

No. 626,125.

Patented May 30, 1899.

W. C. F. ZIMMERMAN.
FEED MILL.

(Application filed Apr. 30, 1898.)

(No Model.)

3 Sheets—Sheet 1.

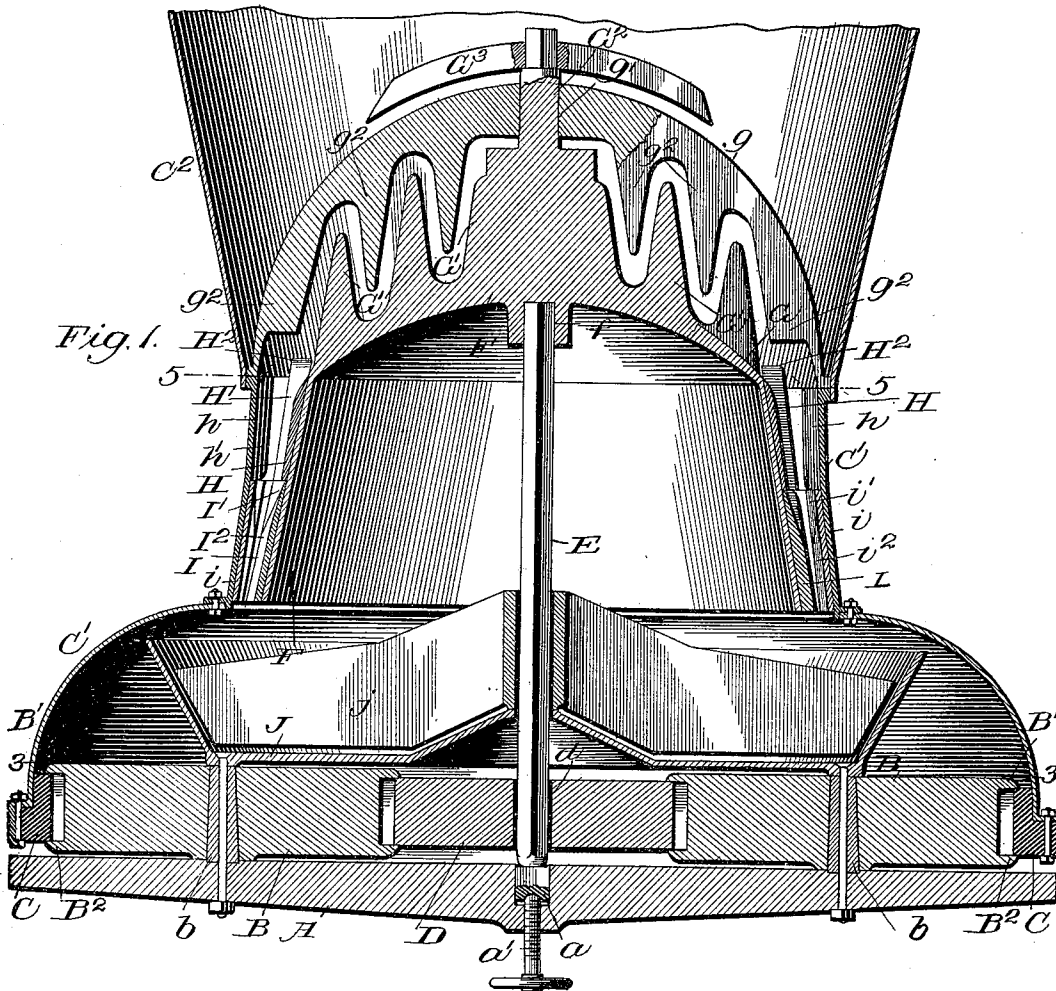
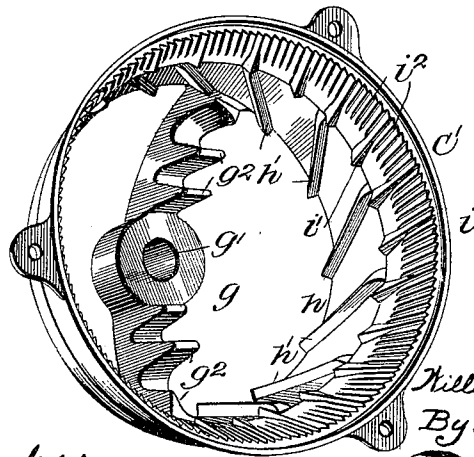
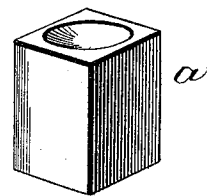


Fig. 7.

Fig. 6.



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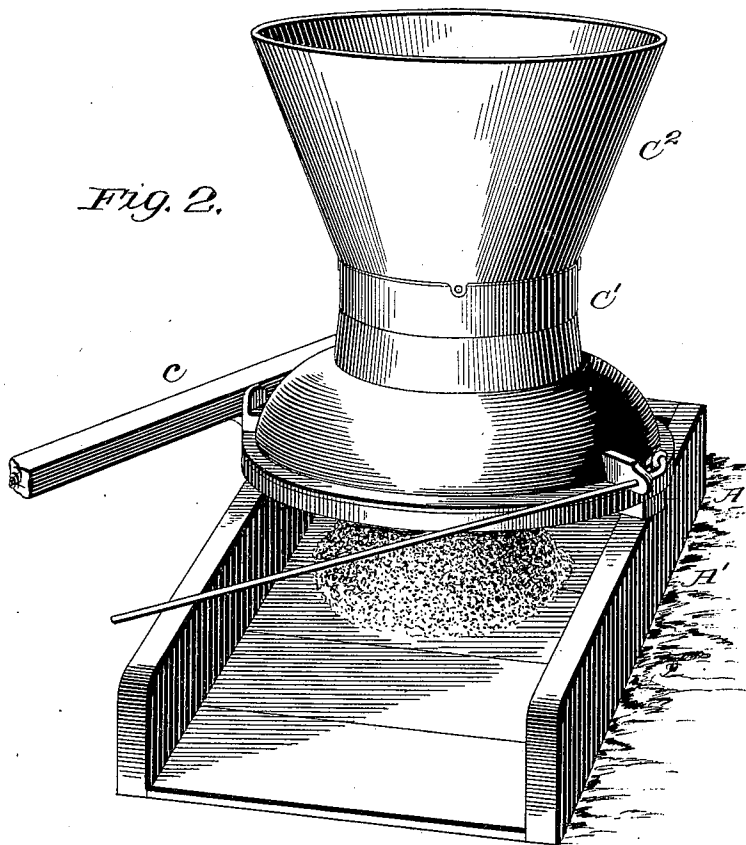
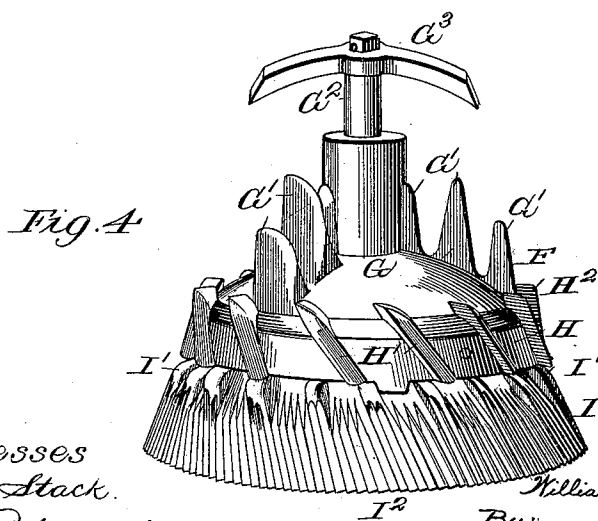
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Fig. 3

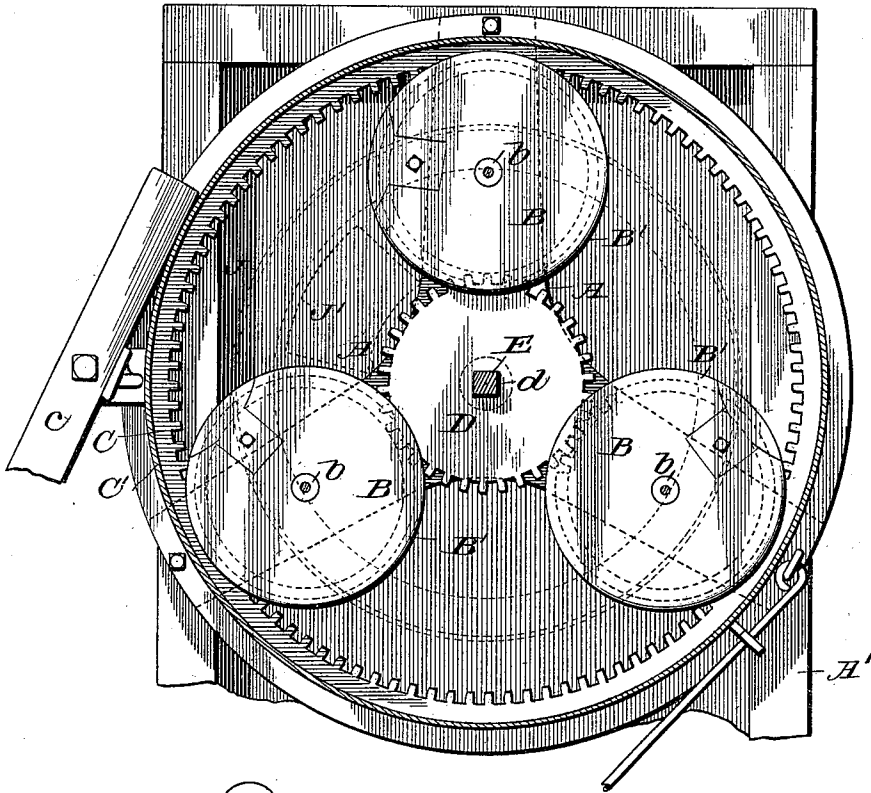


Fig. 5.

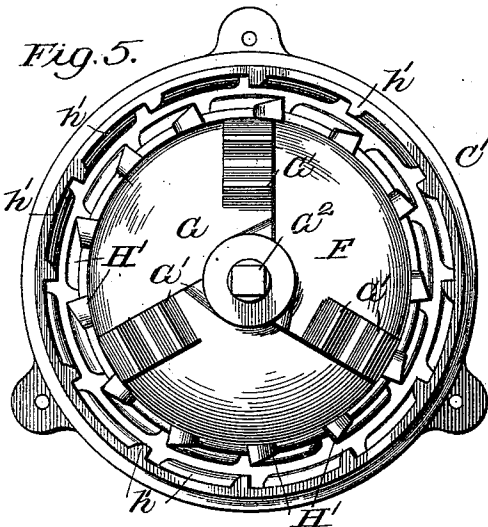


Fig. 8

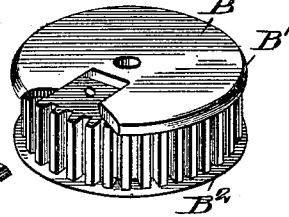
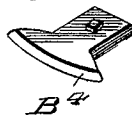


Fig. 9.



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UNITED STATES PATENT OFFICE.

WILLIAM C. F. ZIMMERMAN, OF LONE TREE, IOWA.

FEED-MILL.

SPECIFICATION forming part of Letters Patent No. 626,125, dated May 30, 1899.

Application filed April 30, 1898. Serial No. 679,393. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM C. F. ZIMMERMAN, of Lone Tree, in the county of Johnson and State of Iowa, have invented certain new and useful Improvements in Feed-Mills; and I hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, which form part of this specification.

This invention is an improvement in feed-mills; and its object is to produce a mill that will not become clogged by husks, silk, or other small trash, can be easily adjusted to grind coarse or fine, and will have all the movable parts substantially supported upon a single pivot, and wherein the pressure due to the adjustment of the mill between the movable and stationary parts will be taken up by moving or sliding bearings, so that friction will be reduced to a minimum, and which will be of such simple and efficient construction that it can be readily set up and operated by unskilled workmen.

The invention therefore consists in the novel and improved constructions and combinations of parts set forth in the claims following this specification and illustrated in the accompanying drawings, in which—

Figure 1 is a vertical section of the complete mill. Fig. 2 is an exterior perspective view of the same. Fig. 3 is a transverse section on line 3 3, Fig. 1. Fig. 4 is a perspective view of the interior breaker, crusher, and grinder. Fig. 5 is a detail top plan view, reduced, on line 5 5, Fig. 1. Fig. 6 is a detail view of the exterior crusher and grinder. Figs. 7, 8, and 9 are details.

A designates a base spider-casting having, as shown, three radiating arms and securely fastened upon a base A' of any suitable construction. As shown, this base forms a receptacle to catch the ground material. In the hub of the spider is a vertical angular recess, in which is fitted an angular bearing-block *a*, having its upper end preferably concaved and case-hardened. This block is supported upon an adjusting hand-screw *a'*, by which it can be raised and lowered to regulate the grinding adjustment of the cone and shell. Upon the radial arms of the spider are suitably secured journal-castings *b*, of any suitable construction, upon which are jour-

naled gears B, which are provided with top and bottom flanges B' B², respectively, projecting over the gear-teeth, as shown, for a purpose hereinafter explained. Surrounding and meshing with these gears B is an annular master-gear C, which is supported upon the lower flanges B² of the gears, as shown, and upon this master-ring is supported the exterior casing or shell C' of the mill, and to this master-gear is also attached the sweep *c*, by which the shell and gear are rotated.

Between and meshing with the several gears B is a pinion D, which is also supported upon the flanges B² of the gears B and has an angular bore *d* for the passage of an angular vertical shaft E, which is supported upon the block *a* at its lower end, and its upper end engages a socket *f* in the cone F, which latter is thus supported in the casing C. The top of cone F is formed by a dome-shaped breaker G, provided with upstanding breaking-fingers G' and with a central vertical journal-pin G², which extends through a central opening *g'* in the upper breaker *g*, which is supported on the shell and is provided with depending breaker-teeth *g*², which coast with the teeth G' to break the corncobs and larger pieces of material being operated upon.

On the upper end of pin G² above breaker *g* is secured a sweep, which rotates within the hopper C², surrounding and projecting above the breaker *g* and attached to the shell C'.

Fitted on the upper part of cone F just below breaker G is a crusher H, which is provided with a series of inclined crushing-ribs H', the upper ends H² of which project above the top of the crusher and above the lower edges of breaker G, as shown in Fig. 1, and act as force-feed devices to compel the broken cobs, husks, corn-silk, sticks, and other small trash to pass down between the cone and shell and between the crusher H and the exterior crusher *h*, secured in shell C', near the upper end thereof and just below breaker *g*. This crusher *h* has a series of ribs *h'*, which incline oppositely to ribs H', and it may be formed integral with the breaker *g* and shell C', if desired.

On cone F below crusher H is a grinder I, which may be formed on the cone, but preferably is cast on a ring separate from the cone and slipped thereon, as shown in Fig. 4, be-

ing provided with the usual feeding-ribs I' and reducing or grinding ribs I^2 . The grinder coacts with the exterior grinder i , formed in or secured in the shell C' below the crusher h . Preferably grinder i is formed separate from the shell and bolted in position therein, and it has a series of feed-ribs i' and contacting crushing-ribs i^2 , as shown.

Supported upon the journal b above the gears B is a pan J , into which the ground meal falls and from which it is removed by a sweep j , having an angular bore by which it is loosely fitted on shaft E and rotated thereby, the meal being swept out of the pan through openings J' in the bottom thereof, as indicated in the drawings.

By reference to Fig. 1 it will be observed that the weight of the grinding-cone, with its breaker, crusher, and grinder, is supported upon a single pivot a and that the fine-grinding pressure upon the cone is also supported upon this pivot. The shell is prevented from rising upward when the machine is grinding fine by reason of the master-gear C being held down by the flanges B' of gears B , and although this pressure may be very great it is practically frictionless, because the flanges B' on the gears constitute a sliding or movable frictionless bearing between the gears C and B .

When the machine is adjusted to grind coarse or is running empty, the weight of the shell and gear C is practically carried by the flanges B^2 of the gears B , so that the shell is supported upon or held down by movable or sliding bearings at all times, and thus friction is almost obviated. Therefore instead of wasting power to overcome friction in the machine it can be utilized in useful work. The gear D is supported upon the gears B , as stated, and is not affected by the adjustment of shaft E . The block a can of course be moved up or down to adjust the shaft E and the grinding-cone, but will not rotate, although the shaft E can rotate easily thereupon.

When this machine is adjusted for fine grinding, practically the entire weight of both the inside and outside portions of the machine is borne upon the block a , as the compressed material between the cone and shell almost suspends the latter on the former, and thus at the time when the most power is required the friction is the least.

When the outer casing revolves in one direction, the cone revolves in the opposite direction and with much greater rapidity than the outside casing.

By having the whole weight of the mill practically carried on sliding bearings and using the flanged gears to support and guide the master-wheel and case the friction is reduced to a minimum. By providing crusher H with the projecting force-feed ribs H^2 the mill is effectually prevented from clogging, because the projecting ends of the ribs will catch the husks and corn-silk and force them

down between the crushers and grinders and prevent their clogging on top of the breaker, as they do in ordinary mills. The stirrer prevents the mill clogging above the breakers. The center gear D , it will be observed, has no bearing at all. It is simply supported by the outer gears B . The ribs on the crushers H and h are so set that they will practically shear-cut the material and force it rapidly down to the grinders.

By reason of the above-described novel features of construction the capacity of the mill is greatly increased over those heretofore in use, while the amount of power required to operate it is greatly lessened.

For convenience in assembling the parts of the mill the upper flanges of one or more of the gears B may be provided with removable segments B^4 , as indicated in Figs. 8 and 9. These segments can be removed, so as to permit the pinion to be slipped in place between the gears B , and then the segments can be replaced and secured by bolts or other suitable fastening devices, (indicated in the drawings.) The bottom flanges of the intermediate gears B might be omitted, as the principal pressure is against the upper flanges of these gears when the mill is in operation, and when the mill is empty the hand-screw can be run back or turned down, allowing the master-wheel to simply slide over the cross-arm or casting. For these reasons my invention is not restricted to the employment of flanged gears, except where specifically mentioned in the claims, although I consider the flanged gears very useful elements.

Having thus described my invention, what I therefore claim as new, and desire to secure by Letters Patent thereon, is—

1. In a feed-mill, the combination of the shell, the master-gear supporting it, and the gears meshing with the master-gear and having flanges whereby the master-gear is kept in position, and a central pinion meshing with said gears and supported upon the flanges thereof, substantially as described.

2. In a feed-mill, the combination of the shell, and cone, master-gear supporting the shell and the gears for transmitting motion from the master-gear to the cone, having upper and lower peripheral flanges whereby the master-gear is supported and maintained in horizontal position, substantially as described.

3. In a feed-mill the combination of the shell, the master-gear supporting the same, and the cone, its shaft, the pinion thereon, and the gears for driving the pinion meshing with the master-wheel and having flanges which support both the master-wheel and the pinion, substantially as described.

4. In a feed-mill, the combination of the grinding-cone, the shaft supporting the cone, the pinion thereon and the gears having upper and lower flanges for transmitting motion from the master-gear to said pinion; with a master-gear supporting the shell and

supported and kept in position by and between the flanges on said gears, for the purpose and substantially as described.

5. In a feed-mill, the combination of the grinding-cone, the vertical shaft supporting the cone, the adjustably-supported block upholding said shaft, and the pinion slidably mounted on, but rotatable with said shaft; with gears for transmitting motion from the master-gear to said pinion on said shaft, and a master-gear carrying the shell and supported by the flanges on said gears, substantially as described.

6. In a feed-mill, the combination of the shell, a vertically-adjustable shaft therein, the grinding-cone supported on said shaft, with a pinion slidably fitted on said shaft but rotatable therewith, flanged gears supporting said pinion; and a master-gear engaging said flanged gears and supported and held in position by the flanges thereon, said shell being mounted on said master-gear, substantially as described.

7. In a feed-mill, the combination of the flanged gears, the master-gear supported on said gears, and a shell supported on said master-gear carrying the exterior grinder, crusher and breaker, substantially as described; with a vertically-adjustable angular shaft, a pinion thereon meshing with and supported by said flanged gears, and the cone supported on said angular shaft carrying the interior breaker, crusher and grinder, substantially as described.

8. In a feed-mill, the combination of the spider, the gears journaled thereon, the master-gear supported on said gears, and a pinion also supported on said gears, and a shell supported on said master-gear, and carrying an exterior grinder, crusher and breaker, substantially as described; with an angular shaft passing through said central pinion and driven thereby, the cone supported on said angular shaft and carrying the interior breaker, crusher and grinder, a pan supported upon the journals of the gears and the

sweep loosely fitted on said angular shaft and operating in said pan, substantially as described.

9. In a feed-mill, the combination of the master-gear, the shell supported thereon, the breaker secured in said shell, the crusher below the breaker and the grinder below the crusher, also attached to the interior of said shell; with the flanged gears meshing with the master-gear and supporting the latter by their flanges, the cone within the shell supported upon a vertical shaft, the adjustable block supporting said shaft, the gear for driving said shaft, slidably mounted thereon and the breaker, crusher and grinder supported on said cone, all substantially as described.

10. In a feed-mill, the combination of the master-gear, the shell supported thereon, the breaker *g* secured in said shell, the crusher *h* below the breaker, and the grinder *i* below the crusher, both on the interior of said shell; and a spider below the shell, the flanged gears journaled upon stud-shafts on the spider and meshing with the master-gear and supporting the latter by their flanges; with the cone supported upon an angular shaft *E*, the adjustable angular block *a* fitted in the spider and supporting the lower end of shaft *E*, the pinion for driving said shaft also supported by said flanged gears, the breaker *G* on the upper end of said cone having a journal-pin *G*² extending through an opening in the breaker *g*, and the stirrer *G*³ secured on the upper end of said journal-pin, the crusher *H* having force-feed rib extensions *H*² supported on said cone, and the grinder *I* supported on said cone below crusher *H*, all substantially as and for the purpose described.

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

WILLIAM C. F. ZIMMERMAN.

Witnesses:

HELEN M. FERNSTROM,
C. A. FERNSTROM.