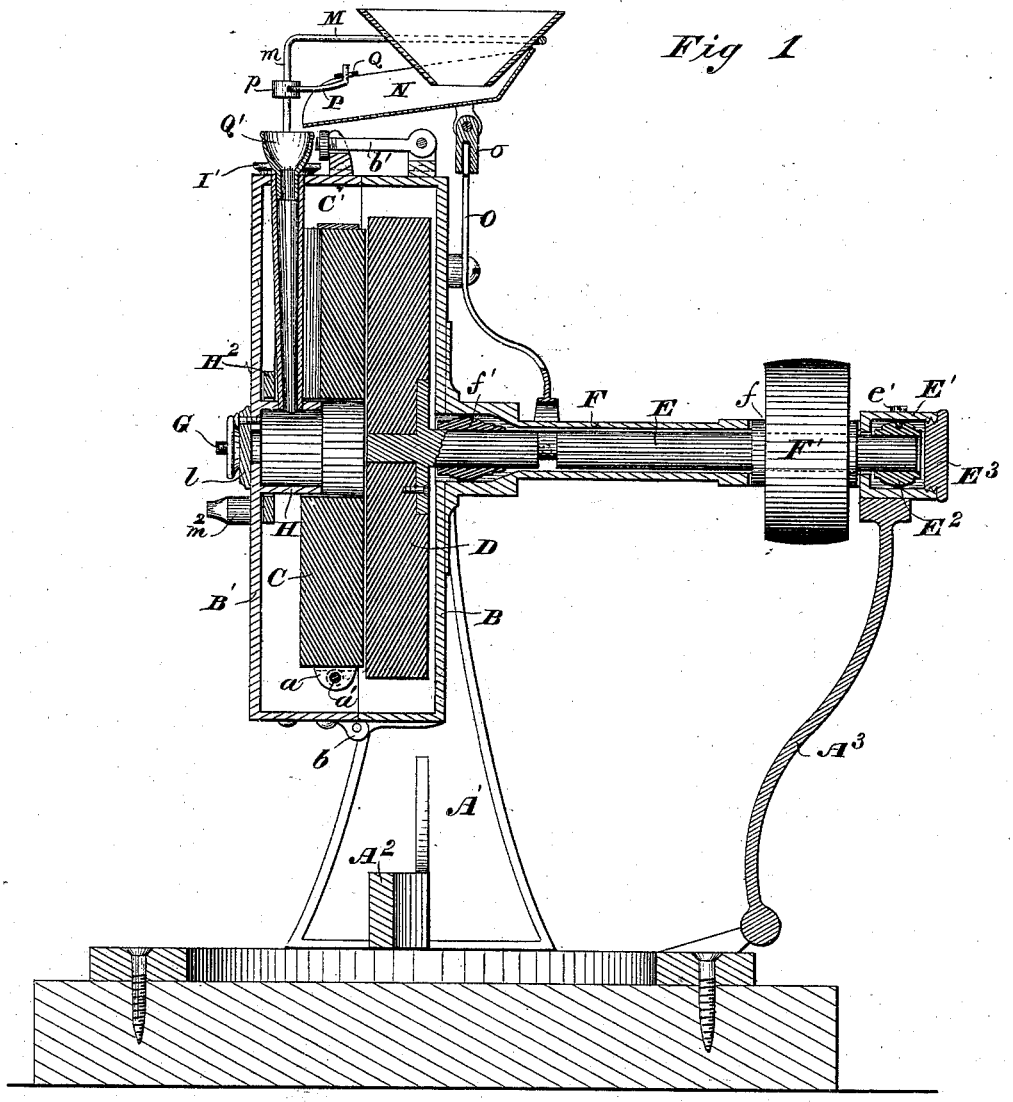
3 Sheets—Sheet 1.

A. H. WAGNER.
Grinding-Mill.

No. 205,322. **Patented June 25, 1878.**

Fig 1



WITNESSES

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3 Sheets—Sheet 2.

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Fig 2

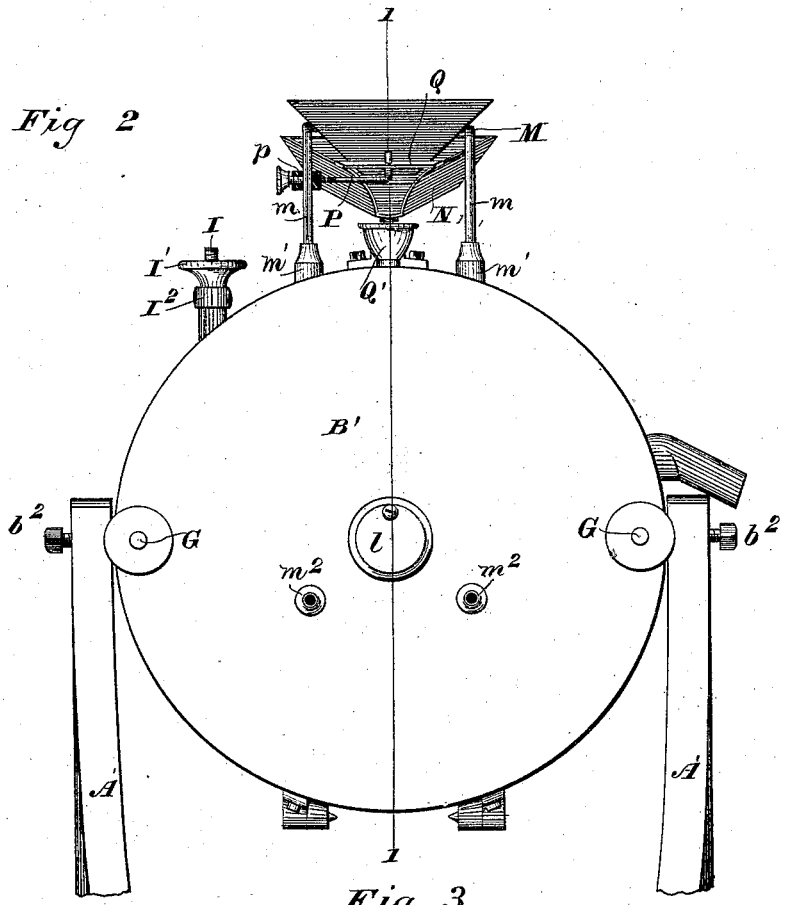

Fig 3.

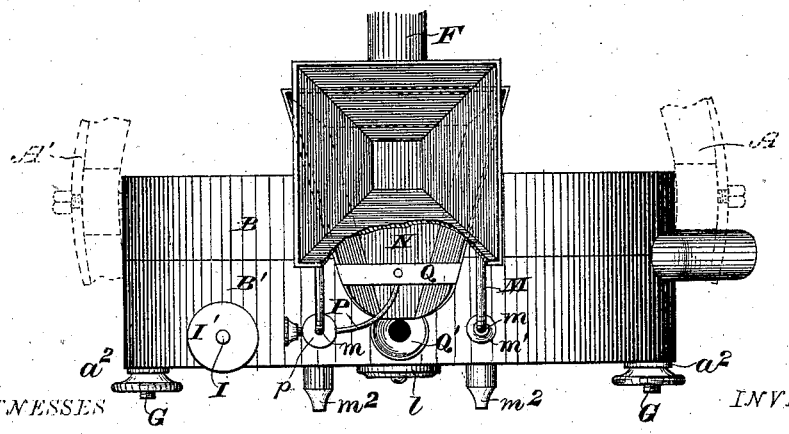

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Fig 4

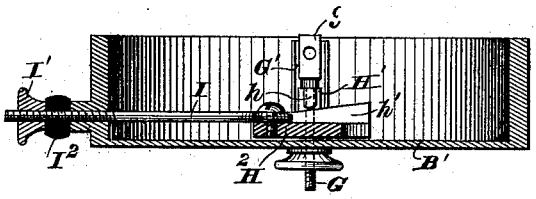


Fig 5

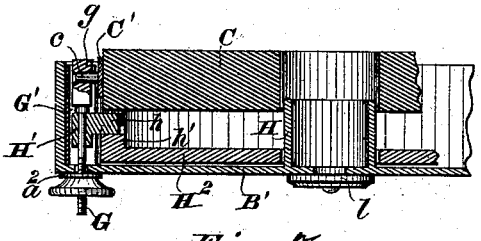


Fig 6

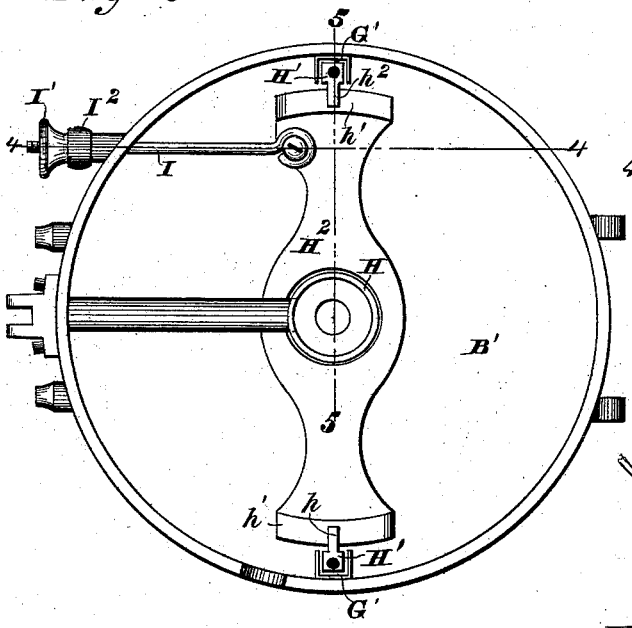


Fig 7

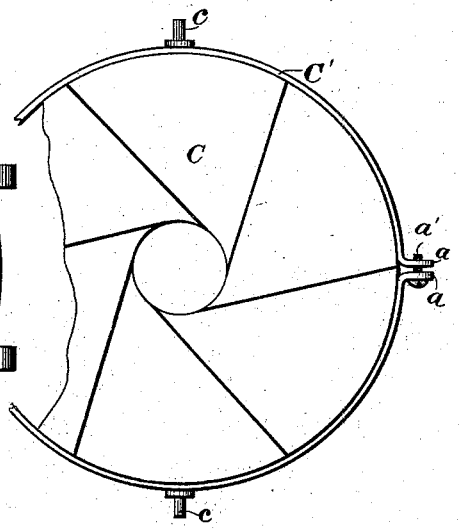
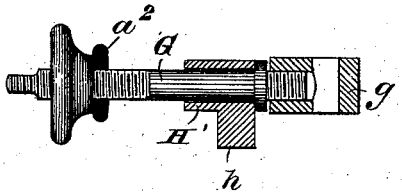


Fig 8



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UNITED STATES PATENT OFFICE.

AUSBERT H. WAGNER, OF CHICAGO, ILLINOIS, ASSIGNOR TO ANNA G. WAGNER, OF SAME PLACE.

IMPROVEMENT IN GRINDING-MILLS.

Specification forming part of Letters Patent No. **205,322**, dated June 25, 1878; application filed May 8, 1878.

To all whom it may concern:

Be it known that I, AUSBERT H. WAGNER, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Grinding-Mills, of which the following is a specification:

My invention chiefly relates to improvements in mills of that class which are capable of being run either as vertical or horizontal mills, and readily convertible from the one into the other, and resembles, in general respects, the invention shown and described in Letters Patent of the United States granted, upon my application, to my assignee, December 11, 1877, No. 197,985.

My objects mainly are to improve and to perfect as to details said patented mill.

The subject-matter claimed hereinafter specifically will be designated.

In the accompanying drawings, Figure 1 is a vertical central section on the line 1 1 of Fig. 2 of my improved mill; Fig. 2, an end elevation thereof, with the frame partly broken away; Fig. 3, a plan or top view of a portion of the mill, showing the sectional casing, feed-supplying devices, &c. Fig. 4 is a section on the line 4 4 of Fig. 6, showing the lower or outer section of the casing and the bed-stone or stationary-stone adjusting devices; Fig. 5, a section on the line 5 5 of Fig. 6, with the outer stationary or bed stone in place and partly broken away; Fig. 6, an inside view, representing a plan or elevation, according to the position to which the parts may be adjusted, of the casing-section in which the stationary, outer, or bed stone is mounted, the stone being removed to show the adjusting devices; Fig. 7, a face view of said stone, partly broken away, with its journaled clamping ring or band; and Fig. 8 is a longitudinal central section through one of the adjusting-bolts and its attachments, on an enlarged scale.

I have shown all my present improvements as applied to a mill such, in most respects, as heretofore patented to my assignee, as before mentioned; but some of the improvements are applicable to other convertible mills, or those of the general class to which my invention more particularly belongs, while others may be applied to non-convertible mills, or those in which no provision is made for changing from a horizontal to a vertical driving-spindle, or vice versa.

A supporting or main frame is provided with two uprights, A^1 A^1, a cross-piece, A^2, and a hinged arm or prop, A^3. The casing is divided into two sections, B B′, hinged together at *b*. One section is provided with a swinging locking-bolt and thumb-nut, b^1, adapted to secure the sections together when closed. The sectional casing is suspended in bearings in the uprights A^1 A^1 by trunnions or journals b^2, projecting from the part B of the casing. The stationary, outer, or bed stone C is supported in the casing-section B′ by adjusting mechanism, and the runner or revolving stone D is supported in the casing-section B by a driving shaft or spindle, E, on the end of which it is firmly secured.

All the parts, as far as described above, are, both in construction and mode of operation, the same as, or substantially similar to, the corresponding parts of the mill shown and described in Letters Patent No. 197,985, before referred to.

Instead of mounting the spindle E snugly in the pipe-box or long bearing-sleeve F, so as to support it in and for the whole length of such bearing, I form the sleeve F of an internal diameter sufficiently large to be loose upon and clear of the spindle E, and do not depend upon it to sustain the spindle, thus avoiding the difficulty of getting a true bearing of the length of the sleeve. As in my previous invention, patented as above stated, the spindle-inclosing sleeve F is provided with a widened or flattened recessed portion, *f*, near its outer end, and a driving-pulley, F′, is fastened to the spindle and rotates in this opening in the inclosing-sleeve, the opposite end of the sleeve being secured to the stone-casing and enlarged to receive a bushing, *f*′, in which the spindle revolves, as it was suggested it might in said patent.

Instead of mounting the outer end of the spindle directly in the end of the sleeve, as before, I enlarge the sleeve to provide a box or housing, E^1, in which is fitted an adjustable and removable bushing, E^2, around the spin-

dle end. The spindle thus finds its bearing in the bushing, which is suitably secured, as by a set-screw, in the sleeve-housing, so that it may be adjusted as required and removed when too much worn for use. A screw-cap, E^3, or other suitable fastening, is secured to the end of the housing, and protects the bearing and guards against endwise movement of the parts. The bushing-retaining set-screw e^1 should be fitted loosely in any one of a series of holes in the bushing, so as to leave it free to rock slightly both longitudinally and transversely, so as to be self centering or adjusting to suit any slight horizontal or vertical movement of the spindle. The outer or housing end of the sleeve is supported by the prop A^3, as in my former invention, when the mill is used as a horizontal mill, and by the cross-piece A^2 when running as a vertical mill.

By the above construction it will be seen that no particular care is required in providing the sleeve or its enlarged ends or housings for the bushings f' and E^2, the only nice work required being the fittings of the bushings and spindle ends.

The stationary, outer, or bed stone adjusting devices resemble in some respects the mechanism heretofore employed by me in my former invention—that is, the stone is hung upon pivots and adjusting-bolts, and a movable plate with cams or inclines is used; but my present improvements differ in essential respects from those previously employed.

A clamping ring or band, C′, surrounds the stone C, and is provided with end flanges or lugs *a a* and a screw, a^1, by which the band may be adjusted upon the periphery of the stone and firmly clamped, so as to balance it, whether horizontal or vertical, upon its pivots or trunnions *c c*, formed with or secured to the band. The stone fits at its eye somewhat loosely around the hub H of the casing. The pivots *c* fit so as to be free to rock in bearings in the heads *g* of adjustable screw-bolts G.

The heads *g* are screwed to the bolts, and are adjustable on them. These bolts pass through the casing-section B′, and are provided with rubber washers or spring-cushions a^2 and adjusting-nuts, as in my former invention. The heads *g* of the bolts fit and are adjustable by moving the bolts endwise in guideways or sockets G′ G′ on the inside wall of the casing.

Beneath the bolt-heads are adjustable blocks H^1 H^1, one for each bolt, through holes in which blocks the bolt-shanks freely pass. These blocks have laterally-projecting lugs or shoulders *h h*, which bear upon the oppositely-inclined cams or sloping ribs *h′ h′* at the ends of a cross-plate, H^2, moving around the eye-hub H.

The outer ends of the screw rods or bolts G are shouldered, or made with flat or square sides, to adapt them to be turned by a wrench to screw the rods inwardly or outwardly in the detachable screw-tapped blocks or heads *g*. Collars or shoulders, one for each of the rods G, and between their heads and the adjustable shouldered blocks H^1 H^1, bear upon these blocks, and confine them against upward movement or from approaching the heads *g*.

An endwise-moving rod, I, jointed at its inner end to the adjusting-plate H^2 near one end thereof, serves to rock or turn it about its axis to adjust it relatively to the bearing-blocks H^1 H^1, and enable the stone C to be adjusted toward or away from the running-stone. This rod is threaded at its outer end, passes through the casing-wall or periphery, as in my previous invention, and is provided with an adjusting-nut, screw-crank, or hand-wheel, I^1, and, in addition, a spring-washer or rubber-block cushion, I^2. This washer fits around the rod and between the adjusting-wheel and a stud on the casing. Its action is such as always to exert strain on the cam-plate and create a tendency to move the stone C away from the back of the casing or toward the runner, this tendency to move being counteracted under ordinary circumstances by the rubber washers of the screw-bolts G G, and regulated as desired by adjusting those bolts and the rod I.

By manipulating the bolts G and the adjusting-rod I, it will be seen that the stone C can be adjusted relatively to the stone D with the greatest nicety, and secured with the faces of the stones parallel, and at any desired distance apart to suit the mill to the work to be done, and so that the force exerted by the springs or rubber washers a^2 will be sufficient to overcome or counterbalance the force exerted by the rubber spring I^2, and thus keep the stones in proper position unless some hard foreign substance should get between them.

Should a bit of metal, a hard pebble, nail, &c., get between the stones, the additional strain on the inclines *h′ h′* by the shoulders of the bearing-blocks H^1 H^1 will cause the spring-cushion I^2 to yield, the rod I to move inward, and the cam-plate to turn, so as to admit of the separation of the stones far enough to discharge the clogging substance and prevent injury to their faces. This discharge of clogging matter is facilitated by the rocking of the stone C upon its pivots.

The under or bearing surfaces of the shoulders *h* of the bearing-blocks are rounded to reduce friction, which is also lessened as much as possible by the employment of suitable metal or alloys for the cams and bearing-blocks.

The cams are kept well lubricated, and preferably have an inclination of about thirty degrees. It would take considerable and unusual pressure upon the inclines or cams, especially when the inclination is so slight as represented by the drawings, to move the cams by the thrust action of the bearing-shoulders; but when any clogging substance sufficiently hard to seriously injure the stones and resist their grinding action gets between their faces, the sudden shock gives a tendency to the bed-stone to jump or violently start away from the runner, and the force thus exerted upon the

inclines of the cam-plate I have found by actual practice to be sufficient to move the cams and allow the bed-stone to recede from the runner.

After the escape of clogging matter the stone is gradually adjusted to its original and normal position by the action of the spring I^2 on the cam-adjusting rod.

The inclination of the cams h' h' and strength of the spring I^2 may be varied somewhat, according to circumstances, to suit the weight of the stone, &c.

Instead of the feeding devices of my former invention, patented as before mentioned, I form a detachable skeleton frame or bracket, M, of a single rod, shaped or bent into a loop or rectangular yoke form, and with ends m m projecting at right angles, to constitute posts, which fit in sockets m^1 m^1 on the periphery of the bed-stone casing when the mill is operated on a horizontal shaft with the stones vertical; and when the stones are arranged horizontally, or run by a vertical shaft, the bracket-frame is secured in sockets m^2 m^2 on the back of the bed-stone casing. The opening to the eye of the stone, when the stone is not used horizontally, is closed by a swinging cap or pivoted plate, l. The hopper rests upon the side bars of the bracket-frame, and delivers the grain or other substance to be ground to a tray or shoe, N, pivoted upon a vibrating lever, O. This lever is operated as in my aforesaid patented invention; but instead of being bent at its end, as before, I form it straight from its fulcrum to the end, where it receives a ferrule or short tubular rod, o. This rod is pivoted to lugs on the shoe. When the mill is run as a horizontal mill, the connection of the shaking-lever O with the shoe is made by the employment of an additional lever or connecting parts. (Not shown herein.) The shoe is supported at its outer end by a hooked or bent rod, P, secured by a collar and set-screw, p, at any required elevation, according to the inclination it is desired to give the shoe on one of the posts m of the bracket. The hooked end of the rod P fits loosely in a hole in a cross-bar, Q, on the shoe, spanning it from side to side. The shoe vibrates about the rod, and delivers the substance to be ground either into a funnel inserted in the mouth of the feed-pipe Q′ or in the eye-hub or bushing H, as fully explained in the previous patent referred to.

I claim as my invention—

1. The combination of the supporting-frame, the running-stone, the casing, the driving-shaft, the loosely-enveloping sleeve on the shaft, having enlarged recessed ends or boxes, and the self-adjusting removable bushings, in which the driving-shaft is fitted, substantially as and for the purposes hereinbefore set forth.

2. The combination, with the self-adjusting plate or turning cam, yieldingly held in position, of the stationary or bed stone, its casing, and devices which support the stone upon said cam, substantially as described, whereby the stone is normally sustained in proper position relatively to the runner, while left free to yield automatically by the turning of the cam to allow clogging matter injurious to the stones to escape, in the manner set forth.

3. The combination, substantially as hereinbefore set forth, of the stationary or bed stone, its pivots, the casing, the guideways or sockets on the inside of the casing-wall or periphery, and the adjustable bolts, having heads movable in the guideways and provided with bearings for the pivots of the stone.

4. The combination, substantially as hereinbefore set forth, of the casing, the adjusting-bolts, having shoulders or collars, the adjustable screw-attached heads of the bolts, the stone pivoted in said heads, bearing-blocks on the bolts, and the adjusting-plate or turning cam upon which the shoulders of said bearing-blocks are supported.

5. The combination, substantially as hereinbefore set forth, of the casing, the stationary or bed stone, its adjustable clamping-band, provided with pivots, the yieldingly-secured adjusting-bolts, their adjustable heads supporting the stone on the pivots, shoulders or collars on the bolts, the adjustable bearing-blocks acted upon by said collars as the bolts are adjusted, and the adjusting-plate or turning cam, upon which the blocks bear, and by which the stone is moved toward or away from the casing-back.

6. The combination, substantially as hereinbefore set forth, of the stationary or bed stone, its casing provided with guideways upon the inner wall or periphery, the adjusting-plate or turning cam, the endwise-moving rod for controlling said plate, the hand wheel or nut thereon, the spring or yielding cushion between said wheel and the casing, the adjusting-bolts, having heads movable in the casing-guideways and supporting the stone on its pivots, and the adjustable shouldered blocks on said bolts bearing upon the cams of the adjusting-plate, whereby the stone may be adjusted as desired, and firmly held in its position under ordinary circumstances, and yet be capable of yielding under unusual strain by the compression of the cushion on its controlling-rod, to allow the escape of clogging matter and prevent injury to the stones, as set forth.

7. The combination, substantially as hereinbefore set forth, of the casing, its sockets, the hopper frame or bracket, formed of a bent rod fitting in said sockets, the shaking-lever, the shoe, the ferrule fitting upon the end of the shaking-lever, and the rod adjustably secured upon one of the ends or posts of the hopper-frame and supporting the outer end of the shoe.

In testimony whereof I have hereunto subscribed my name.

AUSBERT H. WAGNER.

Witnesses:
FRANK W. BURTIS,
CHARLES L. PRATT.