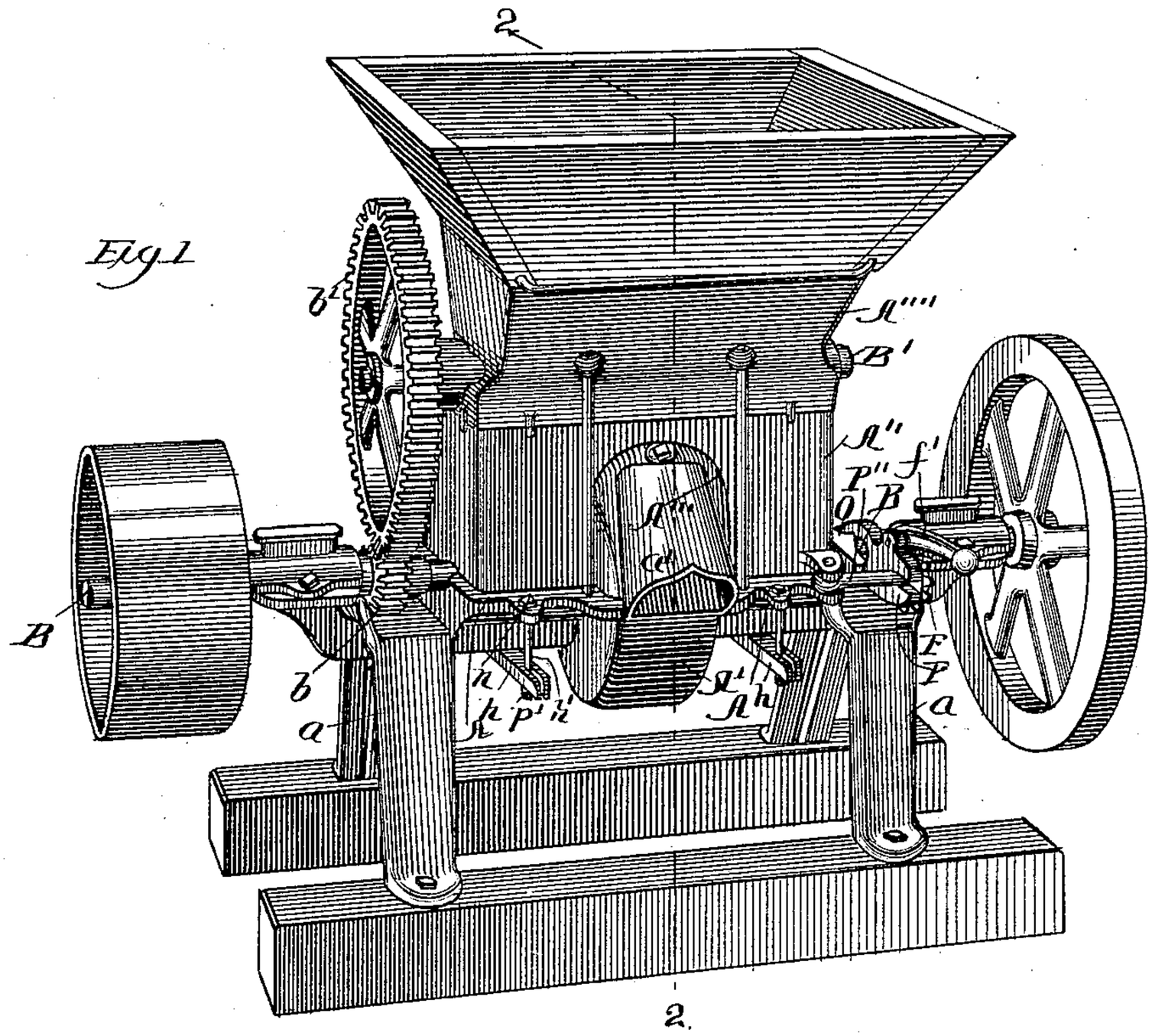
(No Model.) 5 Sheets—Sheet 1.

D. C. STOVER.

GRINDING MILL.

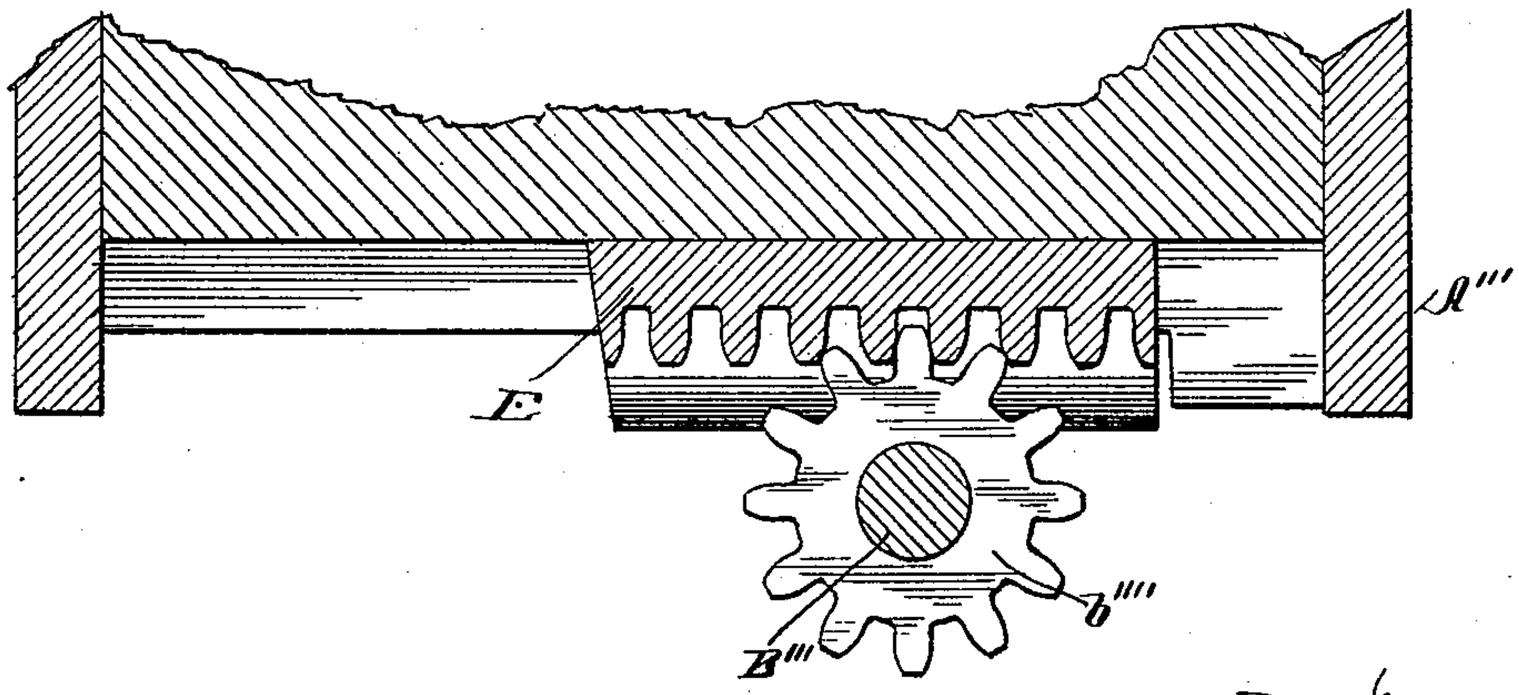
No. 471,345. Patented Mar. 22, 1892.

Fig. 1.



2.

Fig. 8.



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(No Model.) 5 Sheets—Sheet 2.

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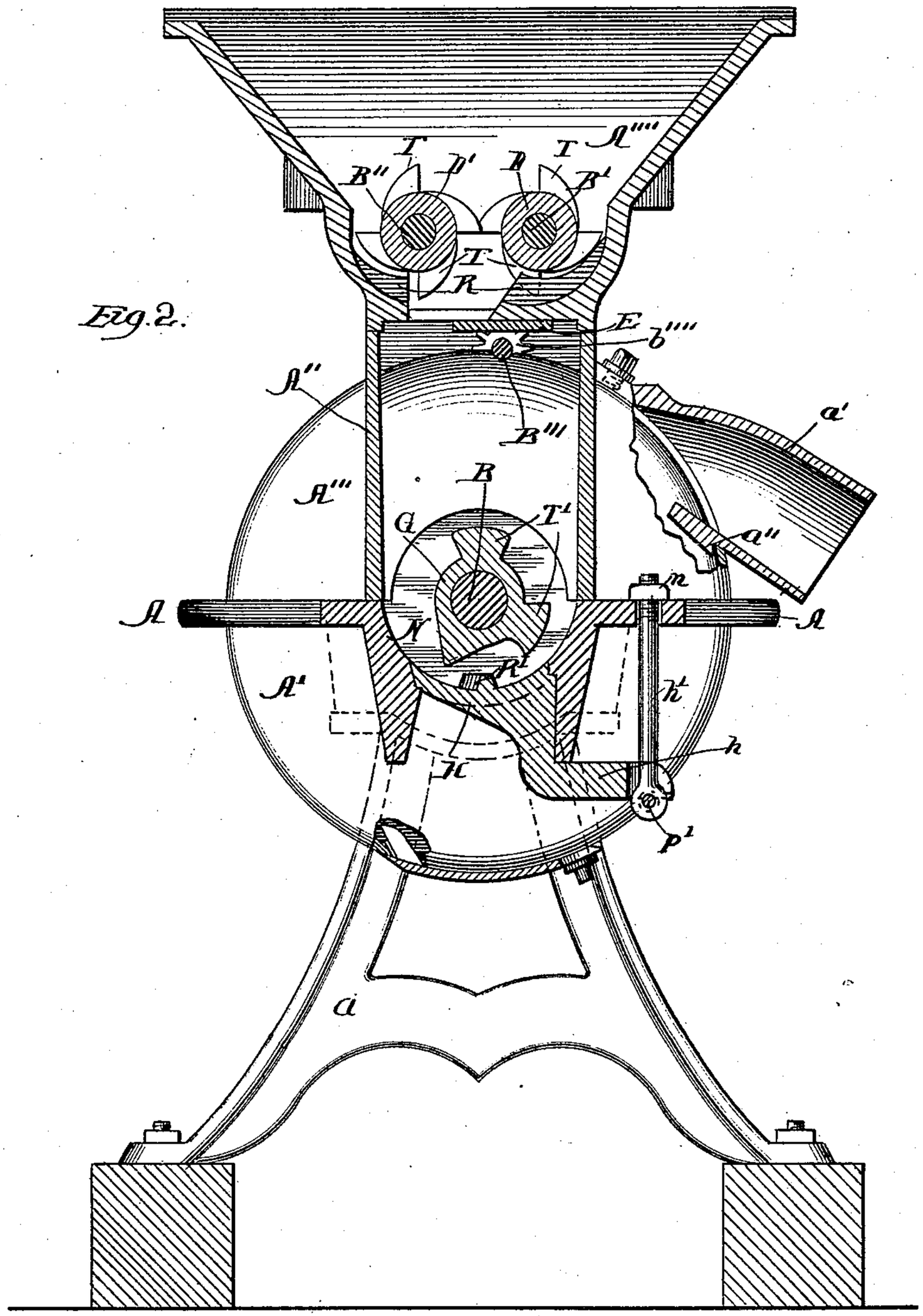
Fig. 2.



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(No Model.) 5 Sheets—Sheet 3.

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GRINDING MILL.

No. 471,345. Patented Mar. 22, 1892.

Fig. 3.

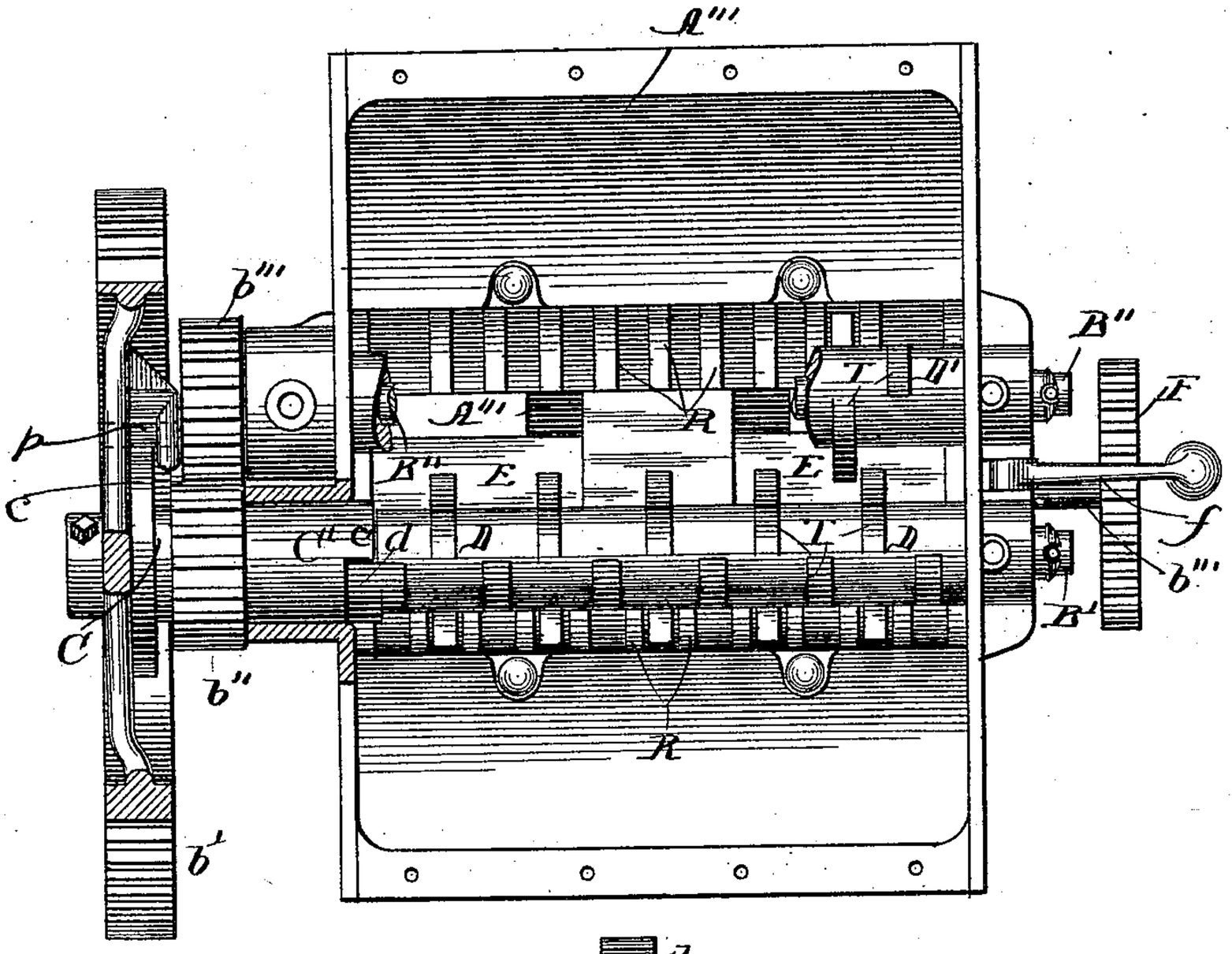


Fig. 5.

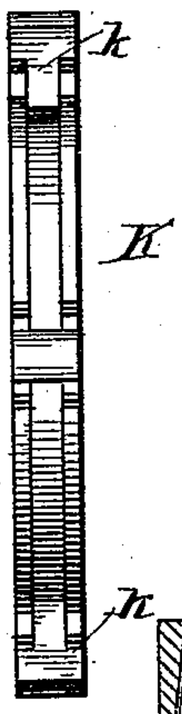


Fig. 6.

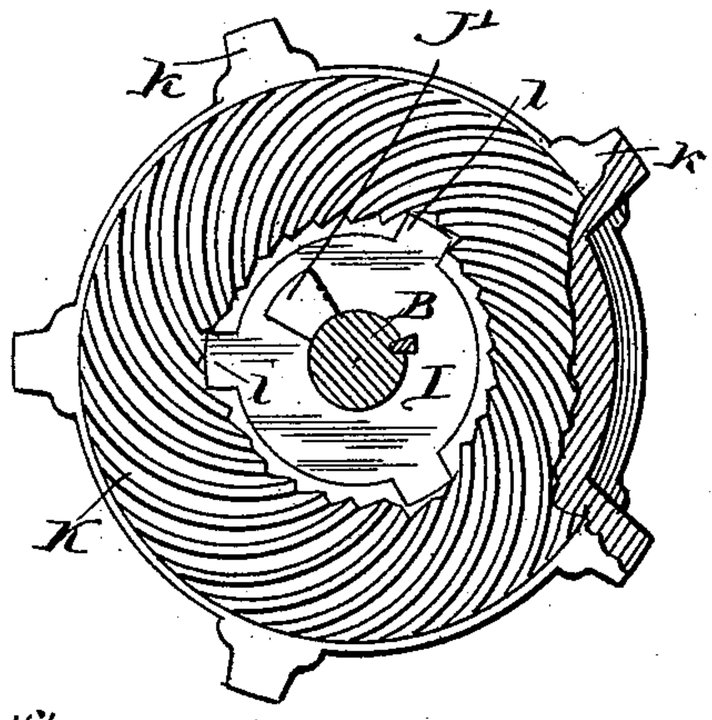
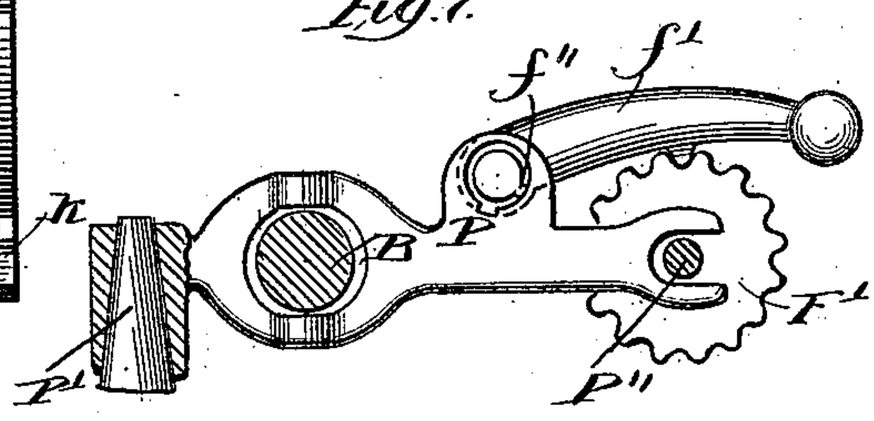


Fig. 7.



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D. C. STOVER.

GRINDING MILL.

No. 471,345. Patented Mar. 22, 1892.

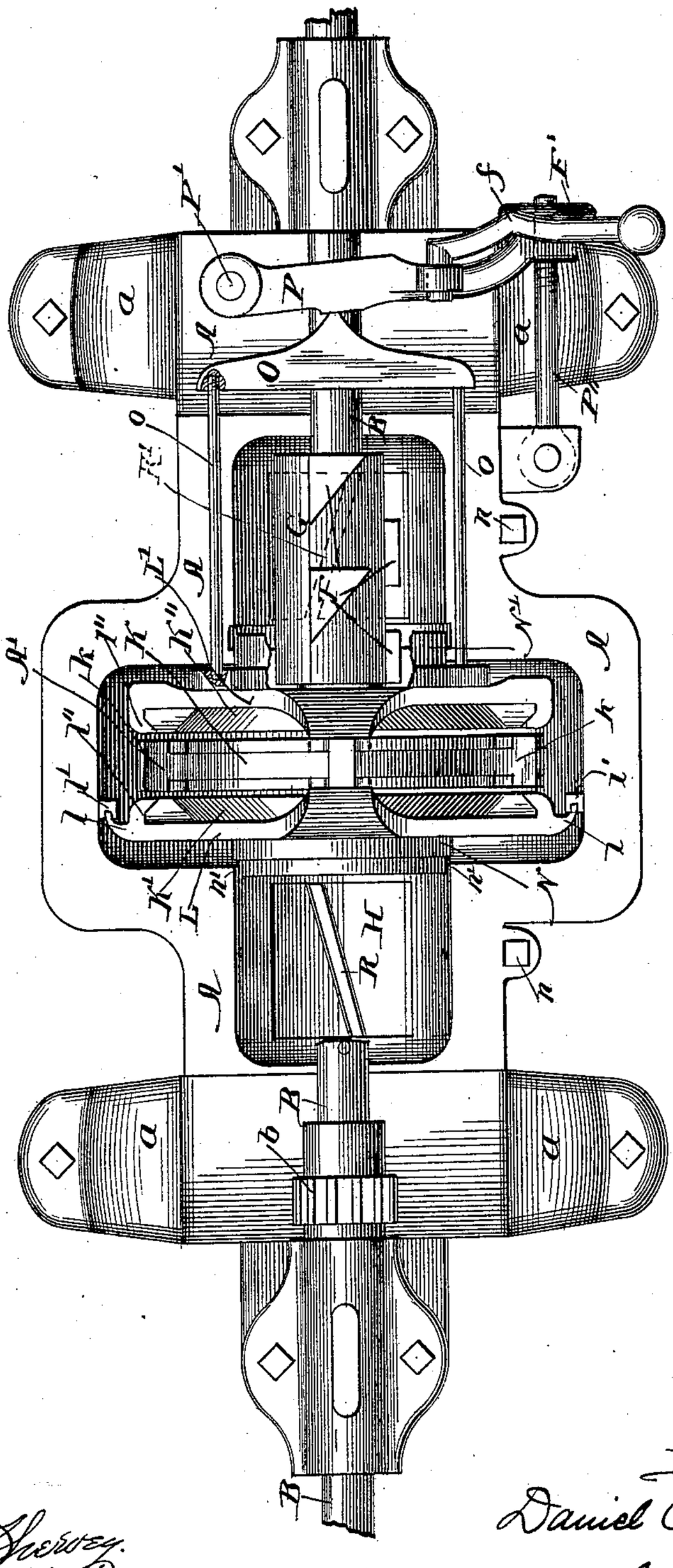

Fig. 4.

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GRINDING MILL.

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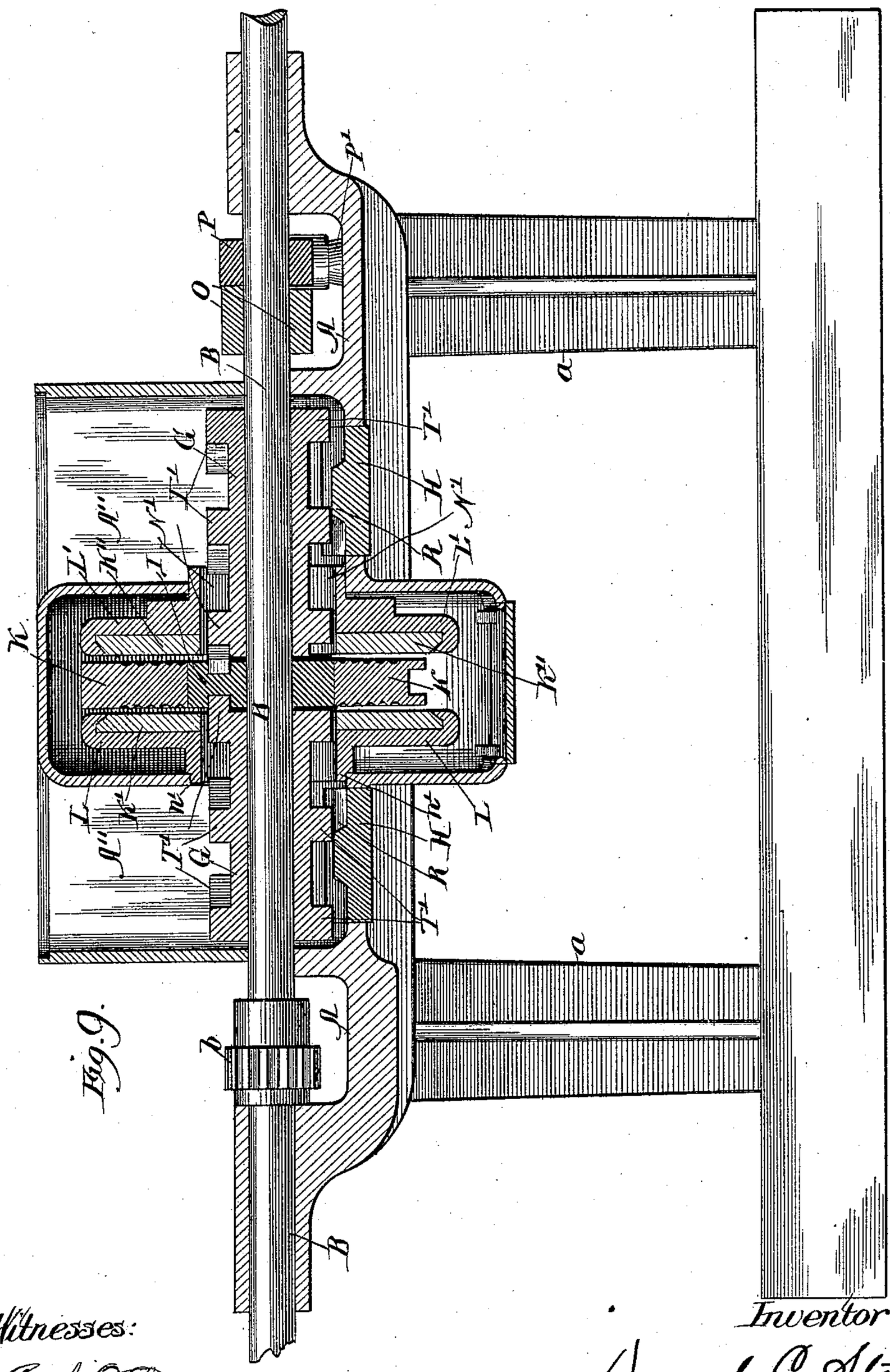

Fig. 9.

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UNITED STATES PATENT OFFICE.

DANIEL C. STOVER, OF FREEPORT, ILLINOIS, ASSIGNOR TO THE STOVER MANUFACTURING COMPANY, OF SAME PLACE.

GRINDING-MILL.

SPECIFICATION forming part of Letters Patent No. 471,345, dated March 22, 1892.

Application filed May 14, 1891. Serial No. 392,655. (No model.)

To all whom it may concern:

Be it known that I, DANIEL C. STOVER, a citizen of the United States of America, residing at Freeport, in the county of Stephenson and State of Illinois, have invented certain new and useful Improvements in Grinding-Mills, of which the following is a specification.

My invention relates to improvements in grinding-mills, and is fully described and explained in this specification and shown in the accompanying drawings, in which—

Figure 1 is a perspective view of a complete mill embodying my invention. Fig. 2 is a transverse vertical section of the mill through the line 2 2, Fig. 1. Fig. 3 is a top plan of the hopper of the mill and the crushing mechanism located therein. Fig. 4 is a top plan of the base of the mill with the grinding and feeding mechanism in place therein. Fig. 5 is an edge view of the central burr of the grinding mechanism. Fig. 6 is a side elevation thereof, showing its connection with the parts by which it is rotated. Fig. 7 is an elevation of the lever, by means of which the position of the grinding-burrs is regulated. Fig. 8 is a transverse section of the slide, by means of which the feed from the crushing mechanism to the grinding-chamber is regulated, together with the means for adjusting the same; and Fig. 9 is a central longitudinal vertical section of the grinding and feeding mechanism and the parts immediately connected therewith.

In the views, A is the bed or base of the mill, provided with legs *a* for its support and formed with a downwardly-extending semi-cylindrical trough or depression A′, which constitutes the lower half of the grinding-chamber of the mill. Upon this base rests a hollow casting A^2, having at its center an upwardly-convex semi-cylindrical chamber A^3, corresponding in position with the trough A′, already referred to, and forming therewith the grinding-chamber. Circular openings in the ends of the grinding-chamber connect it with the spaces in the ends of the hollow casting A^2 and permit the entrance of grain to the grinding-chamber. A spout *a*′, fastened to the upper portion A^3 of the grinding-chamber in the manner indicated in Fig. 2, provides for the escape of meal from the grinding-chamber, and a hopper A^4, resting upon the casting A^2, is adapted to contain grain or other material which is to be crushed and ground in the mill. The hopper, the casting A^2, and the base or bed are bound together by bolts in substantially the manner indicated in Fig. 1.

In the base A is journaled a longitudinal shaft B, projecting at both ends beyond the base, and a driving-pulley and fly-wheel are mounted on the opposite ends of this shaft and serve as a means for operating the mill. A pinion *b* is rigidly mounted upon the shaft B and engages a gear-wheel *b*′, mounted on a shaft B′, which is journaled in the hopper A^4 and extends longitudinally through it. (See Figs. 1, 2, and 3.) A pinion b^2, loosely mounted on the shaft B′, engages a second pinion b^3, mounted on a shaft B^2, journaled in the hopper and parallel with the shaft B′. The pinion b^2 on the shaft B′ is provided at its outer end with a hub C, formed with an arm *c*, lying in the plane of the gear-wheel *b*′ and of such length as to engage a wooden pin *p*, inserted in one of the spokes of the gear-wheel in the manner indicated in Fig. 3. By means of this pin and arm the rotation of the main shaft and of the gear-wheel *b*′ is imparted to the pinions b^2 b^3 and all these parts rotated together until the resistance to the operation of the mill is sufficient to break the pin *p*, in which case the pinions b^2 b^3 no longer rotate with the gear-wheel. Each of the pinions b^2 b^3 has on its inner end a hub extending into the hopper A^4, one of these hubs, lettered C′, being shown in Fig. 3. Two breaking-cylinders D D′ are mounted on the shafts B′ B^2, respectively, and each of these breaking-cylinders is connected with the hub of the corresponding pinion in the manner indicated in Fig. 3, in which *c*′ is a lug formed on the hub C′, and *d* is a corresponding lug formed on the breaking-cylinder D, the two lugs *c*′ *d* being in such engagement that the rotation of the pinion and its hub rotates the breaking-cylinder in the same direction. The breaking-cylinders are provided with projecting teeth T, which pass between corresponding ridges R (see Figs. 2 and 3) and serve to crush any coarse material—such as ear

corn—placed in the hopper, and thus prepare it to be operated upon by the grinding mechanism beneath. Immediately beneath the breaking-cylinders D D′ and in the bottom of the hopper is an opening extending from end to end of the hopper and from one side partly across the bottom thereof, and just under this opening is a slide E, also extending from end to end of the hopper and adapted to be moved from side to side in order to wholly or partly close the opening over it. (See Figs. 2, 3, and 8.) On the lower face of each of the ends of this slide is formed a rack having a suitable number of teeth, and in engagement with this rack is a pinion b^4, mounted on a shaft B^3, journaled in the walls of the casting A^2 and provided at one end with a notched hand-wheel F, Fig. 3, by means of which it may be turned for the purpose of moving the rack. A pawl *f*, pivoted to the casting A^2, engages the hand-wheel F and serves to hold it stationary in any given position, and thus to secure any desired opening between the hopper and the chamber beneath, and thereby regulate the feed from the crushing mechanism to the grinding-chamber.

In the hollow casting A^2 are two spaces or chambers lying on opposite sides of the grinding-chamber and communicating with the interior of the grinding-chamber through the openings in its ends already mentioned, and immediately below these two spaces or chambers are shallow semi-cylindrical depressions formed in the base A, as indicated in Fig. 2. In the bottom of each of these depressions is an opening which is closed when the mill is in use by means of a plate H, provided with an oblique ridge R′, formed on its upper surface. Each of these plates has a downwardly and laterally extending arm *h*, which is held in place by means of a bolt *h′*, provided at its upper end with a nut *n* and at its lower end with a wooden pin *p′*, in the manner indicated in Fig. 2. The upper end of each of the bolts *h′* passes through a flange on the base A, while its lower end is connected with the arm *h* by means of the wooden pin, and the nut *n* provides for drawing the plate upward into position and holding it there securely. When any unusual or excessive strain is brought to bear on the plate, however, the pin *p′* breaks and the plate drops down and relieves the strain.

Immediately above each of the plates H is a feeding-cylinder G, provided with teeth T′, having bevel edges adapted to co-operate with the oblique ridges R′ on the plates H and force grain or other material from both directions into the grinding-chamber. These feeding-cylinders extend into the grinding-chamber and engage at their inner ends with a plate I, Fig. 6, mounted on and loosely keyed to the shaft. One of the teeth T′ of each of the feeding-cylinders enters a corresponding opening in the plate I, so that the rotation of the plate with the shaft rotates the feeding-cylinders, and the plate itself is provided with a series of marginal lugs *i*, entering corresponding notches in the inner margin of a double-faced annular grinding-plate K, Fig. 6, having projecting lugs *k*, which serve to scrape the meal from the bottom of the grinding-chamber and carry it to the discharge-spout *a′*, through which it escapes. The double-faced grinding-plate K lies approximately at the center of the grinding-chamber and on opposite sides of it, and co-operating with it are two stationary grinding-plates K′ K^2, seated in frames L L′, in the manner shown in Fig. 4. Each of these frames has outwardly-projecting lugs *l*, which rest upon correspondingly-placed lugs *l′*, formed on the inner face of the grinding-chamber and preventing rotation of the frame, and each frame is also formed with hooked or undercut lugs l^2, which secure the grinding-plates K′ K^2 in place, the grinding-plates being provided with marginal lugs which pass into the notches in the lugs l^2 and are retained thereby. The frame L has on its outer face a cylindrical neck N, which rests in a corresponding bearing in the base-plate, the neck and the bearing being both turned to fit accurately, and thus secure the centering of the frame and the grinding-plate which it supports. Longitudinal movement of the neck N in its bearing is prevented by means of a shoulder *n′*, which forms a stop for the end of the neck.

The frame L′ is provided on its outer face with a neck N′, resting in a bearing in the base-plate and serving to center the frame and its grinding-plate; but the neck N′ is free to move longitudinally in its bearing for the purpose of adjusting the grinding-plates K K^2 upon the shaft, and thereby varying the spaces between the central double-faced grinding-plate and the two outer non-rotating plates.

The frame L′ is adjusted by means of the mechanism illustrated in Figs. 1, 4, and 7, in which O is a yoke mounted loosely on the shaft and extending laterally in opposite directions therefrom, and *o o* are two rods having their ends seated in sockets in the inner face of the yoke and the outer face of the frame L′. A lever P, pivoted at one end on a vertical boss formed on the base A, rests against a lug on the center of the outer face of the yoke O, and is operated by means of a bolt P^2, passing through the free end of the lever and provided with a notched hand-wheel F′, resting against the end of the lever and serving to press the lever against the yoke, and thereby to lessen the spaces between the grinding-plates. A pawl *f′*, pivoted to the lever P, engages the hand-wheel and prevents its accidental rotation, and it is evident that by means of the lever, the hand-wheel, and the pawl the plates may be adjusted as desired and held securely in any given position.

In the construction of the various parts hereinbefore described various details are embodied which serve to cheapen their manufacture and facilitate their connection and

combination in the machine. Thus, for instance, the discharge-spout a' is held in place by means of a lug a^2, Fig. 2, formed on the lower surface of the spout near its inner end, and a single bolt and nut connecting the upper part of the inner end of the spout with the wall of the grinding-chamber. The lug a^2 being first brought into engagement with the wall at the lower margin of the opening into the grinding-chamber, the spout is next brought into working position and the bolt inserted, and the fastening of the spout in place is thereby completed. The connection of the pinions b^2 b^3 with the crushing-cylinders is another instance, and the connection of the feeding-cylinders G with the grinding mechanism on the shaft B is still another. The connection of the grinding-plates K' K^2 with the frames that hold them, through the simple rotation of the grinding-plates into such a position as to bring their marginal lugs into engagement with the undercut lugs of the supporting-frames, is an extremely simple and convenient mechanical device, and the connection of various of the parts by means of their own shapes and without the use of bolts, screws, or keys is resorted to wherever the general construction of the milll will allow it.

The operation of the mill hereinbefore described, while sufficiently evident from the detail description of the parts, may be again briefly stated. Coarse material, such as ear corn, being placed in the hopper, is crushed by means of the rotation of the crushing-cylinders D D', the crushed product being admitted to the chambers below the hopper through the opening in the bottom thereof at a rate dependent upon the position of the regulating-plate E, which may be adjusted as desired by turning the hand-wheel F. On reaching the chambers below the hopper and on opposite sides of the grinding-chamber the crushed material comes in contact with the feeding-cylinders G and is forced from both directions into the grinding-chamber, where it is subjected to the action of the double-faced rotating grinding-plate K and the stationary plates K' K^2, which lie on opposite sides thereof. The space between these plates may be regulated as desired by means of the yoke O, rods *o*, lever P, and the parts co-operating therewith, and the ground material, after passing from the spaces between the hoppers, is carried by the lugs or scrapers on the central grinding-plate to the discharge-spout, where it escapes. Provision for unusual and excessive strains upon the parts is made by the use of the breaking-pin *p*, which connects the crushing mechanism with the main driving-gear and of the breaking-pin *p'*, forming a part of the support of each of the bottom plates, which lie under the feeding-cylinders. The connection of the pinions b^2 b^3 with the crushing-cylinders facilitates the separation of the parts and the replacing of such parts as may be broken, and the same thing is true of the connection of the main shaft with the grinding mechanism and feeding-cylinders. It is of course apparent that when small grain or shelled corn is to be ground the operation of the crushing-cylinders is not material to the working of the mill, but the grain is simply fed through the opening at the bottom of the hopper to the feeding-cylinders below.

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

1. The combination, with the hopper A^4, the shafts B' B^2, and the crushing-cylinders D D', of the engaging-pinions b^2 b^3, mounted on said shafts, and the gear-wheel *b'*, mounted on the same shaft with the pinion b^2, said pinion being provided with an arm impinging upon a break-pin *p*, set in the gear-wheel, whereby the motion of the gear-wheel is communicated to the crushing-cylinders through said breaking-pin and excessive strain upon the crushing-cylinders may break the pin and destroy the connection between the gear-wheel and the crushing mechanism, substantially as and for the purpose set forth.

2. The combination, with the base A and the shaft B, journaled therein, of the double-faced central grinding-plate rotating with the shaft, the non-rotating frames L L', lying on opposite sides of said central grinding-plate and provided with the undercut lugs l^2 and with means for centering them, and grinding-plates K' K^2, provided with marginal lugs adapted to enter and to be secured by the undercut lugs l^2, substantially as and for the purpose set forth.

3. The combination, with the base and the shaft B, journaled therein, of the plate I, keyed to the shaft, the grinding-ring K, connected with said plate and rotating therewith, the non-rotating frames L L', formed with necks N N', respectively journaled in bearings in the base, the grinding-plates K K', secured in said frames, and mechanism for adjusting said grinding-plates, consisting of the yoke O, rods *o o*, connecting said yoke with the frame L', the lever P, adapted to be pressed against said yoke, and the bolt P^2, and hand-wheel F', adapted to operate said lever, whereby the spaces between the grinding-plates may be varied as desired, substantially as and for the purpose set forth.

4. The combination, with the base-plate, the main shaft journaled therein, and the grinding mechanism and feeding mechanism mounted thereon, of the detachable bottom plates H H, lying beneath the feeding mechanism and co-operating therewith, the arms or levers *h*, formed on said plates, the bolts *h'*, connecting the free ends of said arms with the base-plate, and the breaking-pins *p'*, forming the connection of said bolts with said arms, whereby excessive strain upon the feeding mechanism may break said pins and disconnect said bottom plates from the bed-plate, substantially as and for the purpose set forth.

5. The combination, with the base-plate and the main shaft journaled therein, of the plate I, keyed to the shaft, the grinding-plate K, connected with said plate I and rotating therewith, the non-rotating grinding-plates lying on opposite sides of the plate K and co-operating therewith, and the feeding-cylinders G G, mounted on the shaft and engaging at their inner ends the plate I, whereby the rotation of the shaft rotates both the grinding and feeding mechanism, substantially as and for the purpose set forth.

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