2 Sheets—Sheet 1.

J. MILLS.

Middlings-Grinding Mill.

No. 223,856. Patented Jan. 27, 1880.

Fig. 1

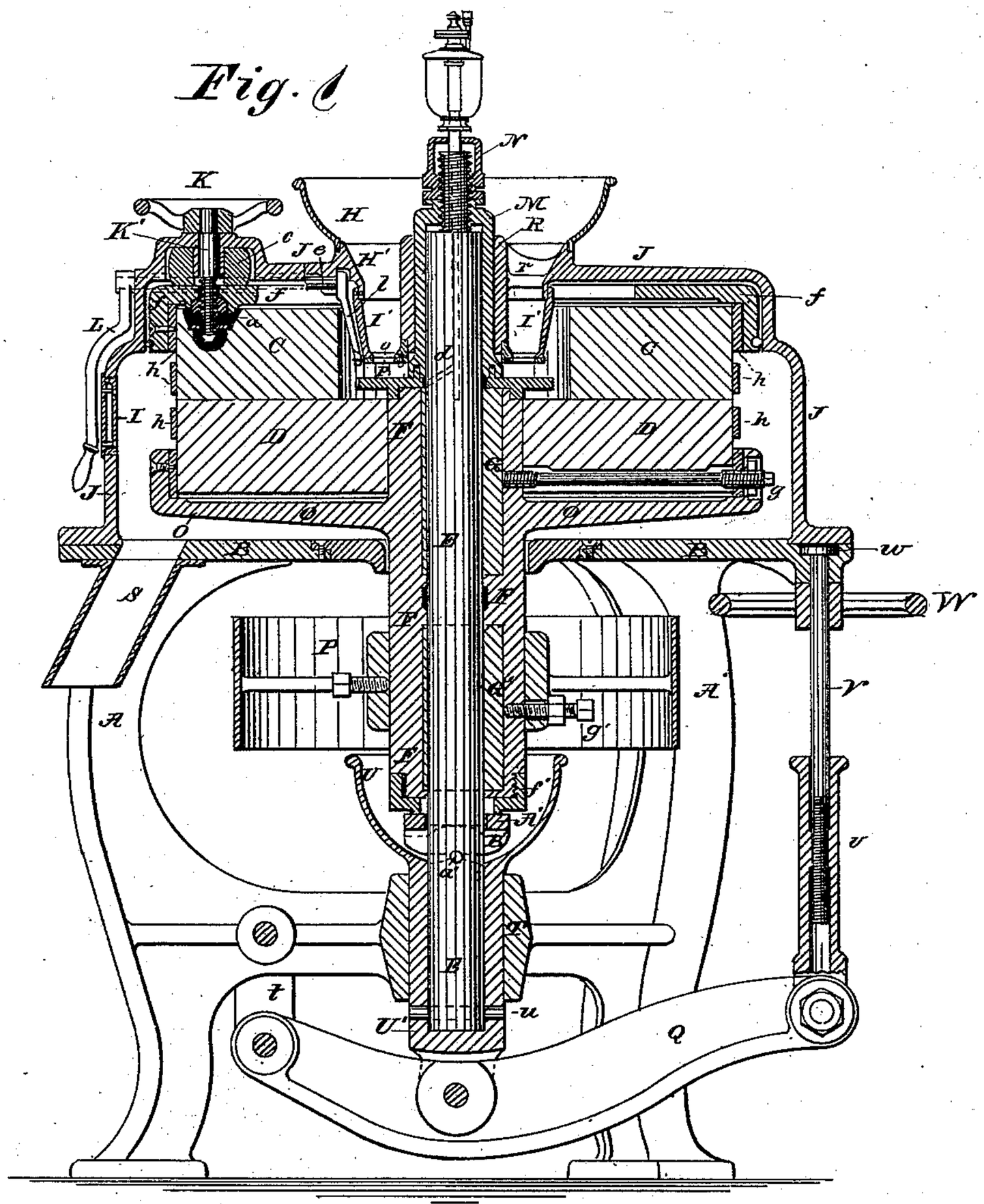


Fig. 3

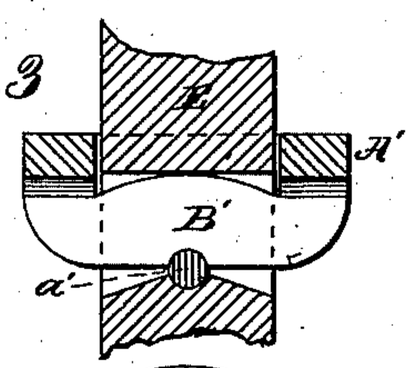


Fig. 4

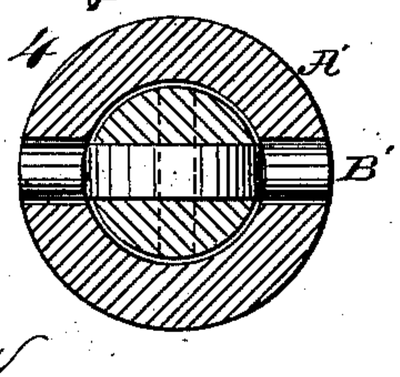
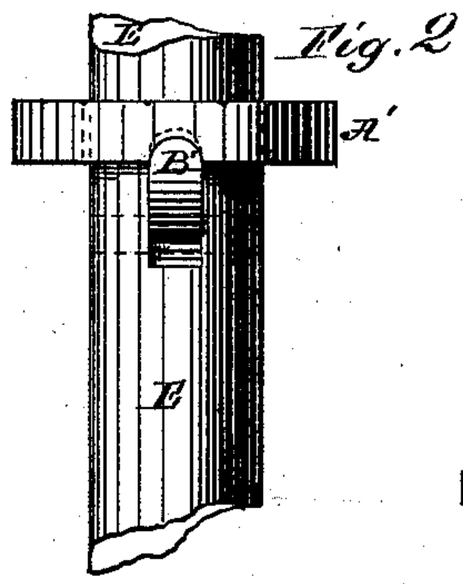


Fig. 2



WITNESSES

Ernst Jebsen.

W. E. Adams

INVENTOR

Jonathan Mills.

Per W. E. Dayton

Attorney

2 Sheets—Sheet 2.

J. MILLS.

Middlings-Grinding Mill.

No. 223,856. Patented Jan. 27, 1880.

Fig. 5

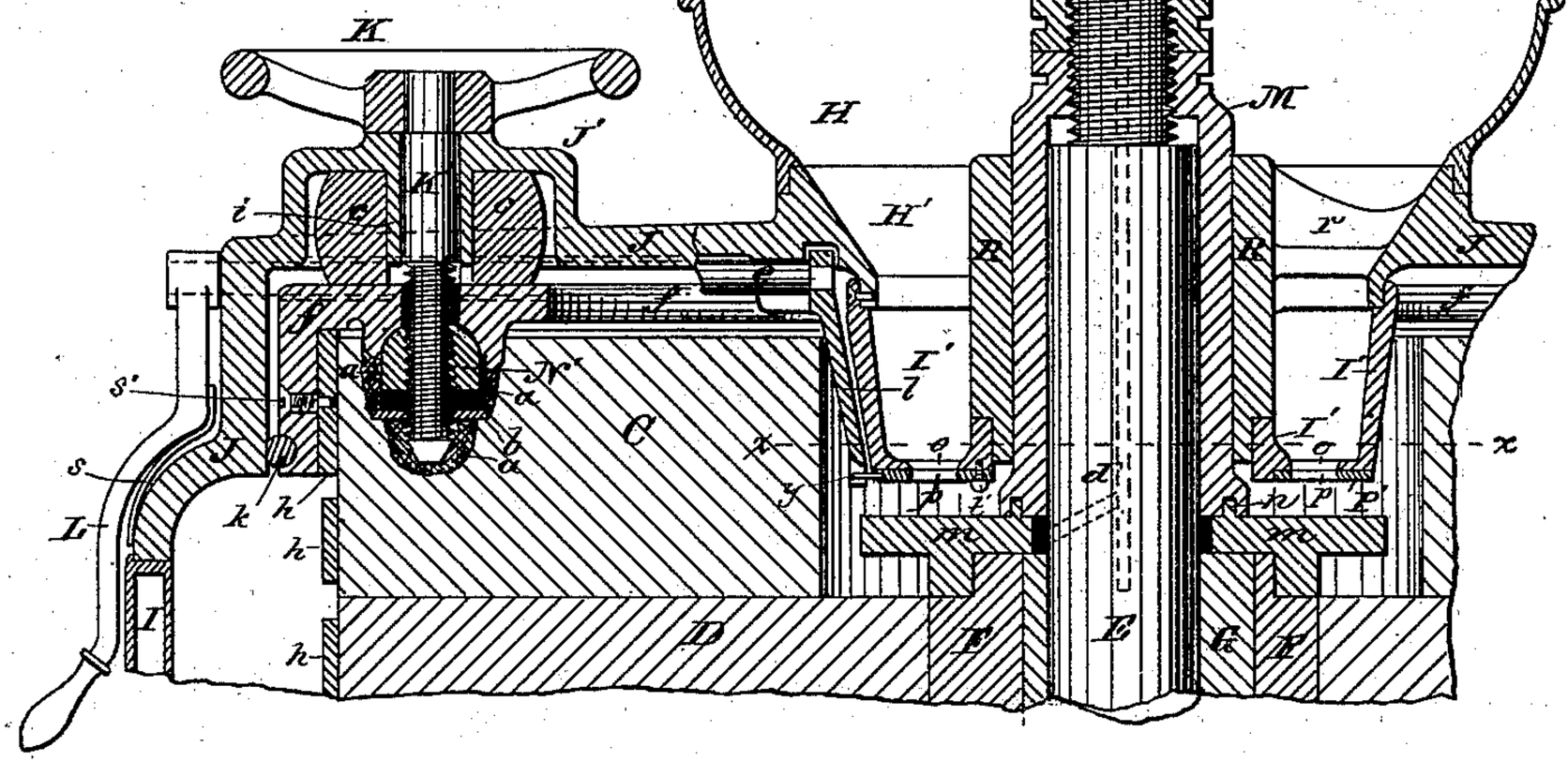


Fig. 7

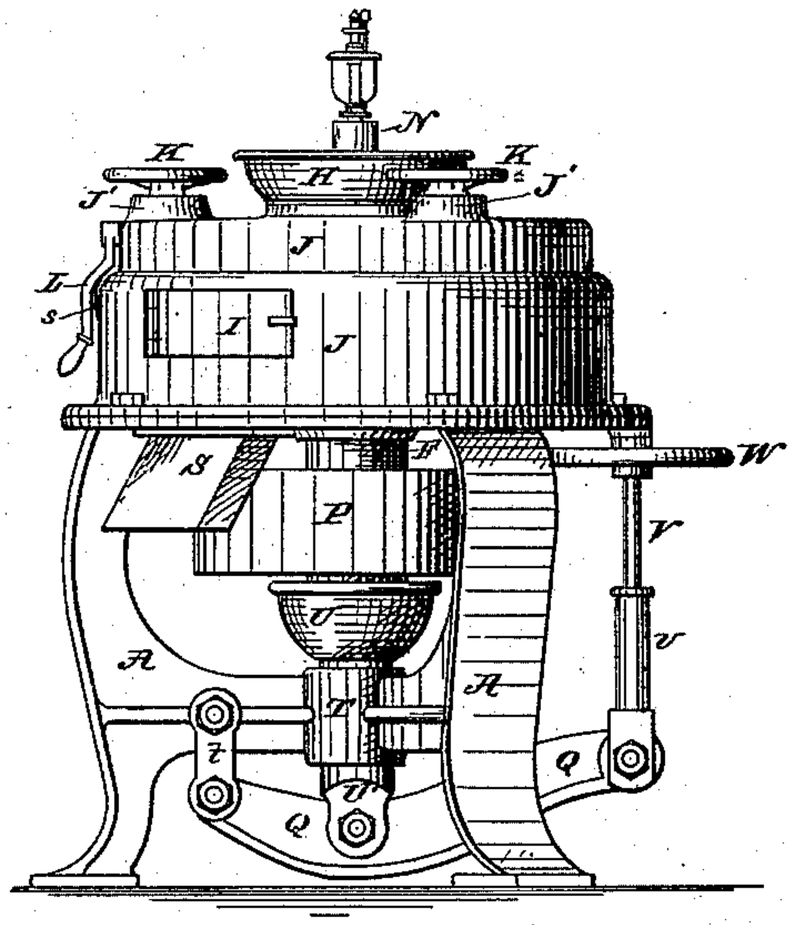
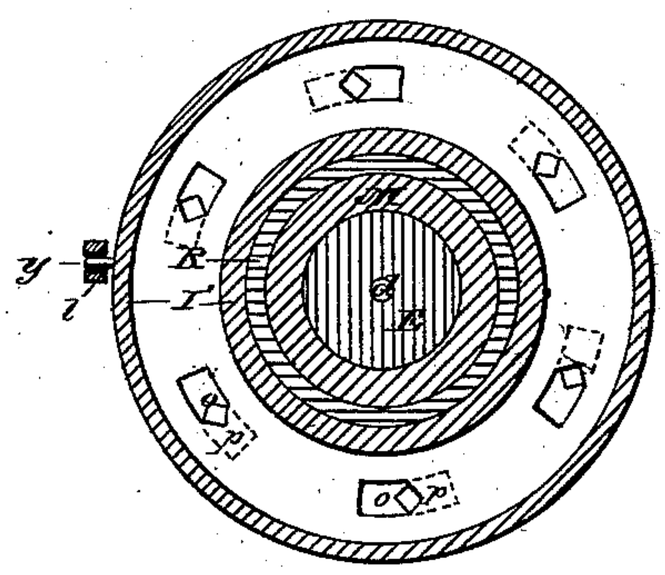


Fig. 6



WITNESSES

Ernst. Jebsen.

H. C. Adams

INVENTOR

Jonathan Mills.

Per W. E. Dayton

Attorney

UNITED STATES PATENT OFFICE.

JONATHAN MILLS, OF MILWAUKEE, WISCONSIN.

MIDDLINGS-GRINDING MILL.

SPECIFICATION forming part of Letters Patent No. 223,856, dated January 27, 1880.

Application filed July 23, 1879.

To all whom it may concern:

Be it known that I, JONATHAN MILLS, of Milwaukee, in the State of Wisconsin, have invented certain new and useful Improvements in Middlings-Mills; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention relates to a mill for the reduction of middlings to flour, said mill being of the class known as "stiff under runners."

The object of the invention is to obtain the utmost steadiness possible in the movement of the under runner, and particularly to avoid the end shake or jumping movement common in the runners of this class of mills.

To this end my invention consists, primarily, in a stationary or non-rotating spindle, supported firmly at both the bottom and the top, and a long sleeve-hub rigidly secured to the runner and rotating upon said spindle between its points of support, together with devices whereby the sleeve-hub of the runner is vertically adjusted on the spindle and others by which the spindle itself is vertically and positively controlled.

It also consists in devices for adjustably suspending the stationary stone, and in other improvements, all of which will be hereinafter fully set forth, and pointed out in the claims.

In the drawings, Figure 1 is a central vertical section of the mill. Figs. 2, 3, and 4 are enlarged detail views, showing the adjustable step on which the runner-hub is supported. Fig. 5 is an enlarged fragmentary vertical section, intended to more clearly illustrate certain parts seen in Fig. 1. Fig. 6 is a horizontal section through the line *x x* of Fig. 5, intended to show the form of the feed-apertures; and Fig. 7 is an elevation of the complete machine.

A represents a cast-iron frame immediately supporting the bed-plate B, which, in turn, supports the cylindric cap-plate J, forming, with its top or horizontal portion, a complete housing for the stones C and D. The upper or stationary stone, C, is suspended from the cap-plate J by means of three equidistant screws, K′, operated by the hand-wheels K.

For the purpose of connecting the screws K′ with the stone C the latter is provided with the strong cast-iron rim *f*, securely fastened to the stone by means of screws *s*′, which pass through the vertical flange of the rim *f* into the upper band, *h*, which is tightly shrunk upon the stone about its upper margin, as shown. In the horizontal flange of the rim *f*, at three equidistant points corresponding with the location of the screws K′, are openings for the free passage of said screws, and on the under face of said flange and around said openings are sockets intended to freely receive the nuts N′ and hold them from turning with the screw. The nuts have a rounded top, and the rim is correspondingly countersunk to receive them. The nut may therefore freely oscillate beneath the flange, so as to maintain proper relation to the screw K′.

Recesses *a a* are cut in the stone at proper points to admit the screws, and the horizontal plates *b* are fitted in said recesses for the purpose of holding the nuts erect and in position for the screws to enter them.

At J′ J′ the cap-plate J is raised to give room beneath it for the rubber cushions *c*, which are interposed between the cap-plate and the rim *f*, and also for the purpose of giving space for more lengthened bearing upon the screw-shaft provided in the sleeve *i*, which closely embraces the plain portion of said screw-shaft, and holds the same rigidly vertical and the stone C firmly in place against any tendency to rotate.

By means of the devices above described the stone C may be accurately trammed, and is adapted to yield to any foreign substance that may be accidentally admitted between the stones. Openings provided with doors I are located at proper intervals in the vertical sides of the cap-plate J to give necessary access to the stones in tramming, or for other purposes.

The lower stone or runner, D, is set firmly in the strong circular cast-iron bed O, which has a vertical marginal flange embracing the stone. Screws or pins pass through this flange into the shrunk hoop of the stone, as already described of the upper stone and its rim *f*. The bed O is provided with a central hub, F, which rises to or slightly above the top of the stone D, and beneath the same forms an

extended sleeve reaching below the bed B, and there receiving the drive-pulley P. This long sleeve-hub has a central bore, through which rises the fixed spindle or non-rotating shaft E, upon which the runner revolves. The spindle E sets deeply in the bridge-pot U, and is firmly secured therein by the pin *u*. The bridge-pot is supported laterally by the bridge-tree T, and vertically by the lighter bar Q and screw V. The upper end of the spindle E is laterally sustained by the arms *r*, which support the hollow head R, between which and the spindle is closely fitted the sleeve M. This sleeve M is contracted at the top and threaded to fit the screws *s* cut on the upper extremity of the spindle. N is a jam-nut, which follows the sleeve-nut described. The sleeve-nut M bears upon the upper end of the hub F of the runner through the interposed horizontal plate *m*, affixed to the hub, and having the flange *n*, which enters a corresponding groove in the foot of the sleeve.

The hub F is provided at its lower extremity with the foot-piece *f'*, which rests upon an adadjustable step, (made the subject of special illustration in Figs. 2, 3, and 4.)

Referring to these figures, B' is a strong flat bar thrust through a slot cut in the spindle, and poised to oscillate therein upon the pin *a'*, which is inserted beneath it transverely to the slot. A' is a step-ring similarly poised on the rounded protruding ends of the bar B'. The ring A' is thus adapted by a double oscilating movement to adjust itself perfectly to the foot-piece *f'*, and for the purpose of such movement is also made to encircle the spindle loosely.

The object of the sleeve-nut M is to co-operate as a clamp with the step A' to confine the runner-hub longitudinally and to prevent all vertical movement thereof upon the spindle E; but in order to perfectly restrain the runner from all jumping or "end shake," it is also necessary to equally control the spindle itself. This is done in a positive manner by means of the head *w* of the lighter screw V, closely embraced between the firmly-joined cap-plate J and bed-plate B, or it may be done by the head *w*, arranged to bear in one direction upon a portion of the fixed frame, and the hub of the hand-wheel W, bearing in the other, as shown in Fig. 1.

All joints and connections uniting the lighter devices to each other and to the frame are made so close as to have no lost motion, and the nut *v* is made long, so as to not be thrown out of line with the screw V.

By these means the runner may be confined to a purely horizontal movement by simply running the clamp-nut M down into contact with the plate *m*, and the space between the runner and fixed stone is positively and permanently determined by operation of the lighter screw through the hand-wheel W.

The hub F should be carefully fitted to the shaft or spindle E. It is preferably babbitted and provided with the gibs G, making the bearing in two sections, as shown in the drawings, Fig. 1. The gibs are set up by the gib-sets *g g'*—one shown as running through a channel cut in the stone D, and the other entering through the pulley-hub. Oil is fed to the bearing of the hub F through the duct *d*, drilled in the axis of the spindle and branched to discharge at the upper point of the bearing. Suitable packing may be inserted in the groove with the flange *n* of the plate *m*, to prevent the escape of oil at this point.

The centrally-located hopper, as a whole, is made up of the flanged opening H' of the cap-plate J, the upper section, H, and the lower section, I', which latter drops into the eye of the stationary stone C, as shown. The latter section has a stationary horizontal bottom piece connecting with the collar or head R, and having any desired number of apertures *o*. Immediately beneath and in contact with the bottom plate described a second plate, P', having a corresponding number of apertures, *p*, is supported, being adapted to slide in this position about the spindle, so as to open and close the feed-opening *o* wholly or partially, and thus to regulate or entirely cut off the feed from the hopper to the mill. The sliding plate may be held movably in position by screws *t'* passing through slots therein into the upper plate, or in any other convenient manner.

The feed-plate P' is reciprocated by means of the lever *l*, affixed to the inner end of the shaft *e*, which shaft is suitably retained in place by bearing-connections with the cap-plate, and is rotated by the outer lever, L. For this purpose the lever *l* is slotted at its end to embrace the pin *y*, which projects from the plate P'. Said plate is held in any desired position—that is, so as to give any required area of feed-opening—by means of the spring *s*, affixed to the lever L, and arranged to bear upon the outer surface of the cap-plate, or by any other desired form of friction or clamping device.

To avoid clogging of the feed-openings when nearly closed, or, in other words, to provide a light and at the same time uniform feed to the mill, the apertures *o* and *p* are made narrow, each at that end which proximates or passes the other in closing, as shown in Fig. 6, so that the variable aperture when small is of comparatively uniform lateral dimensions, instead of being long and narrow, and is therefore favorable to a uniform flow of material from the hopper. The plate *m* extends outward in all directions beneath the feed-openings, and, by centrifugal action, throws off the material fed thereon, distributing the same uniformly to the stones.

Beneath the bed-piece O of the runner are attached the ordinary sweeps which throw the ground material to the curb and facilitate its discharge through the spout S.

A rubber packing, *k*, may be advantageously inserted between the rim *f* and the

upper contracted portion of the cap-plate, and the same may be conveniently retained by means of a groove cut for its reception in said rim, as shown.

Having thus described my invention, I claim—

1. In a grinding-mill, the combination of an under-runner having a hollow hub and a fixed or non-rotating spindle passing through said hub and rigidly supported both above and below the hub to form a bearing for said hub, substantially as and for the purposes set forth.

2. The combination, in a grinding-mill, of the hollow runner-hub F, the non-rotating spindle E, supported both above and below the hub, and mechanism applied to said spindle to restrain the hub from vertical movement thereon, substantially as described.

3. The combination, with the runner-hub F and the non-rotating spindle E, laterally supported both above and below the hub, of mechanism operating to prevent longitudinal movement of the hub on the spindle, and mechanism by which the spindle itself may be positively controlled vertically, substantially as described.

4. The combination, with the runner-hub F and supported spindle E, of the step A′ and clamp-nut M, secured to the spindle, substantially as described, and for the purposes set forth.

5. In combination with the hub F and non-rotating spindle E, the annular step A′, adapted to oscillate upon its supports, so as to adjust itself to the hub-foot, substantially as described.

6. In combination with the rotating hub F and grooved clamp-nut M, the plate *m*, secured to the hub and having the flange *n* entering the groove of the clamp-nut, substantially as set forth.

7. In an under-runner mill, the combination, with the rigidly-fixed cap-plate J and the stationary stone C, of the screws K, cushions *c*, interposed between the cap-plate and stone, and oscillating nuts N′, secured to the stone, whereby the stone C is adjustably suspended from the cap-plate and adapted to recede from the runner by compression of the cushions, substantially as described.

In testimony that I claim the foregoing as my invention I affix my signature in presence of two witnesses.

JONATHAN MILLS.

Witnesses:
M. E. DAYTON,
JESSE COX, Jr.