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F. BROTHERHOOD.

RICE POUNDING MACHINERY.

No. 250,340. Patented Dec. 6, 1881.

Fig. 1.

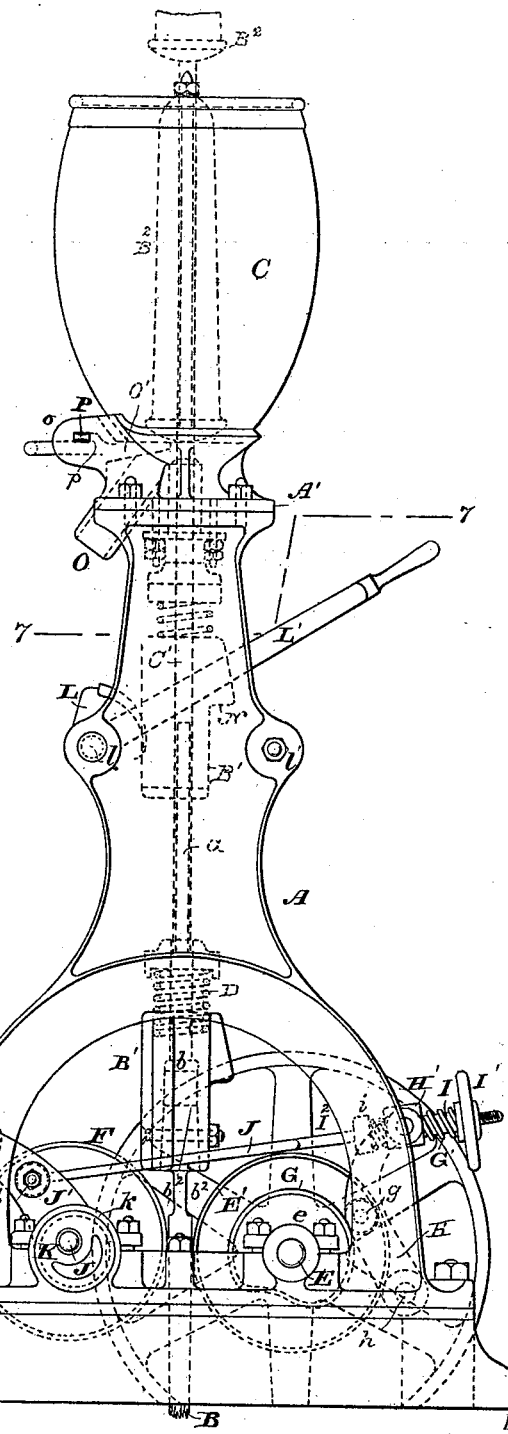

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Fig. 2.

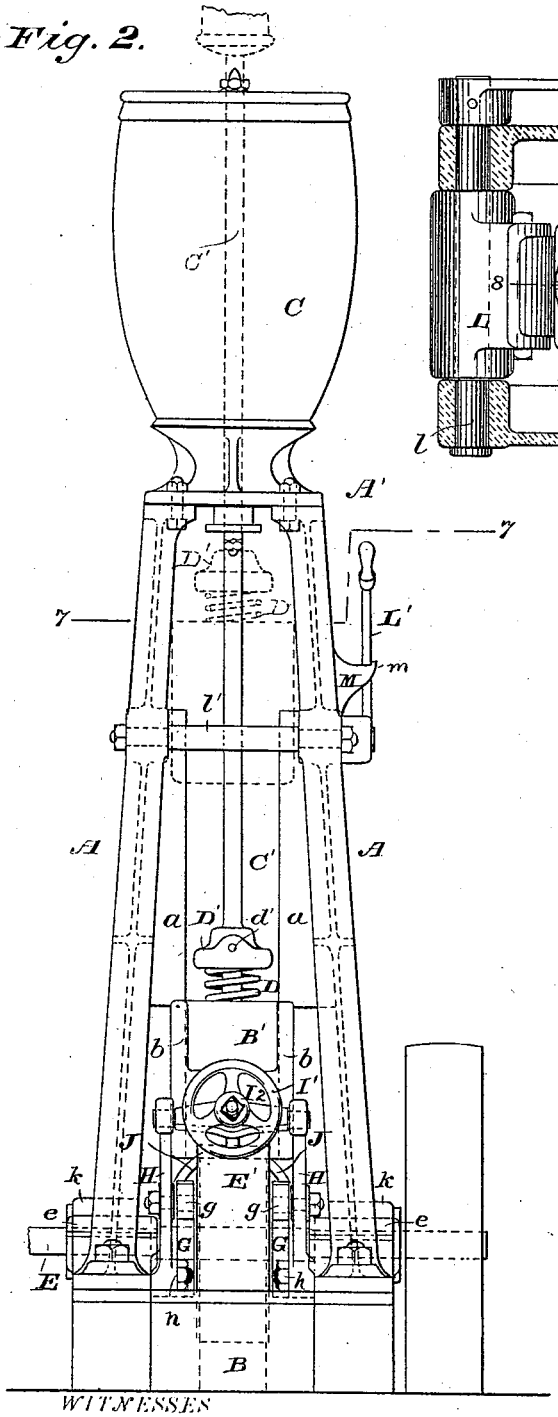

Fig. 7.

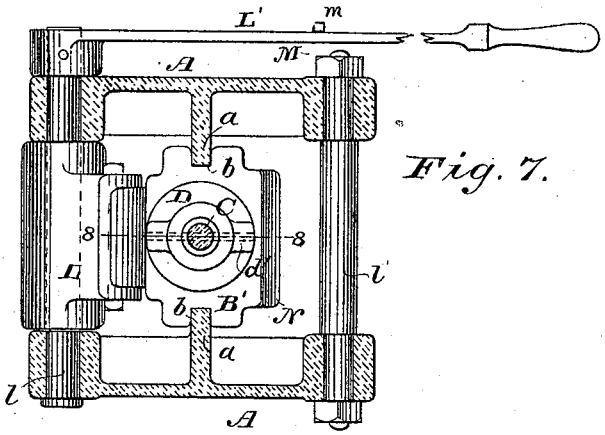

Fig. 8.

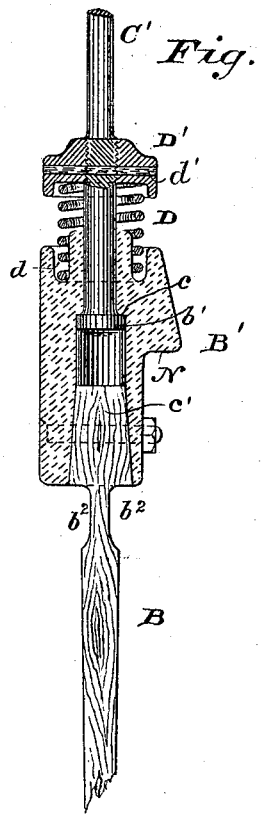

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Fig. 4.

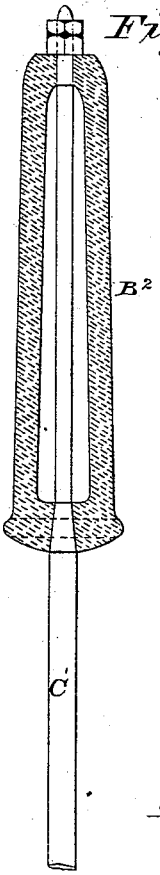

Fig. 3.

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Fig. 6.

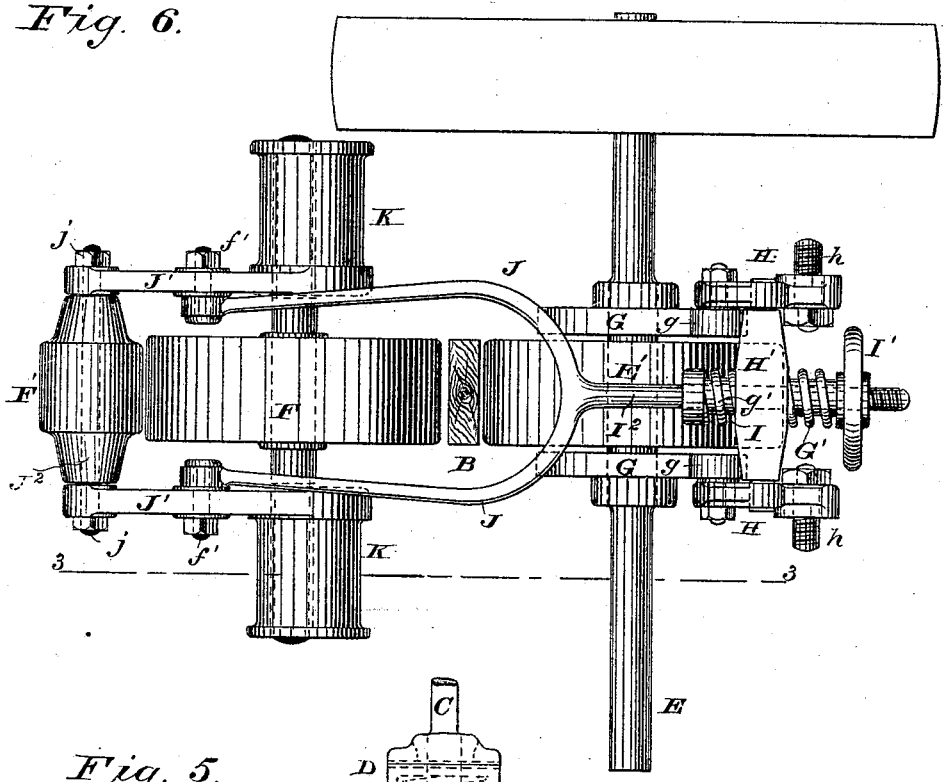

Fig. 5.

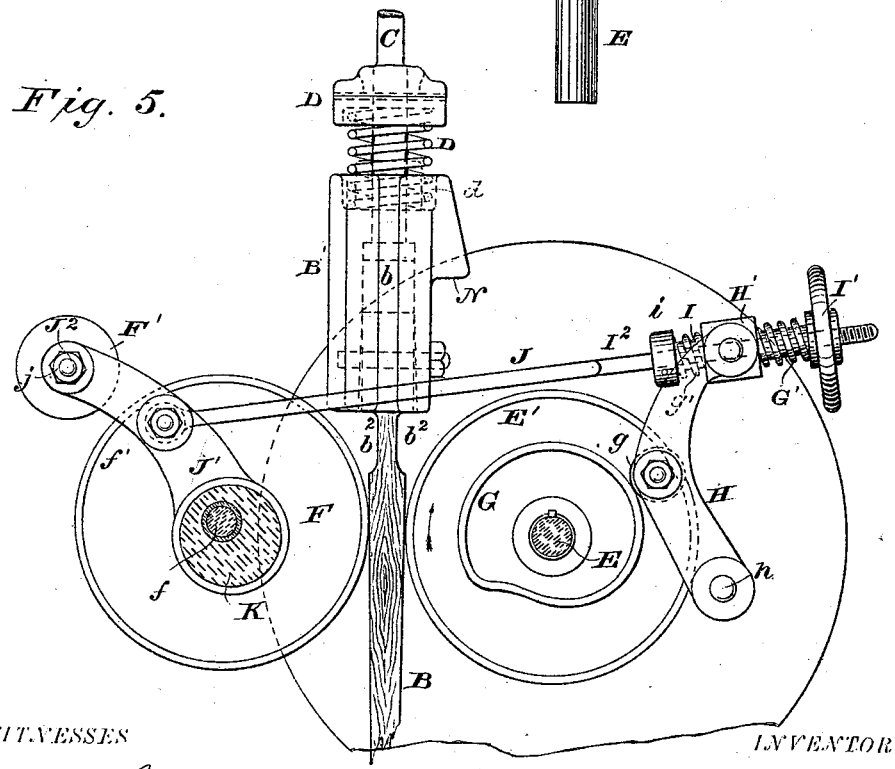

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Fig. 9.

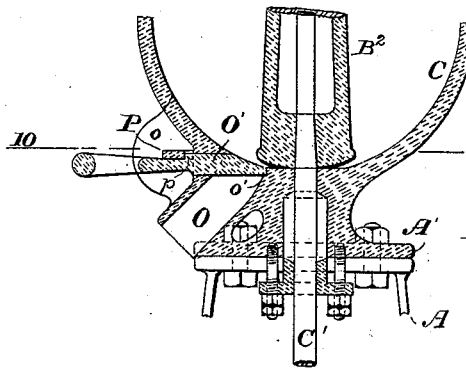


Fig 12

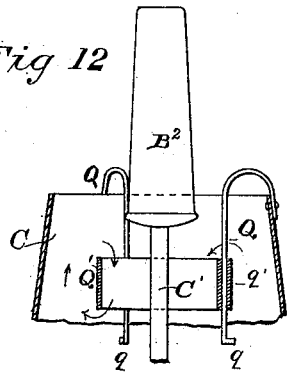


Fig. 10.

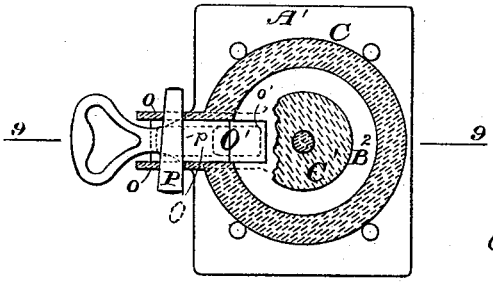


Fig 11

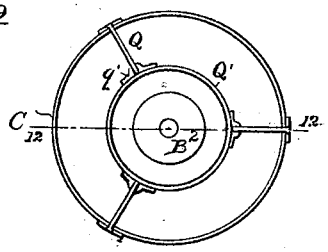
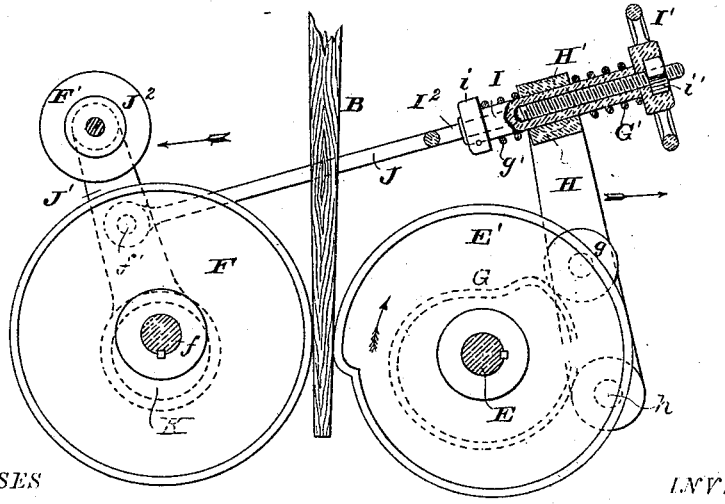


Fig. 13.



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UNITED STATES PATENT OFFICE.

FRED BROTHERHOOD, OF CHARLESTON, SOUTH CAROLINA, ASSIGNOR OF ONE-HALF TO JAMES BROTHERHOOD, OF STRATFORD, CANADA.

RICE-POUNDING MACHINERY.

SPECIFICATION forming part of Letters Patent No. 250,340, dated December 6, 1881.

Application filed September 13, 1881. (No model.)

To all whom it may concern:

Be it known that I, FRED BROTHERHOOD, of the city of Charleston, in the State of South Carolina, have invented certain new and useful Improvements in Rice-Pounding Machinery, of which the following is a specification.

My invention relates to improvements in mills for pounding and cleaning rice of the class having pestles which are lifted and released in rapid succession, that they may fall by gravity repeatedly and at short intervals into the rice to be treated in mortars, my invention especially pertaining to that particular type of this class of mills in which the pestles are actuated by intermittingly-operating griping-rolls or revolving nippers acting on lifters or lifting-boards, to which the pestles are attached. Letters Patent of the United States No. 210,002 were granted to me November 19, 1878, for a machine of the class, generally speaking, to which my present improvements apply.

My objects are to provide improved griping-rolls or revolving nippers, and mechanism by which to adjust them and control their action upon the lifter, while admitting of the desirable amount of yield or self-adjustment of the rolls in the pressure or gripe upon the lifter; to avoid breaking or injuriously straining either the griping-rolls or their supports or attachments; to so construct a lifter and adapt griping-rolls to act thereon that the lifter shall be tightly griped by or compressed between the rolls at the commencement of their action upon it, and afterward act with gradually-decreasing pressure, so avoiding slip of the rolls upon the lifter in starting it, while avoiding unnecessary strain and undue wear of parts after inertia has been overcome; to provide simple means for arresting the action of a lifter when it may be desired to hold it out of operation; to facilitate the operation of the pestle upon the mass of rice in a mortar by presenting different grains or portions of the mass to the action of a pestle upon its successive descents; to provide for rapidly discharging the contents of a mortar, and admit of the mortar being readily cleaned.

The accomplishment of the above-referred-to desiderata is provided for by a novel organization of mechanism and certain combinations of devices, which will be hereinafter fully described, preparatory to designation of the subject-matter claimed.

The accompanying drawings show all those parts of a complete machine which are needed for illustration of a suitable adaptation of my improvements to a power-driven mill of the type in which the overhead or elevated mortars have openings in their bottoms through which the pestle-lifters work. Some of my improvements—essential and co-operating parts of my invention—may be used in hand-driven mills, as well as in other machines differing in construction in various respects from that shown and hereinafter specifically described.

Figure 1 is a view in side elevation, showing in dotted lines some of the parts obscured by the frame-work, &c. Fig. 2 is a front elevation. Fig. 3 is a view on an enlarged scale, partly in side elevation and partly in section, on the line 3 3 of Fig. 6, showing the griping-rolls, lifter, pestle-arresting lever, &c. Fig. 4 is a sectional view of the pestle, with a portion of its shank or prolongation of the lifter in elevation. Fig. 5 is a view showing some of the parts illustrated by Fig. 3, but in different positions. Fig. 6 is a view, partly in plan and partly in section, on the line 6 6 of Fig. 3. Fig. 7 is a view, partly in plan and partly in section, on the lines 7 7 of Figs. 1 and 2, showing details of the lifter cross-head, its guideways, the frame, the pestle-arresting lever and its eccentric for acting on the cross-head. Fig. 8 is a view, partly in elevation and partly in section, as indicated by the line 8 8 of Fig. 7, showing portions of the pestle-lifter and the pestle-shank, of piston-rod form, and the manner of connecting these parts to the cross-head. Fig. 9 is a view, partly in elevation and partly in section, on the line 9 9 of Fig. 10, showing portions of a mortar, its supporting-frame, the pestle-slide, and the pestle. Fig. 10 is a view, partly in plan and partly in section, on the line 10 10 of Fig. 9. Fig. 11 is a plan view, showing a mortar as provided with a loosely-supported self-adjusting band or rice-turning ring. Fig. 12 is a view, partly in elevation and partly in section, on the line 12 12 of Fig. 11. Fig. 13

is a view, partly in elevation and partly in section, showing a modification of the griping rolls or nippers for acting on the lifter.

A suitable supporting-frame, A, is constructed in skeleton form, or so as to provide an unobstructed central space or vertical passage between the frame-uprights for the pestle-lifter B to work endwise in, as guided in its movements by its cross-head B′. Guideways *a a* on the frame fit the guide-grooves *b b* of the cross-head.

The mortar C is supported upon the top or plate A′ of the frame, and is provided, as usual in this type of mills, with a central opening in its bottom, through which projects the rod or shank C′ of the pestle B^2.

The pestle shank and lifter are connected with the cross-head B′ in such manner that they may be detached therefrom when separation of the parts is desirable. The connection of the cross-head, pestle-shank, and lifting-board B is made, as clearly shown in Fig. 8, in the following way: The pestle-shank is formed of a rod having a head or enlargement, *b′*, at its lower end, and the cross-head is formed with an opening extending through it vertically, or from end to end. The lower part of this opening for, say, half or two-thirds the length of the cross-head, is of larger area than the opening through the top or upper end of the cross-head. The diameter of the opening is suddenly contracted where the smaller portion merges in the larger portion, thus forming a shoulder, *c*. The lower part of the larger opening is flaring to form a tapering socket, into which the correspondingly-shaped end of the lifter is wedged and secured by a cross-pin or bolt and nut after the shank C′ has been slipped into the cross-head opening from below, so as to bring the shank-head *b′* between the shoulder *c* and the end *c′* of the lifter after the latter is inserted. Endwise movement of the pestle-shank independently of the movements of the lifter and cross-head is thus provided for. An expansive or thrust spring, D, rests at its lower end in an annular socket, *d*, in the top of the cross-head, around its central opening, and at its upper end the spring bears against a collar, D′, on the pestle-shank. For the purpose of securing a very strong connection between the collar D′ and shank C′ the former is made with a thread to match a screw upon the latter, and a pin, *d′*, prevents the turning of this collar-nut D′ upon the shank. The spring D prevents injury arising from violent concussion or too sudden and unyielding action upon the pestle through the lifter by the griping-rolls, presently to be described. It will readily be understood that the resistance to motion of the pestle when the lifting-board is suddenly and quickly moved upward will cause the spring to yield and the pestle-shank to move downward in its support in the cross-head. Motion is thus gradually imparted to the pestle to overcome inertia, when the lifting-board B is first acted upon, by mechanism such as next referred to and in turn described.

I have found it preferable to employ symmetrical or truly cylindrical griping-rolls instead of lifting-cams or eccentric griping-rolls, such as shown in my before-referred-to patent, and to have one an idle-roll and the other a positively-driven roll, instead of two geared or positively-actuated rolls. The idle-roll is caused, by suitable cam-actuated mechanism connecting it with the driven roll, to approach and bear against or to recede from and occupy a position clear of the lifter, according to whether the lifter is to be griped or pressed upon on opposite sides by the griping-rolls or is to be released and allowed to drop. The intermittingly-acting griping-rolls, their connecting mechanism, supports, &c., will now be described in their order.

A driving or main shaft, E, provided with a band-wheel or its equivalent, is suitably mounted in the main frame A. One of the pair of bearings, *e e*, for the driving-shaft is clearly shown in Fig. 1. A positively-actuated roll, E′, is fastened to the driving-shaft, and at the opposite sides or faces of this roll cams G G, of less diameter than the roll, are also fastened to this shaft. These cams may be made quite small—say of half or even less than half the size of the roll E′—and are exactly alike and correspondingly arranged upon the shaft at the sides of the roll.

A vibrating bifurcated frame is jointed at the extremities or lower ends of its arms H H to the supporting-frame A by suitable pivots, *h h*, so that it may rock vertically. The arms of this frame are shown as curved away from the roll E′, or bent outward from or near their centers. Rollers *g g* are mounted, one upon each arm, at the angles or midway the curves of the arms, and these rollers respectively bear upon the peripheries of the respective cams G G. The forked frame is shown as made in three parts or sections, consisting of the two arms H H, and a pivoted cross-bar or connecting-top portion, H′, trunnioned at its ends in the tops of the arms, so as to be free to rock independently of the frame-arms. The rocking frame, bridge-piece, or cross-bar H′ has an opening through it in which a sleeve, I, is supported, so as to be free to turn and move endwise in the bearing-opening. A hand-wheel, I′, is fastened at one end to the sleeve I, and a removably-secured collar, *i*, is fastened to the other or inner end of the sleeve. That the sleeve I may be moved endwise along a rod, I^2, which constitutes the shank or controlling-arm of a yoke, J, to be described farther on, the hub of the hand-wheel is either provided with a screw-thread to match a thread upon the yoke-shank, or with a nut, *i′*, (see Fig. 13,) which is firmly secured in a recess in the hand-wheel hub. The sleeve I may be moved inward or outward by turning the hand-wheel in the proper direction, and the frame H H H′ rocked so as to cause its rollers *g g* to move toward or away from the cams G G. Two thrust-springs, G′ *g′*, upon the sleeve I, bear at the inner or adjacent ends upon the opposite

sides of the cross-bar H′ of the rocking frame, while the other ends of these springs bear, respectively, against the hub of the hand-wheel and the collar *i* on the sleeve, for a purpose to be explained. The spring G′ is longer or of greater resiliency than the spring *g*′, which acts as a buffer or yielding washer, and the two oppose each other in pressure exerted by them upon the rocking frame.

The idle-roll F of the pair of griping-rolls, as before stated, is not geared with the roll E′, but is caused to rotate only by contact with the lifter, when the latter is in motion, and the intermitting contact of the idle-roll with the lifter results from the movements given this roll—through or by way of the controller or yoke J—from the cams G G, vibrating frame H H H′, &c., above described. The remaining features of suitable cam-actuated mechanism connecting the driven and the idle-roll and the manner of supporting the idle-roll are, by preference, as follows:

The shank or rod extension I² of the controller or yoke proper, J, connects with the center of the bow, or at the junction of the forks of the yoke, and these forks are pivoted at their outer ends respectively with an eccentric rocking frame, which, like the before-described rocking frame, acted upon by the driven-roll cams, is made in sections consisting of two arms, J′ J′, and a removable cross bar or rod, J², connecting the outer ends of the arms. A weight or counterpoise acting constantly with a tendency either to rock this eccentric actuating-frame downward or away from the driven roll E′, or to hold it in the position it occupies when the roll F is inoperative, is shown as formed by a heavy roller, F′, mounted on the cross-rod J². Nuts *j j*, upon the threaded ends of the cross-rod J² and the hub of the counter-balance roller F′, serve to brace the outer ends of the frame-arms J′ J′. The inner ends of these frame-arms are respectively fastened to or rigid with their respective eccentrics or rollers K K, which are supported in suitable bearings or boxes, *k k*, in the supporting-frame A. The idle-roller F is fastened upon its shaft *f*, which at its ends is mounted eccentrically, and so as to turn loosely in the rollers or eccentrics K K. The yoke-arms J J are pivoted at their ends to the arms of the eccentric rocking frame. Pivot-bolts *f*′ *f*′ and their nuts connect the yoke with the eccentric-frame arms J′ J′, about midway between the eccentrics and the counter-balance F′.

The lifter B is, by preference, considerably reduced in thickness next the cross-head by recesses *b*² *b*², and also tapered or made gradually thinner from this cut-away part to its opposite end. One object of so forming the board is to make it self-adjusting, or give to it a degree of flexibility sufficient to reduce to a minimum the frictional contact of the lifter against the driven griper-roll in the descent of the pestle. Were the lifter made quite stiff or unyielding, as by constructing it throughout of the same thickness which it is necessary to give it for its main portion to secure proper strength, the lifter would chafe and wear injuriously by its hard pressure against the driving-roll E′ in its fall. By tapering the lifter, as shown, I also provide for securing a very tight gripe upon the board by the rolls in starting, as will be more fully set forth farther on, and thus avoid possibility of slip at the time when the greatest power is required.

From the above description the following reference to the operation of parts of the mechanism so far alluded to will readily be comprehended, assuming the following-named parts to occupy positions and to be adjusted as now to be mentioned, whether the mill be at work or merely ready to be started. The lifter and pestle are in their inoperative or lowermost positions, as shown in Figs. 1 and 2, and about as shown in Fig. 5. The cams on the driving-shaft, or at the sides of the positively-actuated griping-roll, at this time occupy positions such as to present their cut-away or cam surfaces to the rollers of the rocking frame, say, as shown in Fig. 3, or as if viewed at a period in the revolution of the cams slightly before the time at which they would be brought to positions in which one of them is represented in Figs. 1 and 5. The spring G′ is compressed by turning the hand-wheel I′, and the rocking frame H H H′ thus caused to occupy a position such as will present the rollers *g g* to the cams, and hold them up to the cams with sufficient pressure, while admitting of the proper amount of play to accommodate for inequalities of surface or variations in the thickness of the lifter by the yield of the idle-roll, as will presently be understood. The roll E′ being revolved in the direction indicated by the arrows thereon in various figures of the drawings, the cams will be brought to positions which will cause their regular or concentric surfaces to act upon the rollers of the rocking frame. By or slightly before the time the cams and the cam-actuated rollers occupy the relative positions in which they are represented in Figs. 1 and 5 the rocking frame will have been vibrated on its pivots and rocked outward at top against the hand-wheel and the yoke-shank by way of the spring G′. This movement of the rocking frame is due, as will readily be perceived, to the action upon its rollers of portions of the cams of greater radii than those portions to which the rollers had previously been presented. The rocking of the frame imparts a similar movement to the idle-roll F through or by way of the controller, its shank, and the remainder of the connecting mechanism between this roll and the cams G G. The two rolls are thus caused to firmly, though yieldingly, gripe or press upon the opposite sides of the lifter, which is raised and then dropped by being released from the rolls upon the presentation of the recesses in the cams to the rollers of the rocking frame, the rocking frame swinging inward and the idle-roll away from the lifter. As the lifter is thickest where it is first acted upon by the rolls the pressure exerted upon it

at such point is obviously greater than that exerted upon it elsewhere, as the spring G′ has to yield and be compressed and therefore exert its greatest force to draw the idle-roll against the lifter at the time that this roll is forced, in adjusting itself to the lifter, to occupy a position farther away from the roll E′ than at other times. The proper degree of pressure upon the lifter by the griping-rolls is thus exerted at a time when the greatest power is required, and slip or yield prevented. Proper action of the griping-rolls upon the lifter in starting is greatly aided by decreasing the effect of inertia, or aiding the rolls to overcome it by the employment of the spring D. Another advantage arising from the arrangement of this spring in the manner before explained is that in event of overspeeding the rolls, so that they catch the lifter on its descent, the concussion is greatly lessened and liability of breakage of parts reduced to the minimum, for, when the lifter is suddenly arrested in its drop, the unyielding weight only of the lifter and cross-head has to be sustained, the movement of the pestle and its rod being gradually arrested as the spring D yields and allows of the endwise movement of the pestle-rod independently of the cross-head and lifter. The weight of the pestle and lifter being considerable results in frequent breakage of parts, particularly when cams are employed to operate the lifter, when the cams are brought to act upon the board too quickly or before it has fully dropped.

In order to arrest the movement of the lifting-board and pestle, or to stop any one of a series of pestles driven from a common shaft without stopping the driving-shaft or interfering with the operations of other pestles of a series, a segmental cam or eccentric, L, operated by a lever, L′, is pivoted in a suitable way, as by a tie-rod or cross-shaft *l*, of the frame A, and in such relation to the cross-head, when elevated, that it may be caused to bear thereon and force or jam it tightly against its guideways, so as to create sufficient frictional contact between the cross-head and guideways to prevent movement of the lifter. In Figs. 1 and 2 this lifter arresting and supporting eccentric L is shown in its inoperative position, and in Fig. 3 it is shown in operation.

Any suitable means may be employed for supporting the operating-lever L′ in position to hold the eccentric against accidental operation. In this instance a rest or bracket, M, is employed. The lever rests inside the lug *m* of the bracket. When it is desired to stop and hold up a lifter, the lever is seized, and by raising and then forcing or springing it sidewise is cleared of the rest. The cross-head, if already elevated, will catch upon the eccentric at the commencement of its descent, and if ascending will first act upon and rock the eccentric out of the way and then engage it.

A projection, N, on the side of the cross-head affords a hold for a lever, by which to raise the lifter to a position higher than that at which it may be supported by the eccentric L, and thus, if desirable, elevate the lifter clear of or above the griping-rolls at its lower end. Any suitable bar or lever may be rested or fulcrumed upon the tie-rod *l′* of the frame, with its end under the projection N, and the lever may be made heavy enough or of length sufficient to hold up the lifter.

It is obvious that the griping rolls or nippers may be thrown out of action upon the lifter by adjusting the hand-wheel I′ in a suitable way, so as to relieve the rocking frame or free it from pressure by the spring G′, and thus prevent the adjustment of the idle nipper-roll, which is necessary to cause it to act.

The mortar C is provided with a discharge opening or chute, O, at one side of the center of its bottom. (See Figs. 1, 9, and 10.) A slide, O′, is fitted between guide flanges or brackets *o o* on the mortar, and works in an opening terminating in the mortar above the chute O. A wedge, P, passing through holes in the guideway-lugs *o o* and bearing against a shoulder, *p*, of the slide, serves to hold the slide in place. By forming the discharge-opening low down or close to the center of the bottom of the mortar the grain can readily be run out. It should be noticed that the inner end of the slide is curved to correspond with the shape of the mortar-bottom, and that the slide is supported at its extreme inner end by a seat, *o′*. It is thus firmly supported against the blows of the pestle and pressure of the grain. The mortar is provided with a "turning-ring" or device, by which the portion of grain directly beneath the pestle, when it strikes a blow, is directed toward the sides of the mortar and upward, forcing other portions of the mass from the sides of the mortar into position to be acted upon by the next blow of the pestle.

Instead of employing, as heretofore, either a rice-turning ring or annular band resting loosely or without any support upon the mass of grain, or a ring rigidly secured in place in the mortar, I provide, as shown in Figs. 11 and 12, a series of arms, Q, say, three, which are curved and secured at top to the mortar, and are provided with stops *q* at bottom to prevent the ring Q′ from falling off the skeleton supporting and guiding frame thus formed. The ring is attached to this frame by means of suitable bearing clips or eyes, *q′*. The arrows indicate the circuit or movement imparted to the rice by the ring and pestle.

As advantages arising from the use of a ring supported as just described, instead of a loose ring or one merely resting on and supported by the rice, or a rigidly-supported ring, it may be mentioned that it does not get out of center or under the pestle, nor become tilted, as a ring laid on the rice without guide or support is liable to, nor does my ring always occupy a fixed relation to the mortar regardless of the amount of rice or its shrinkage as operated upon, but, on the contrary, follows the rice as it shrinks, always operating uniformly, which is not the case with fixed rings.

In Fig. 13 is illustrated a modification by

which a cam roll or eccentric is employed instead of a cylindrical roll. In this way the advantages arising from the employment of my system of nipping-rolls and the use of the tapered or flexible lifting-board are retained, while giving a greater pressure upon the lifter after starting them by the preferred construction hereinbefore in detail explained.

It is obvious that any desired number of pestles may be operated from the single driving-shaft merely by duplicating the parts, that hand-power may be adapted to work small mills constructed in accordance with my invention, and that, instead of elevated or overhead mortars and thrusting-pestles, low-down mortars, with the driving mechanism above to lift the pestles by pulling instead of thrusting, may be used in connection with essential features of my improvements.

I am aware that it is old, broadly considered, to support one of a pair of griping-rolls or revolving nippers in a cam-actuated vibrating frame, and to intermittingly actuate such roll or nipper so as to cause it to approach and recede from the other roll of the pair, as well as to hold the adjustable roll up to its work with yielding pressure, and therefore I do not unqualifiedly claim griping-rolls so supported and actuated; neither do I broadly claim the employment of a spring in connection with a lifter to relieve shocks, &c., nor the employment of a lever to arrest and hold up a lifter, nor a mortar provided with a discharge-opening and means for closing it, as such features and constructions, unqualifiedly considered, are older than my invention.

I claim as of my own invention—

1. The combination, with a griping-roll-actuated rising and falling lifter, of an idle or intermittingly-operated griping-roll, a controlling-frame, rollers rigidly attached to said frame, the shaft of the idle-roll eccentrically mounted in said rollers, and means by which to rock the rollers and thereby cause the idle-roll automatically to bear against or vibrate away from the lifter, substantially as and for the purpose hereinbefore set forth.

2. The combination of the positively-actuated roll, the idler or intermittingly-actuated roll, its controlling-frame, rollers rigidly secured to said frame, the shaft of the idle-roll mounted eccentrically in said rollers, a counter-balance acting with a tendency to rock said rollers in a direction such as to move the idle-roll away from the positively-driven roll, and a controller by which to cause the idle-roll to approach the positively-driven roll automatically and at intervals, substantially as and for the purpose hereinbefore set forth.

3. The combination, substantially as hereinbefore set forth, of a pair of griping-rolls, one of which is positively driven, cams by the sides of and rotating with said positively-actuated roll, an eccentric actuating rocking-frame adjustably supporting the other roll of the pair, and cam-actuated connecting mechanism by which said adjustable roll is moved toward and away from the positively-driven roll, and thus intermittingly brought into position to co-operate with the driven roll, for the purpose described.

4. The combination of the driving-shaft, the griping-roll fast thereon, the cams at the sides of said roll revolving with the driving-shaft, the vibrating frame actuated by said cams, the eccentrically-mounted adjustable griping-roll, and the controller or yoke connected with the adjustable support of said roll, and yieldingly connected with the cam-actuated vibrating frame, substantially as and for the purpose hereinbefore set forth.

5. The combination, substantially as hereinbefore set forth, of the driving-shaft, the roll thereon, the cams, the vibrating frame, its rollers acted upon by the cams, the trunnioned cross-bar of the vibrating frame, the adjustable sleeve passing through said bar, the adjustable roll, the rod or yoke-shank by which the adjustment of said roll is controlled, and the spring acting upon the vibrating frame to press the rollers thereof against the cams on the driving-shaft, for the purpose described.

6. The combination of the positively-actuated griping-roll, the adjustable idle-roll, the cams at the sides of the positively-driven roll, the vibrating frame actuated by said cams, the yoke by which to adjust the idle-roll, its rod or shank, the sleeve thereon, the hand-wheel, and the spring bearing at its opposite ends against the hand-wheel and against the pivoted cross-bar of the cam-actuated vibrating frame, substantially as and for the purpose hereinbefore set forth.

7. The combination of the frame, the cross-head, the lifter tapered to reduce its thickness gradually from a point near the cross-head to its opposite or free end, and the griping-rolls, as and for the purpose set forth.

8. The lifter cut away next the cross-head and tapered to gradually increase its thickness from its free end to said cut-away part, as and for the purpose described.

9. The combination, substantially as hereinbefore set forth, of the lifter, the pestle, the positively-actuated griping-roll, the intermittingly-acting griping-roll, and cam-actuated connecting mechanism between said rolls to move the idle-roll up to the lifter at intervals, as described.

10. The combination, substantially as hereinbefore set forth, of the lifter, griping-rolls by which it is actuated, the lifter cross-head, the pestle, its rod supported by and movable endwise independently of the cross-head, and the spring for relieving concussion upon the rolls and aiding in overcoming inertia in starting the lifter and its attachments.

11. The combination of the lifter cross-head provided with an endwise and shouldered opening, the headed rod fitted thereon, the collar on said rod, and the spring interposed between the collar and cross-head, substantially as and for the purpose hereinbefore set forth.

12. The combination of the cross-head provided with an endwise and shouldered opening, the lifter fitted in the enlarged flaring end of said opening, the headed rod or shank fitted and movable endwise in the smaller end of said opening, and having its head confined between the lifter end and shoulder of the opening, and the spring acting at one end against the shank and bearing at its opposite end upon the cross-head, substantially as and for the purpose hereinbefore set forth.

13. The combination, substantially as hereinbefore set forth, of the supporting-frame, the lifter, the cross-head, the eccentric acting on the cross-head, and its controlling-lever.

14. The combination of the supporting-frame, the lifter, the cross-head, the eccentric mounted upon a cross-shaft or tie-rod of the frame, the lever, and the rest for the lever, substantially as and for the purpose hereinbefore set forth.

15. The combination of the griping-rolls, the supporting-frame, the pestle, the lifter, and the cross-head provided with the projection by which the lifter may be raised clear of the griping-rolls, as described.

16. The combination of the mortar having the discharge-opening in its bottom close to its center, the slide, the guideway-flanges therefor, and the wedge passing through said flanges and acting upon the shoulder of the slide, as and for the purpose described.

17. The combination of the mortar, the rice-turning ring, and the skeleton supporting and guiding frame therefor, substantially as and for the purpose hereinbefore set forth.

In testimony whereof I have hereunto subscribed my name this 8th day of September, A. D. 1881.

FRED BROTHERHOOD.

Witnesses:

A. G. ROSE,

LLOYD B. WIGHT.