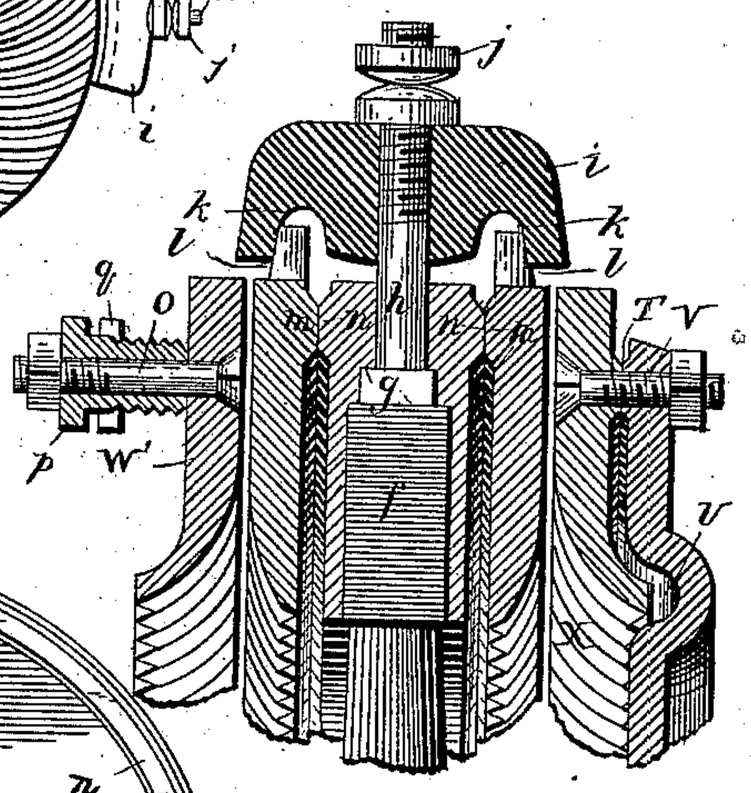


Fig. 5.

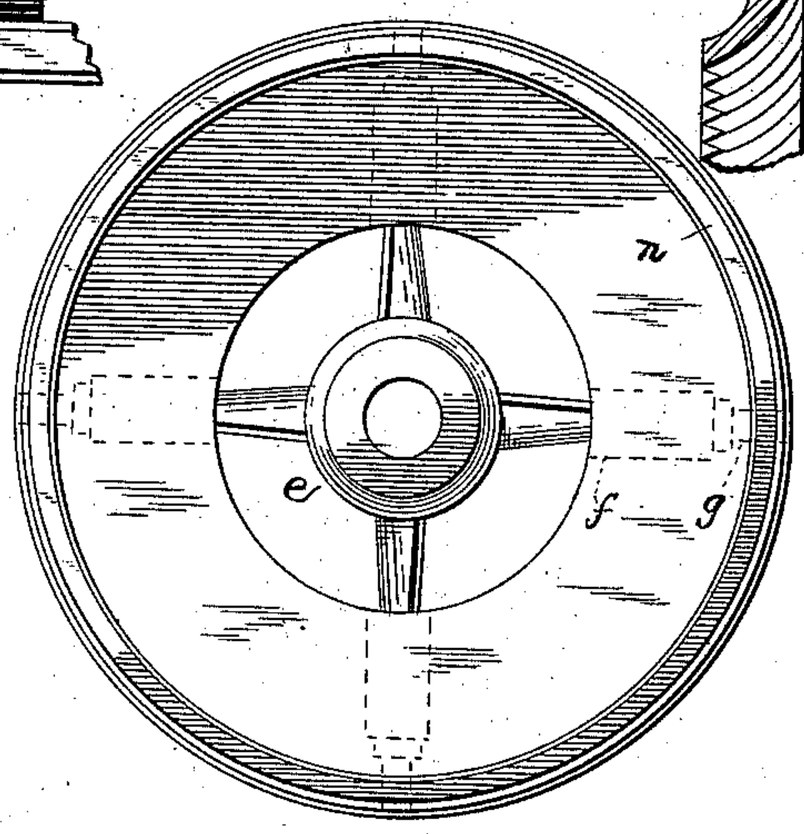
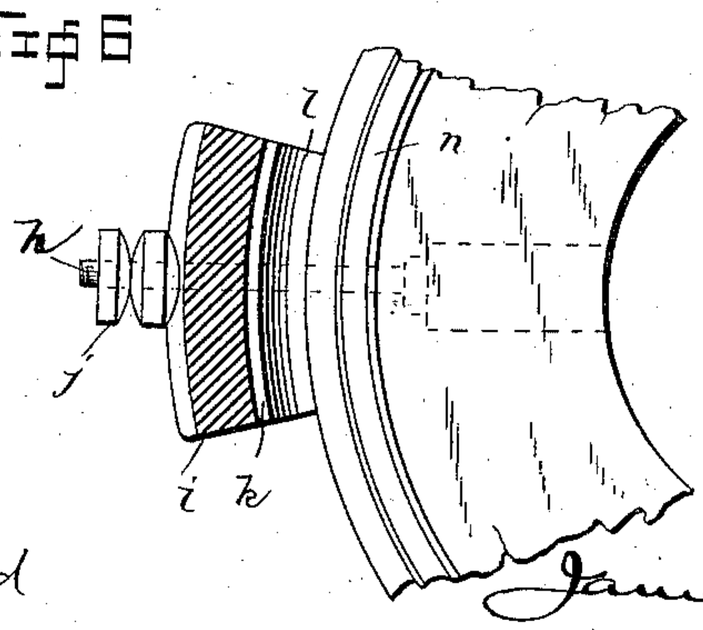


Fig. 6.



WITNESSES

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UNITED STATES PATENT OFFICE.

JAMES F. WINCHELL, OF SPRINGFIELD, OHIO.

CRUSHING AND GRINDING MILL.

SPECIFICATION forming part of Letters Patent No. 365,717, dated June 28, 1887.

Application filed September 18, 1886. Serial No. 213,887. (No model.)

To all whom it may concern:

Be it known that I, JAMES F. WINCHELL, a citizen of the United States, residing at Springfield, in the county of Clark and State of Ohio, have invented certain new and useful Improvements in Crushing and Grinding Mills, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to certain new and useful improvements in crushing and grinding mills; and it consists, first, in means for mounting one of the stationary grinding-plates in such a manner that it may be adjusted to secure alignment with the rotary grinding-plate which co-operates with it and still be held to the casing of the mill, no matter what may be the adjusted position; second, in means for securing the rotary grinding-plates to a grinding-wheel mounted upon the main shaft of the mill; and, third, in means for adjusting first one of the rotary grinding-plates with respect to one of the stationary grinding-plates, and for next adjusting the other stationary grinding-plate with respect to the other rotary grinding-plate, both adjustments being accomplished through a common screw, all as hereinafter more specifically set forth and claimed.

In the accompanying drawings, forming a part of this specification, and on which similar letters of reference indicate the same or corresponding features, Figure 1 represents a plan view of the lower half of the main portion of the mill-casing, and also shows the operating parts mounted therein, partly in section; Fig. 2, an enlarged sectional view of a portion of the casing and the means for adjusting and holding one of the stationary grinding-plates; Fig. 3, a sectional view of another portion of the casing, showing the manner of mounting one of the yoke-supports; Fig. 4, a side elevation of one of the rotary grinding-plates, showing the manner of mounting the same; Fig. 5, a like view of the rotary grinding-wheel with the grinding-plate removed; Fig. 6, a partial view of the grinding-wheel and one of the clamps; Fig. 7, a plan view in continuation of Fig. 1, but on a smaller scale; and Fig. 8, an enlarged sectional view of the grinding-plates, the grinding-wheel, one of the clamps, and the several devices in immediate juxtaposition therewith.

The letter A designates a suitable framework, upon which the casing is mounted, and the letter B the casing, the same being preferably constructed of cast-iron, and consisting of a crushing chamber, C, a grinding-chamber, D, and being otherwise substantially like the casing illustrated and described in Letters Patent No. 342,158, May 18, 1886. This casing is provided with journal-boxes E, F, and F′, in each of which a suitable bushing of Babbitt metal is fitted.

At G the casing is provided with an aperture coincident with the aperture in the upper portion of the casing, (a fragment of which is shown at H in Fig. 3.) These portions of the casing are also channeled at I, to receive one end of the yoke-supports J, which terminate in cross-heads fitting the said apertures. When the two portions of the casing are secured together, these supports are firmly held, and upon them is mounted a yoke, K, and a double set of nuts, L and M, serve to hold the yoke upon the supports wherever adjusted, as also to allow of adjusting the yoke back and forth, as by unscrewing one set of nuts and advancing the other toward them. The purpose of thus adjusting the yoke will be presently explained.

A standard, N, extending from the yoke carries an L-shaped latch or dog, O, which serves to lock the adjusting-wheel P by engaging one or the other of its notches.

The letter Q designates a sleeve fitted to the Babbitt bushing F, and is constructed to move back and forth, but not to rotate, and is formed on its inner end with a disk, R, the face of which is provided with an annular bead, T, as also with an annular recess, U, and with apertures to receive the bolts V. To this disk is secured one of the stationary grinding-plates W by means of the bolts V, the heads of the bolts being countersunk, so as to be flush with the face of the grinding-plate. This plate is in the form of an annulus, the inner periphery of which extends somewhat into the annular recess U in the disk R, while the face X of said annulus is provided with a series of grinding teeth or protuberances. The outer end of said sleeve Q terminates in a flange, Y, having bolt-holes, which receive the bolts Z, by means of which a nut, *a*, is secured to the flange. This nut has a thread in it in a contrary direction

to the thread in the yoke K—say a left-hand thread and the yoke a right-hand thread, both being of the same or about the same pitch. The sleeve further carries a Babbitt or other bushing, *b*, to which is fitted one portion of the mill-shaft *c*, another portion having a bearing in the bushing E. This shaft carries a crusher, *d*, of any approved construction—as, for instance, of the kind illustrated in Letters Patent granted to me, as above mentioned. This crusher also acts as a conveyer to convey the crushed material to the grinding-plates. Upon this shaft is also mounted what I term a "grinding-wheel," *e*. (Shown more clearly in Fig. 5.) The wheel is constructed with a series of, say, four recesses, *f*, in the rim thereof, and with holes *g* running from said recesses outwardly through the rim, the recesses being for the reception of the heads of the bolts *h*. These bolts pass through clamps *i*, and are provided with jam and binding nuts *j*. The inner faces of the clamps are provided with grooves *k*, the outer walls of which are inclined, as seen in Fig. 1, while the rotary grinding-plates are constructed with segmental lugs *l*, the outer faces of which incline to agree with the outer walls of the grooves *k*, and are fitted to said grooves. These plates are of annular form, and are provided with annular rims or surfaces *m*, which agree with like surfaces *n*, formed on either side of the rim of the wheel *e*.

The rotary grinding-plates are placed with these surfaces against those on the rim, and by operating the nuts on the bolts *h* the clamps *i* are drawn centrally and impinge tightly against the lugs *l* on the rotary grinding-plates. These plates are provided with a series of grinding teeth or protuberances upon their surfaces opposite the respective stationary grinding-plates.

It will be observed that by the means just described the rotary grinding-plates are firmly yet detachably secured to the grinding-wheel. The stationary plate W′ is constructed like the plate W, but is differently secured. Bolts *o*—one preferably at either side, in about the same horizontal plane as the axis of the main shaft, and one beneath said shaft and near the bottom of the plate (not shown)—are fitted to screw-threaded bushings *p*, which in turn are fitted to threaded apertures in the casing B, and are provided with jam-nuts *q*. The inner ends of the bushings form shoulders, against which the plate W′ is held by the bolts *o*, and by turning the bushings the plate is adjusted back and forth to the proper position to secure alignment with the adjacent rotary grinding-plate, the jam-nut *q* serving to hold the bushing to any adjusted position.

The letter *r* designates a washer, and *s* an anti-friction wearing-plate interposed between the mill-shaft *c* and the adjusting-screw *t*. This screw is provided with right and left hand threads to fit, respectively, the threads in the yoke K and in the nut Z.

I will now refer to the uses of the yoke K, the screw *t*, the wheel P, and the nut *a* in respect to adjusting the grinding-surfaces with proper relation to each other. In the first place, the shaft *c*, with the grinding-wheel and the rotary grinding-plates, is placed in its bearings, as also the sleeve Q, the disk R, the stationary grinding-plates W and W′, and secured in place. The first adjustment to be effected is that between the non-rotating grinding-plate W and the rotary grinding-plate adjacent to it. This is done by operating the adjusting-wheel P and rotating the screw *t*, to allow the shaft *c* to move in the direction of the adjusting-wheel under the influence of the spring or of gravity, as will presently appear, it being understood that the first relative position between the non-rotating grinding-plate W and the adjacent rotary grinding-plate is with a space between them. When the main shaft shall have moved in the direction just indicated far enough to bring the rotary grinding-plate the proper distance from the non-rotating grinding-plate W, the wheel P is stopped and the dog O dropped into one of its notches.

The remaining adjustment to be effected is that between the other rotary grinding-plate and the non-rotating grinding-plate W′. This is done by turning the nuts L away from the yoke K, and then turning the nuts M against that yoke and forcing the screw *t*, the main shaft, the grinding-wheel, the plates attached to it, the non-rotating-plate W, the disk R, the sleeve Q, and the nut *a* toward the stationary plate W′. This action of the yoke is continued until the proper relative position between the non-rotating grinding-plate W′ and the adjacent rotary grinding-plate is obtained, when the nuts L are screwed against the yoke to hold it. It should be noted that this latter adjustment does not disturb the adjustment previously made between the plate W and the adjacent rotary grinding-plate. The adjustment between the non-rotating grinding-plate W′ and its rotary grinding-plate, as just described, is only made when the machine is set up. The subsequent adjustment between each non-rotating grinding-plate and its adjacent rotary grinding-plate is effected in the following manner:

Let it be supposed that a space of one-sixteenth of an inch exists between the respective non-rotating grinding-plates and the rotary grinding-plates, and that it is desired to grind the material more finely. The adjusting-wheel P is rotated in the direction of the arrow and the screw *t* turned in the yoke K, which moves the shaft *c* away from the yoke, and also carries with it the sleeve Q, by reason of the bodily advance of the screw *t*. When the space between the non-rotating grinding-plate W′ and its adjacent rotary grinding-plate has been taken up, the space between the non-rotating grinding-plate W and its adjacent rotary grinding-plate will also have been taken up, notwithstanding that these latter two plates both move in the same direction under the in-

fluence of the screw *t*, operating from the yoke K. When, however, this has taken place, the action of the screw *t* in the nut *a*, by reason of the left-handed threads, moves the sleeve and its disk and the non-rotating grinding-plate W an additional one-sixteenth of an inch independent of the movement of the shaft *c*, thereby closing this space between the non rotating grinding-plate W and its adjacent plate, although both move one-sixteenth of an inch during the closing of the space between the non-rotating grinding-plate W′ and its rotary plate.

As seen in Fig. 7, the main shaft is provided with a fly-wheel, *u*, and a driving-pulley, *v*. A spiral spring is interposed between the hub of the driving-pulley and the journal-box, for the purpose of forcing the operating-shaft normally in the direction of the non-rotating grinding-plate W.

It will be noticed from Figs. 1, 4, and 5 that the position of the sides of the spokes *e′* of the wheel *e* is oblique to the axis of the main shaft. The object of this arrangement is to cause the spokes to act as conveyers, to assist in drawing the material to be ground from the grinding-plates adjacent to the crushing-chamber to those at the opposite side of the wheel. The space between the spokes, the rim, and the hub allows the passage of the material; but to be thoroughly effective there should be something to act upon the material. This action is accomplished by the spokes.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a grinding-mill, the combination, with the non-rotating grinding-plates and rotating grinding-plates, of a screw having right and left handed threads, a nut connected with one of the non-rotating plates, and with which one of said threads engages, a support having a thread with which the other thread on the screw engages, and means for actuating said screw.

2. In a mill, the combination, with the non rotating grinding-plates and the rotating grinding-plates, a shaft upon which the latter plates are mounted, and means, substantially as described, for urging said shaft in the direction of one of said non-rotating grinding-plates, of a screw having a right and left hand thread, a nut connected with the non-rotating plate toward which the shaft tends, and with which one of the said threads engages, a support having a thread with which the other thread on the screw engages, and means to rotate said screw.

3. In a grinding-mill, the combination, with the frame, two non-rotating grinding-plates and two rotating grinding-plates, and a shaft upon which the latter plates are mounted, and means, substantially as set forth, for pressing the said shaft in the direction of one of the non-rotating plates, of a screw having a right and left hand thread, a sleeve having a nut and a disk connected with the non-rotating plate toward which the shaft tends, a yoke supported by the frame, and an adjusting-wheel mounted on said screw, one of the threads of the screw being fitted to the yoke and the other to said nut.

4. In a grinding-mill, the combination of the two non-rotating grinding-plates, the sleeve to which one of said plates is attached, and having a nut, a shaft, means for urging said shaft toward the last-mentioned plate, a wheel mounted rigidly thereon, rotating grinding-plates secured to said wheel, and a right and left hand threaded screw, a notched adjusting-wheel, a yoke supported by the mill-casing, the said screw being mounted in said yoke and said nut, the whole being constructed to permit of the adjustment between one of the rotating grinding-plates and one of the non-rotating grinding-plates by actuating the screw and the adjustment between the other rotating plate and non-rotating plate by operating the yoke.

5. In a grinding-mill, the combination, with the non-rotating plates, shaft-bearings, a shaft, and rotating grinding-plates, of a common adjusting-screw, a threaded bearing for said screw, having a fixed relation to one of the non-rotating plates, and an adjustable threaded bearing, with which said screw engages, whereby upon moving the adjustable bearing the adjustment between one of the non-rotating plates and one of the rotating plates is effected, and upon rotating said screw the adjustment between the other non-rotating plate and the other rotating plate is effected.

6. In a grinding-mill, the combination, with the main shaft, a wheel rigidly mounted thereon, and clamps carried by said wheel, of grinding-plates fitted against said wheel and held thereto by said clamps.

7. In a grinding-mill, the combination, with the main shaft and a wheel rigidly mounted thereon, its rim recessed and bored, and grooved clamps having inclined walls, of grinding-plates fitted against said rim, segmental lugs with tapering sides extending from said plates and fitted into said grooves, and bolts to bind the clamps against the said lugs.

8. In a grinding-mill, the combination, with a frame, shaft-bearings thereon, a longitudinally-movable shaft, rotating grinding-plates mounted thereon, and non-rotating grinding-plates, of a double-threaded screw connected with one of said non-rotating plates and fitted to act against said shaft, threaded bearings for said screw, and means to rotate it, whereby its rotation adjusts all the said plates with proper relation to each other.

9. In a grinding-mill, the combination, with the feed-chamber, the main shaft, a wheel mounted thereon and having the sides of its spokes placed obliquely to its axis, and grinding-plates secured to said wheel, and having feed-openings through them, of non-rotating plates, one of which has an opening through it, the openings in the plates being substantially

opposite the space between the spokes, whereby the material in being fed can pass from one set of grinding-plates to the other set of grinding-plates through the action of the spokes.

10. In a grinding-mill, the combination, with the casing having a chamber from which the material is fed, of the grinders, a shaft mounted in said chamber, a conveyer mounted on the shaft and within said chamber, a wheel mounted on the shaft, and having spokes the sides of which are obliquely disposed to the axis of the wheel, rotating grinding-plates secured to said wheel, and stationary grinding-plates, one of them having a feed-opening opposite the respective rotating plates.

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

JAMES F. WINCHELL.

Witnesses:
M. A. BALLINGER,
EDWIN L. BRADFORD.