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J. F. WINCHELL.

CRUSHING AND GRINDING MILL.

No. 342,311. Patented May 18, 1886.

Fig. 1.

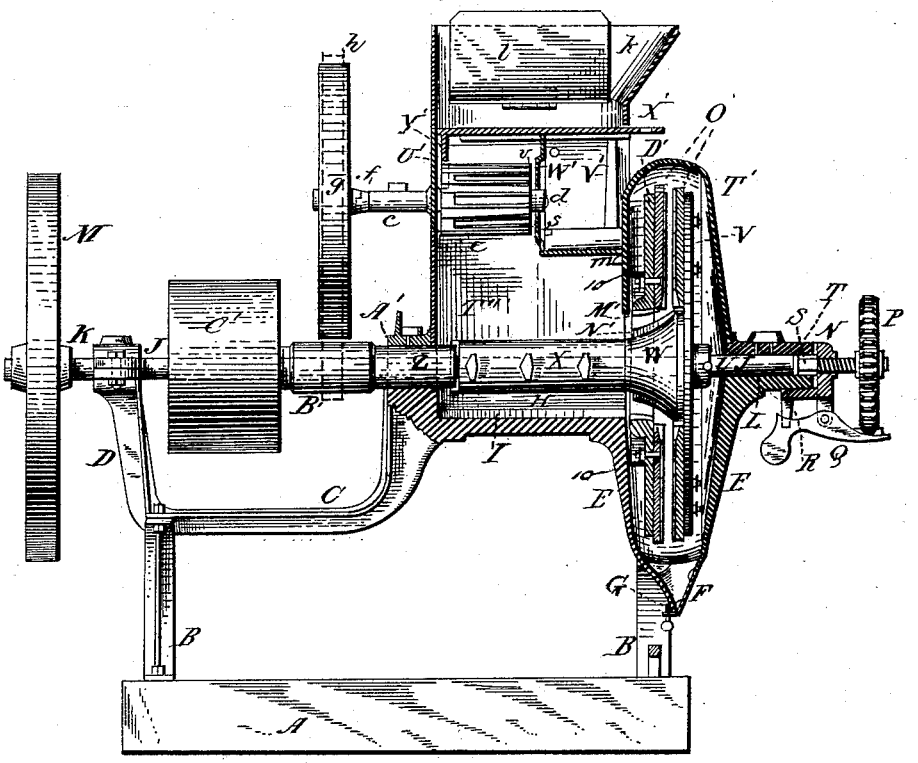
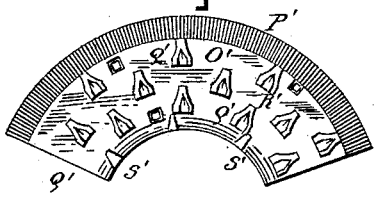


Fig. 2.



WITNESSES

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CRUSHING AND GRINDING MILL.

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Fig. 3.

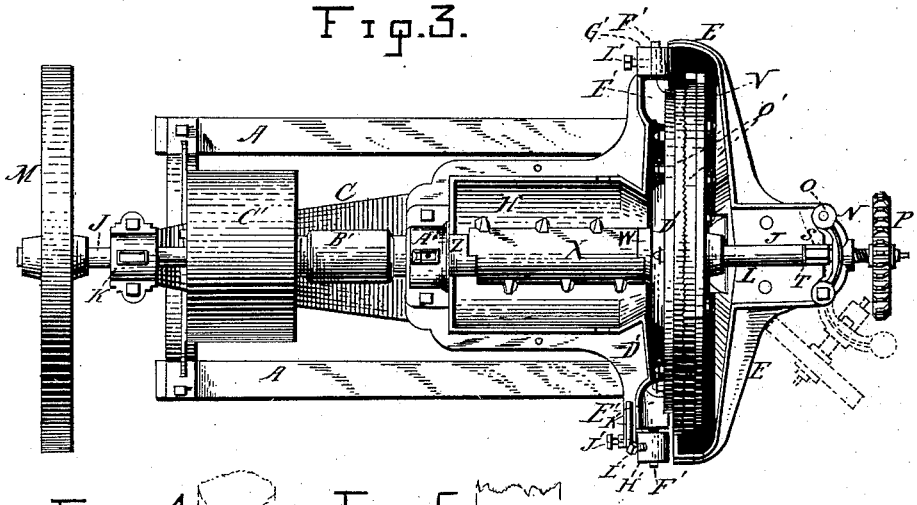

Fig. 4.

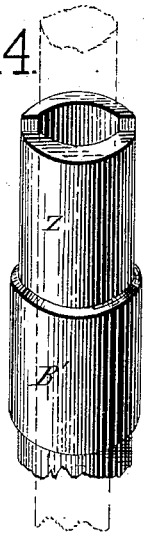

Fig. 5.

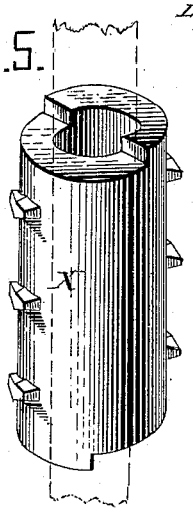

Fig. 6

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Fig. 8.

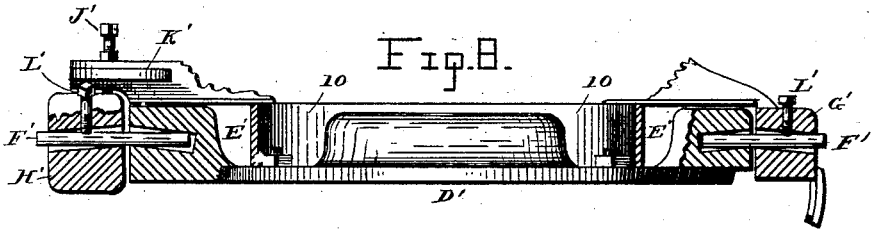


Fig. 7.

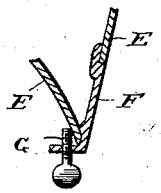


Fig. 9.

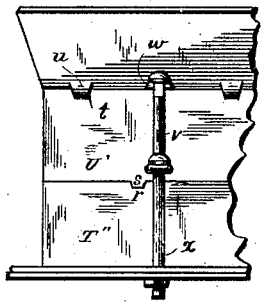


Fig. 10.

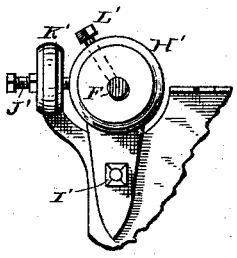
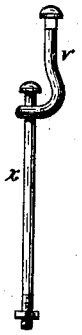


Fig. 11.



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CRUSHING AND GRINDING MILL.

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Fig. 12.

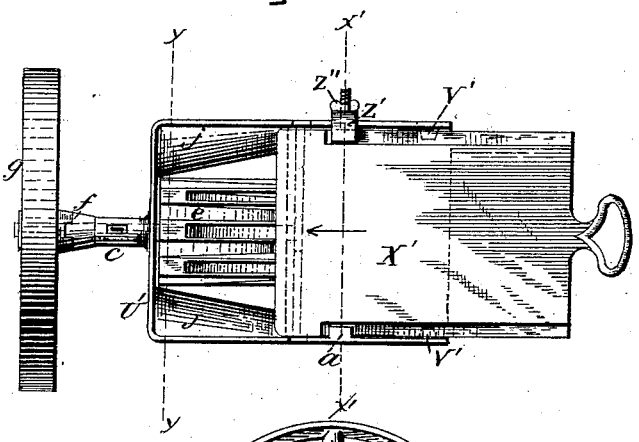


Fig. 13.

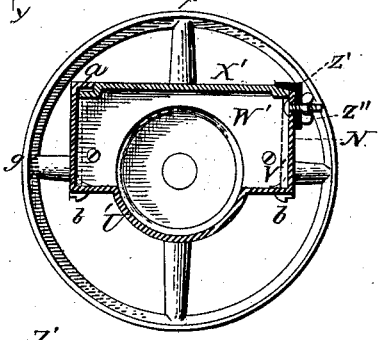


Fig. 14.

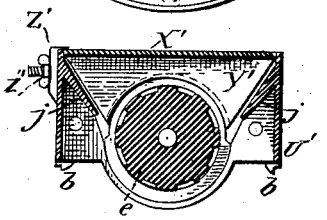
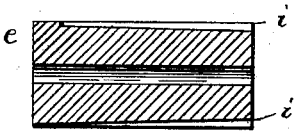


Fig. 15.



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UNITED STATES PATENT OFFICE.

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CRUSHING AND GRINDING MILL.

SPECIFICATION forming part of Letters Patent No. 342,311, dated May 18, 1886.

Application filed November 9, 1885. Serial No. 182,241. (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 improvements in crushing and grinding mills, and it is designed to crush and reduce bark, bones, and other substances, and to reduce cereals of various kinds; and it has for its objects, first, to provide a mill with a crusher and a grinding-head, so locked together that the motion of one is transmitted to the other, and with means to maintain this engagement and of such a nature as will not become dislodged and caught in the working parts of the mill; second, to provide a mill with a crusher and a grinding-head locked therewith, and with a sleeve locked to the crusher, whereby motion received from the head will be transmitted by the crusher to the sleeve; third, to provide a mill with a force-feed device or devices, which will act to positively feed the material from a hopper to or toward the grinding mechanism proper; fourth, to provide a mill with a grinding-head mounted so as to maintain a set position with respect to the other grinder by frictional contact with its mountings.

In the accompanying drawings, forming a part of this specification, and on which like reference-letters indicate corresponding features, Figure 1 represents a vertical sectional view of the casing, generally, of the machine, showing a portion of the mechanism in section and a portion in side elevation; Fig. 2, a detached face view of one of the segmental grinding-plates; Fig. 3, a plan view of the machine with the upper portion of the casing and the feeding mechanism and hopper removed; Fig. 4, a detached perspective view of the combined feeder-operating pulley and sleeve; Fig. 5, a like view of the crusher; Fig. 6, a detached view of the outer face of one of the crushing-lugs; Fig. 7, a vertical sectional view through a part of the lower portion of the casing and the door; Fig. 8, an enlarged detached partial edge and sectional view of the stationary grinding-head, showing that part of the main frame which is in immediate juxtaposition; Fig. 9, a partial side elevation of the hopper-box, the feed-box, and the upper portion of the casing, showing the means of connecting the same together; Fig. 10, a side elevation of the bracket for supporting one side of the stationary grinding-head, showing also the adjacent portion of the main frame and the adjusting-screws; Fig. 11, a detached view of the bolts for binding the casing, the feed-box, and the hopper together; Fig. 12, a detached plan view of the feeding mechanism; Fig. 13, a transverse section of the same on the line x' x', looking in the direction of the arrow; Fig. 14, a like section on the line y y, looking in the opposite direction; and Fig. 15, a longitudinal sectional view of the feed-roller.

The letter A designates the sills, to which the standards B are firmly secured, and the letter C the general frame of the machine, which is bolted or otherwise secured to the said standards, and which consists of cast-iron and terminates in a shaft-support, D, at one end, and in a semicircular shell or casing, E, at the other end. The lower portion of the casing E is provided with a discharge-opening and a detachable door, F, having a lug on its upper inner end, which engages the casing, and a similar lug at the lower inner end, which also engages the casing, as seen in the lower right-hand portion of Fig. 1, and in detail in Fig. 7. The door is further provided with a lip and set-screw, G, by means of which its position with respect to the casing is maintained, the screw tending to bind the door closer to the casing as it is screwed more tightly. The intermediate portion of the frame C is hollowed out to form a chamber, H, having one or more longitudinal recesses or grooves, I, which serve the function of arresting the escape of corn-cobs, and of holding them against the action of the crushers when the machine is organized for reducing large substances.

The letter J designates the main shaft or arbor of the machine, which extends from end to end, and is supported in suitable boxes at K and L, and which carries a balance-wheel, M, and is longitudinally adjustable by means of an adjusting device, now about to be described. This device consists of a yoke, N, pivotally

mounted at one end to the end of the machine, and secured at the other by a wooden or other fragile pin, O, whereby it will yield or break in case any hard substance—as a stone—is accidentally thrown into the machine. This yoke has a screw-threaded opening, in which works an adjusting-shaft correspondingly threaded and provided with a hand-wheel, P, the periphery whereof is provided with notches graduated with respect to the number of threads to the inch on the shaft, whereby a rotation of one or more notches will adjust the space between the grinding-surfaces to a predetermined distance or quantity. To the lower part of the yoke is pivotally mounted a weighted locking-dog, Q, guided by lugs R at its inner end, and engaging the notched wheel at the other. A metallic block, S, and an anti-friction washer, T, are interposed between the main shaft J and the adjusting-shaft, the washer being composed of some smooth and lasting substance. Secured to the main shaft, in the present instance by a pin, U, is a grinding-head, V, of disk form, the said pin engaging its hub. On the face the head is provided with a conical boss, W, having a curved exterior and provided with an offset on its face, so as to present two distinct vertical planes when in the position shown in Fig. 3.

The letter X designates a sleeve or cylindrical crusher mounted upon the shaft J, and constructed at both ends with offsets adapted to register, respectively, with the offset on the face of the boss W. The exterior of the crusher is provided with a series of lugs, whose sides are fashioned each into two surfaces. The angle of the said surfaces to each other on one side is slight, while the angle of the surfaces on the other side is increased, the result of which is to feed the grain from the chamber H into the space between the grinding-surfaces more or less rapidly, according to the position in which the crusher is placed, for when the greater angle of the lugs is placed toward the boss W the grain is fed more rapidly from the chamber and into the said space than when the lesser angle is placed toward the said boss. Also mounted upon the shaft J is the sleeve Z, having a bearing at A′ in the main frame, thereby serving to support the shaft J at this point. The sleeve has its end adjacent to the crusher provided with an offset adapted to register with that in the end of the crusher, whereby rotary motion imparted to the crusher by the revolving grinding-head will rotate the sleeve. The peculiar means for driving the crusher, however, is embodied in Letters Patent granted to me April 15, 1885, No. 297,049. The sleeve is constructed with an enlargement, which forms a pulley, B′, and by reason of its increased diameter the oil from the adjacent journal is prevented from reaching the belt. To the shaft is also secured the driving-pulley C′. By the above arrangement of offsets I am enabled to turn the crusher end for end, and yet rotate it in either direction. This also avoids the necessity of resorting to set-screws or anything of that nature which is liable to become disconnected and get caught in the working parts of the machine, thereby causing serious injury, and sometimes exposing the operator to danger.

The letter D′ designates the stationary grinding-head, which, like the rotating grinding-head, is of disk form. It is provided at diametrical points with bosses E′, integrally formed therewith, and in each of these bosses is fitted somewhat loosely a trunnion-pin, F′, which also extend, the one into an enlargement, G′, formed integrally with the frame, and the other into an adjustable bracket, H′, secured to the main frame by a bolt, I′, or other equivalent device, in such wise as to admit of adjustment to and from the rotating grinding-head. An adjusting-screw, J′, passing through a lug, K′, extending from the frame, serves to adjust the bracket H′. The holes in the enlargement G′ and the bracket H′ are preferably at a slight angle to the adjacent holes in the stationary head D′, in which the trunnion-pins F′ fit, as illustrated in Fig. 8. The object of this construction is to secure the position of the head D′ by means of the set-screws L′, wherever set. For instance, when, from any cause, the rotating head loses a true vertical position, and it is desired to set the stationary head to agree therewith, it is simply necessary to operate the adjusting-wheel, force the rotating head against the stationary head, and thus cause the latter to change its position until the two heads agree. The wheel is then turned back until the proper space is had between the heads for grinding purposes. The friction between the trunnion-pins and the holes in the bosses on the stationary head and in the brackets prevents the head from losing its adjusted position. The object of adjusting the bracket H′, as above indicated, is to adjust the stationary head with respect to the rotating head in case the position of the main shaft should vary from a right angle to the stationary head on account of shifting laterally in a slight degree. This adjustment of the stationary head is also of importance in setting up the machine, as it saves the expense of the finer workmanship, which would otherwise be required to secure the proper relative position of these heads. Inasmuch as the bracket G′ is a part of the main frame of the machine, and inasmuch as the bracket H′ is firmly secured by the bolt I′ to the said frame after any given adjustment, and inasmuch as the trunnion-pins F′ are prevented from moving in said brackets by the set-screws L′, practically speaking, the said pins become firmly secured to the frame. The said head D′ is provided with a central opening and is thickened about the opening, and has several ribs M′, projecting inwardly into the opening, which act in conjunction with the similar ribs, N′, projecting from the boss W. These ribs approach each other in the direction of the grinding-plates, and their function

is to draw and somewhat reduce to a finer state the material under operation from the chamber H.

The letter O′ designates the grinding-plates, the same being preferably constructed of cast-iron and of segmental form, and being provided on their inner faces and near the periphery with a series of V-shaped ribs or teeth, P′, as also with a series of grinding studs or protuberances, Q′, preferably of the form shown—that is, with curved and straight sides and recesses R′, the latter affording additional grinding-edges. The lugs S′ serve as a continuation of the ribs M′ and N′, and thus assist in drawing the material between the grinding-plates. These plates are bolted to the grinding-heads in any convenient manner.

The letter T′ indicates the upper portion of the casing, a part of which envelops the grinding mechanism, and the other part, T″, constitutes a box, which fits over and conducts the grain and cobs, as the case may be, to the chamber H.

The letter U′ designates the feeder-box, which fits upon the portion T″ of the casing, and is provided with ribs V′ and a partition, W′, which serve to support a slide or cut-off, X′. This slide has a depending wing, Y′, which serves to clear the feed-wheel of any undue accumulation, and is beveled off on one side, against which bevel a bracket, Z′, is adapted to be impinged by a screw and thumb-nut, Z″, for the purpose of holding the slide in any fixed position. The opposite edge is rabbeted and travels beneath a lip, *a*. The lower side of the box has notched lugs *b*, which engage the upper edge of the portion T″ of the casing and maintain the box in position.

The letter C indicates a bearing projecting from the box, and *d*, a bearing formed on the partition W′. In these bearings the shaft of the feeding-roller *e* is mounted, and through the clutch *f* and the band-wheel *g* (whose hub has a corresponding clutch-surface) rotary motion is imparted to the said roller, a band, *h*, being employed to connect the wheel *g* with the pulley B′. The feeding-roller is provided on its periphery with an alternating series of longer and shorter grooves, slightly deeper at one end, *i*, than at the other, as seen in Fig. 15, the ribs or edges left between the grooves serving to effect a forced feed of the grain. The box is also provided with inclined inner walls, *j*, which guide the grain to the roller, and which reduce the space between the roller and the walls proper of the box. These inclined walls taper from the roller in the direction in which the slide is opened, thus increasing the width in the space, as well as the length thereof, for the passage of the material as the slide is drawn out.

The letter *k* designates the hopper, which fits upon the box U′ and supplies the material to be acted upon. This hopper is provided with a hinged flap, *l*, which serves no purpose in the machine as organized in this application, but which serves the purpose of preventing the broken corn-cobs (or the grain when the cobs are ground with the grain on them) from being thrown up by the machine, as described in my application filed February 27, 1886, Serial No. 193,464, for improvements in crushing and grinding mills.

The portion T″ of the casing has several recesses, *r*, in the upper edge, and the feeding-box U′ has lugs *s* and notches *t*, which fit each other and serve to keep them in proper relative position. The hopper also has lugs *u*, which engage the notches of the boxes or the notches of the portion T″, as the case may be, for the same purpose. Should it become necessary, however, to bind the several structures together, as seen in Fig. 9, then I engage a bolt, *v*, with a lug, *w*, on the hopper, and pass a bolt, *x*, through an eye in the said bolt *v*, and through an opening in the main frame, and apply a nut. When the feeding-box U′ is omitted, I secure the bolt *v* directly to the main frame, by passing it through a hole, as seen at Fig. 9, by a bolt similar to the bolt *x*, but very much shorter.

By reason of the construction of the crusher and the sleeve and the boss with which it engages the machine may be successfully operated in either direction, and by reason of the V-shaped or saw-tooth configuration of the grinding-teeth the rotating grinding-head may be run in either direction, and thus keep the teeth sharp and increase the period of their usefulness. The crushing-lugs, having two faces on each side, are, therefore, capable of performing their function, no matter in which direction the crusher-sleeve is rotated.

As already stated, the function of the crusher and its lugs is to convey the grain from the chamber H to the grinders when cereals are being ground.

In order to prevent the material from getting between the stationary grinding-head and the interior of the casing E and T′, and thence out of the discharge-spout without being duly acted upon by the grinding-plates, I provide a rubber or other yielding band, 10, and secure it to the said head in any convenient manner, as by stretching it over the nuts of the bolts which hold the plate to the head, as seen in Figs. 1 and 8.

The devices herein shown and described, but not specifically claimed, and which have peculiar reference to the mill in its crushing capacity, form the subject-matter of claims in my application filed February 27, 1886, Serial No. 193,464, for crushing and grinding mills.

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 main frame provided with a casing and a chamber, of the grinding mechanism consisting of the heads having grinding-plates, and the reversible sleeve or crusher having lugs with angular sides, and mounted to rotate and feed the material to the plates.

2. In a grinding-mill, the combination, with

the main frame having a casing and a chamber, of the fixed and rotating grinding-heads, the fixed and rotating grinding-plates, and the reversible sleeve or crusher having lugs with angular sides, the angle on one side varying from that on the other side, and mounted to rotate and feed the material with varying rapidity.

3. In a grinding-mill, the combination, with the main frame having a casing and a chamber and the stationary grinding head and plates, of the adjustable shaft, the grinding-head mounted thereon and the plates secured thereto, the pulley-sleeve mounted upon the shaft, and the crusher or sleeve constructed to form a locked engagement at either end with the pulley-sleeve and the rotating head, and provided with lugs having angular sides, the angle on one side varying from that on the other side, and adapted to feed the material with varying rapidity.

4. In a grinding-mill, the combination, with the shaft and the pulley-sleeve mounted thereon, and having its end provided with an offset, of a grinding-head having grinding-plates, and a boss having an offset in one end and mounted upon said shaft, and another grinding-head having grinding-plates, and the reversible crusher or sleeve fitting said shaft, and having its ends offset to correspond with the pulley-sleeve and boss, and provided with lugs having angular sides, the angle on one side varying from that on the other side.

5. In a grinding-mill, the combination, with the main frame and a yoke pivotally connected thereto at one end, and having a fragile connection at the other, the adjusting-shaft, and notched graduated wheel and locking-dog, of the main shaft adapted to be longitudinally adjusted by the adjusting-shaft.

6. In a grinding-mill, the combination, with the main frame and the adjusting-shaft and its wheel, the yoke, and the dog, of the main shaft and the interposed block and washer of hard smooth substance.

7. In a grinding-mill, the combination, with the main frame having a casing and the stationary grinding-head adjustably secured thereto and provided with grinding-plates, of the main shaft, the grinding-head secured thereto, and having grinding-plates, the pivoted yoke having a fragile connection with the frame, the adjusting-shaft, its notched graduated wheel, and the locking-dog.

8. In a grinding-mill, the combination, with the main frame having a casing, of the stationary grinding-head and trunnion-pins secured firmly to the frame and fitted somewhat loosely to the holes in the head, the fit creating sufficient friction to normally sustain the head, yet to admit of an adjustment of the head with respect to the opposite head.

9. In a grinding-mill, the combination, with the main frame having a casing, of the stationary grinding-head and trunnion-pins secured to the frame, one adjustably, and fitted somewhat loosely to holes in the head, the fit creating sufficient friction to normally sustain the head, yet which will admit of an adjustment of the head with respect to the opposite head.

10. In a grinding-mill, the combination, with the main frame having an enlargement, and a bracket secured to said frame and having holes therein, of the stationary head having pin-holes at an angle to the holes in the enlargement and bracket, the trunnion-pins fitted in said holes, and the binding-screws.

11. In a grinding-mill, the combination, with the main frame having a casing provided with an opening in the lower part thereof, of the plate fitted to the opening, and having a lug which engages the inside of the casing and an outer lug provided with a binding-screw which impinges against the casing.

12. In a grinding-mill, the combination, with the main frame and the main shaft mounted in bearings in said frame, of the sleeve fitted to said shaft, and having an enlargement to form a pulley, and serving as an intermediate journal for the shaft.

13. In a grinding-mill, the combination of a feed-box provided with a slide and constructed with outer walls and inclined inner walls, the edges of which run at an angle to each other, so as to leave a tapering space between them, and a roller within said box.

14. In a grinding-mill, the combination, with the upper casing having a box-like portion which leads to the grinding-heads, of the feeding-box fitted upon said portion, and having a slide and a grooved feeding-roller mounted therein beneath the slide and constructed to effect a force-feed of the material to the upper casing, and mechanism to operate the roller.

15. In a grinding-mill, the combination, with grinding-heads and an upper casing having a box-like portion which leads to the grinding-heads, of the feed-box fitted upon said portion, and having a slide and a grooved feeding-roller mounted therein beneath the slide and constructed to effect a force-feed of the material to the upper casing, mechanism to operate the roller, and the hopper fitted upon the feeding-box and opening upon the slide.

16. In a mill, the combination, with the grinders, a crusher mounted to rotate and convey the material to the grinders, and the upper portion of the casing, of the feed-box fitted thereon, and having a grooved feeding-roller and the slide, and the hopper fitted upon said box and emptying upon the slide, whereby the material is supplied, regulated, forced, and conveyed to the grinders.

17. In a grinding-mill, the combination, with the feed-box and the slide fitted thereto, of a clamp adapted to bind upon the slide and the binding-screw secured to the box, and having a nut whereby the slide is held in a set position.

18. A grinding-mill comprising the main frame having a casing and a chamber, and the

feeding-box, its feeding-roller and slide, and the hopper, the main shaft, the grinding heads and plates, and the reversible sleeve or crusher having lugs with angular sides, the angle of one side being greater than that of the other.

19. In a grinding-mill, the combination, with the main frame having a casing and a chamber, of the stationary grinding head and plates, the main shaft, the rotating grinding head and plates, the crusher having lugs, and the sleeve and driving-pulley, the sleeve and rotating disk being constructed to engage the end of the crusher.

20. In a mill, the combination, with the casing having notches in its upper edge, of the feeding-box having lugs fitted to said notches and notches in its upper edge, and the hopper having lugs which fit the latter notches, and the devices to bind them together.

21. In a mill, the combination, with a grinding-head and a chamber, of a crusher and a sleeve mounted upon the same shaft, the crusher being constructed to form a locked engagement with the head and sleeve, and to transmit the motion received from the head to the sleeve.

22. In a mill, the combination, with a grinding-head and a chamber, of a crusher mounted upon the same shaft, the crusher being constructed to form a locked engagement with the head, and the sleeve adapted to maintain the crusher and head in engagement.

23. In a mill, the combination, with a suitable frame and grinding mechanism, of a reversible crusher having lugs with angular sides, the angle on one side being greater than that on the other, and constructed to partially reduce coarse material and to feed it to the grinders.

24. In a mill, the combination of a reversible crusher provided with lugs having angular sides, the angle of one side being greater than that of the other, with a crushing-chamber.

25. In a mill, the combination of the reversible crusher or sleeve having both ends formed with an offset and provided on its periphery with a series of lugs having angular sides, the angle of one side being greater than that of the other, with a crushing-chamber.

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

JAMES F. WINCHELL.

Witnesses:

WILBER COLVIN,

A. A. YEATMAN.