(No Model.)

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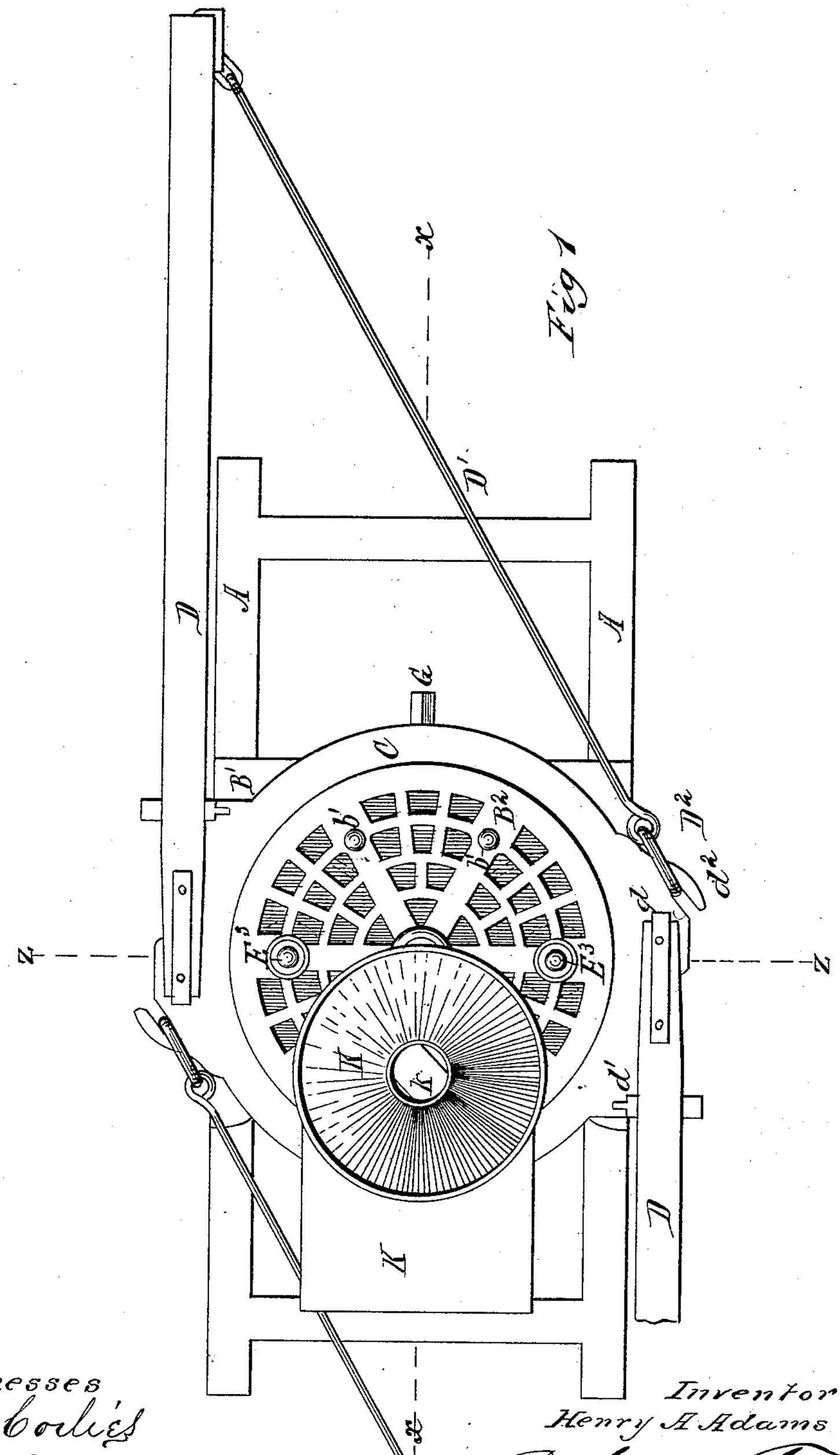
H. A. ADAMS.

GRINDING MILL.

No. 348,607. Patented Sept. 7, 1886.



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(No Model.)

4 Sheets—Sheet 2.

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GRINDING MILL.

No. 348,607. Patented Sept. 7, 1886.

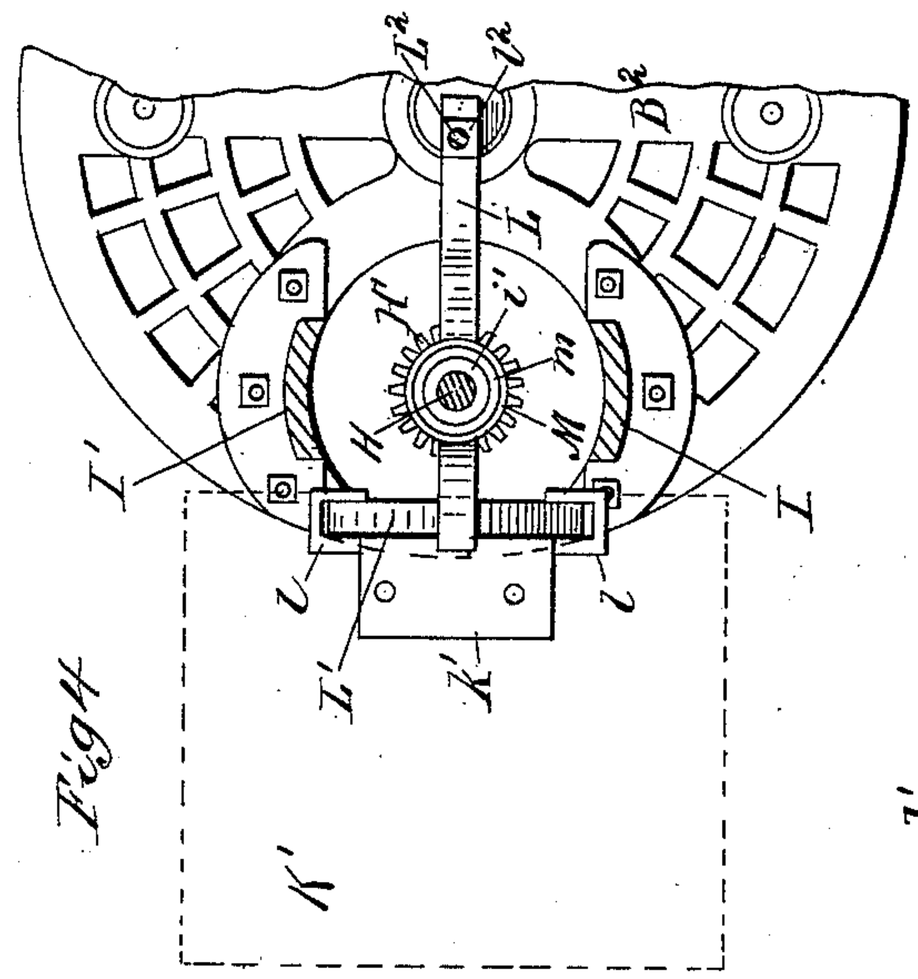

Fig 4

Fig 2

Fig 3

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4 Sheets—Sheet 3.

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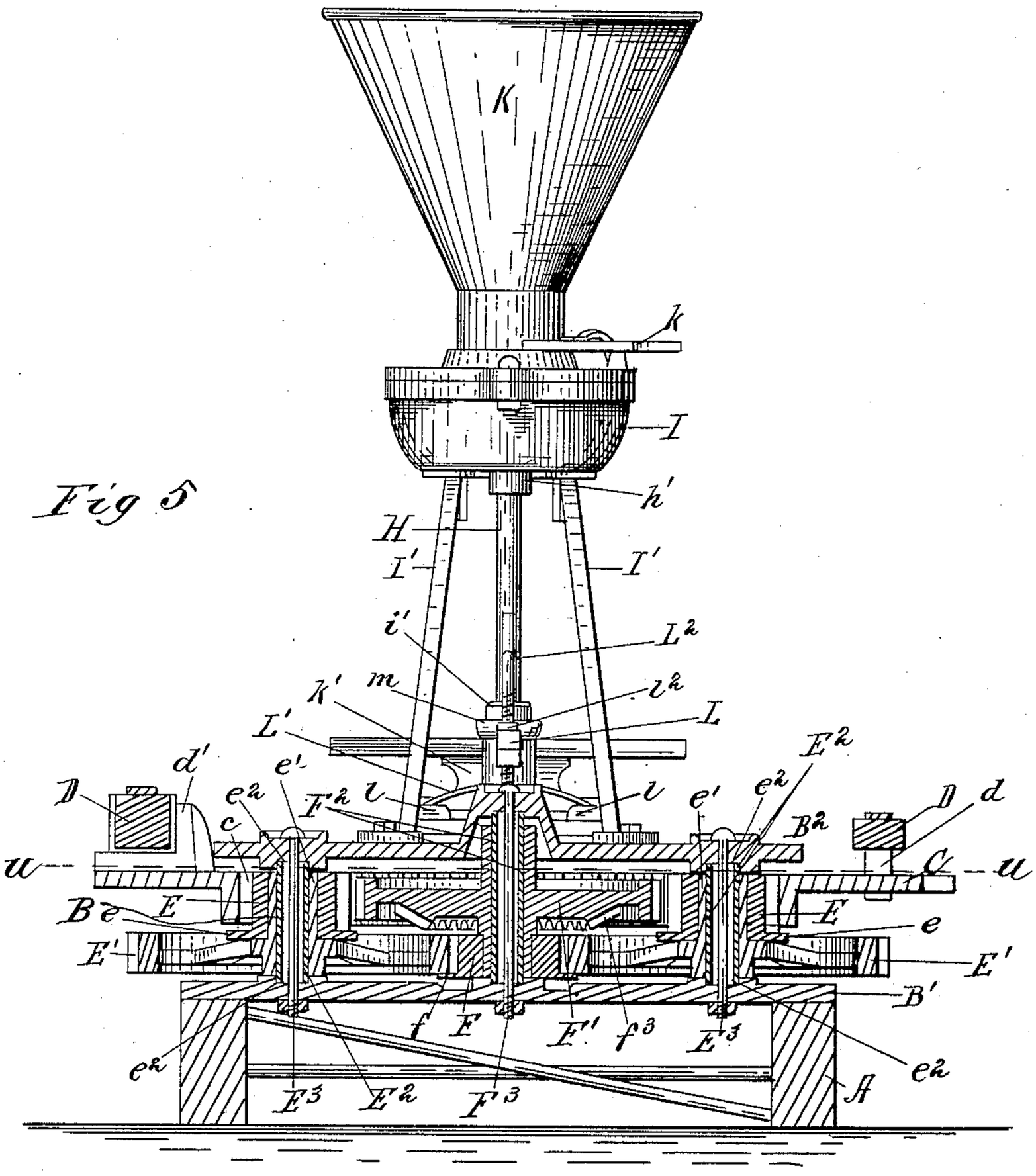
GRINDING MILL.

No. 348,607. Patented Sept. 7, 1886.

Fig 5



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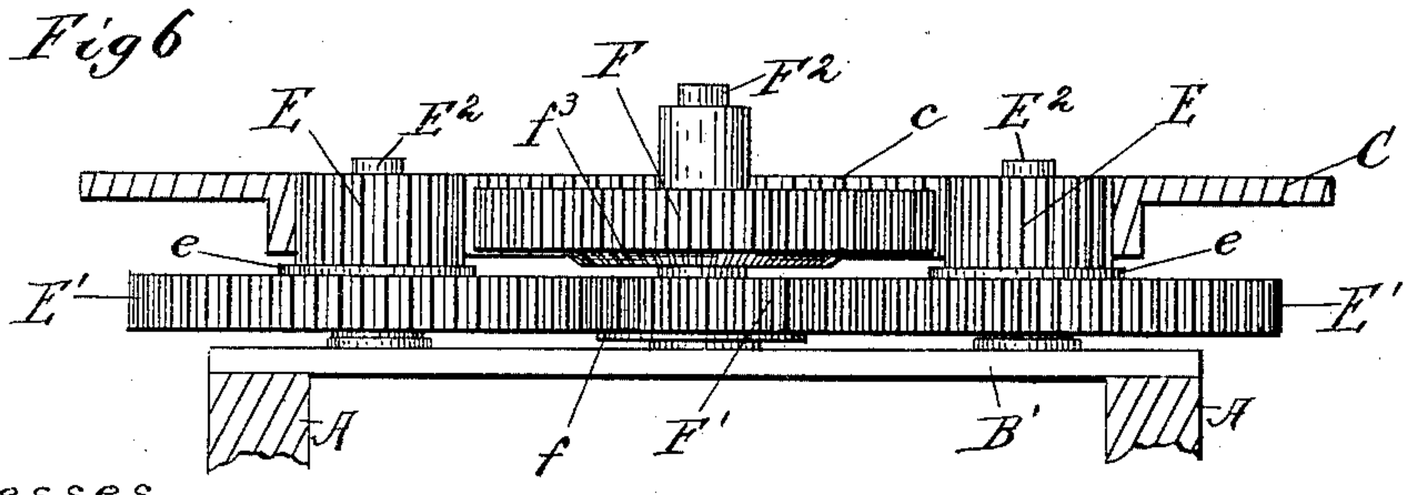

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No. 348,607. Patented Sept. 7, 1886.

Fig 7

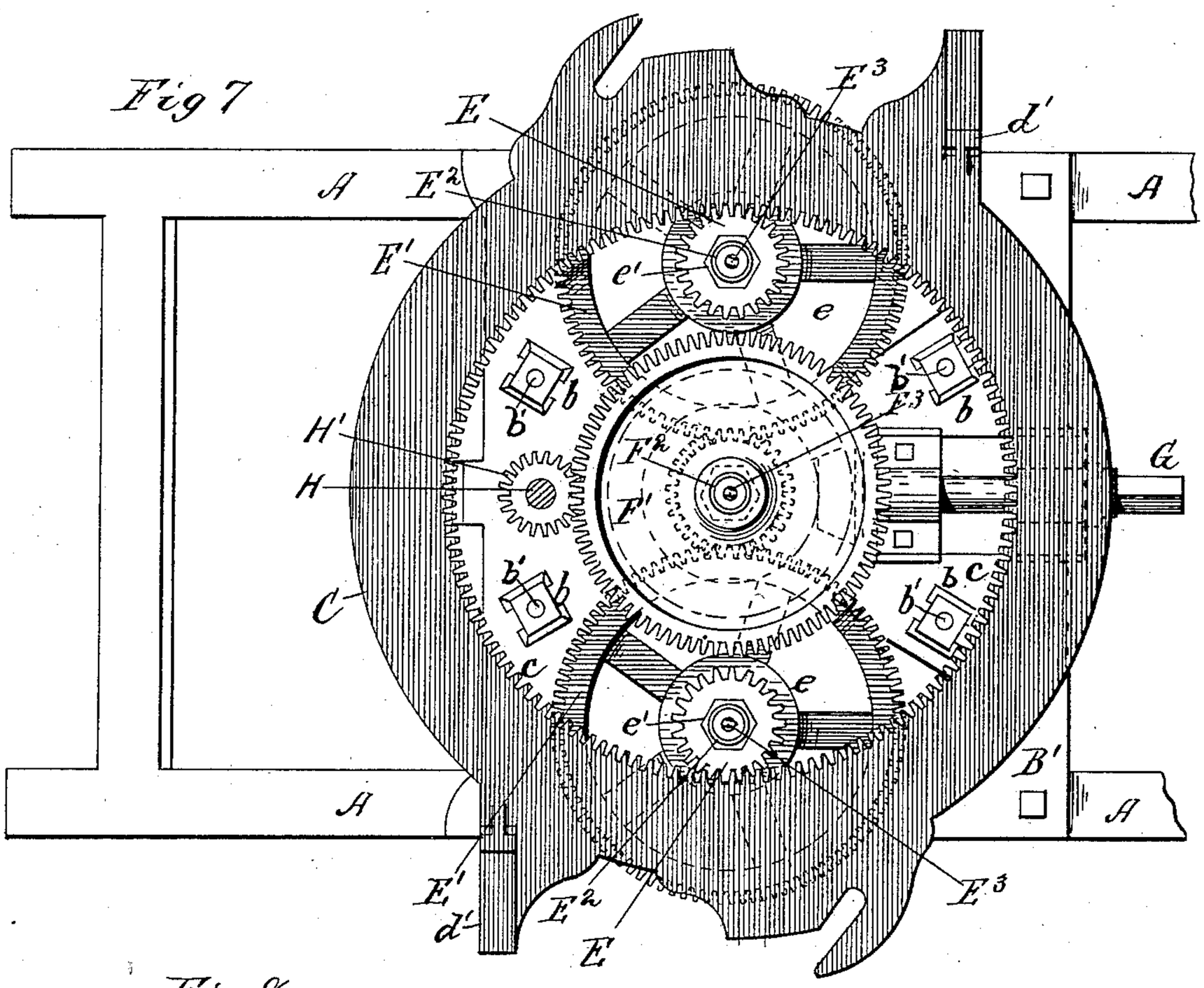


Fig 8

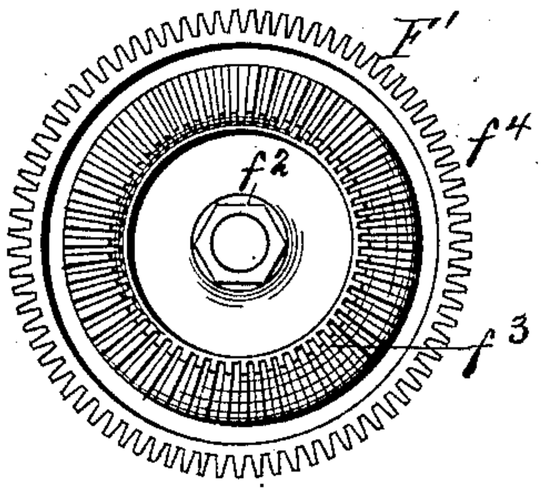


Fig 9

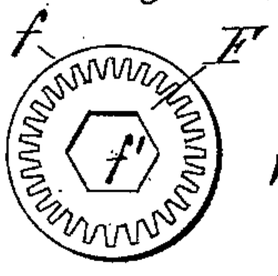


Fig 10

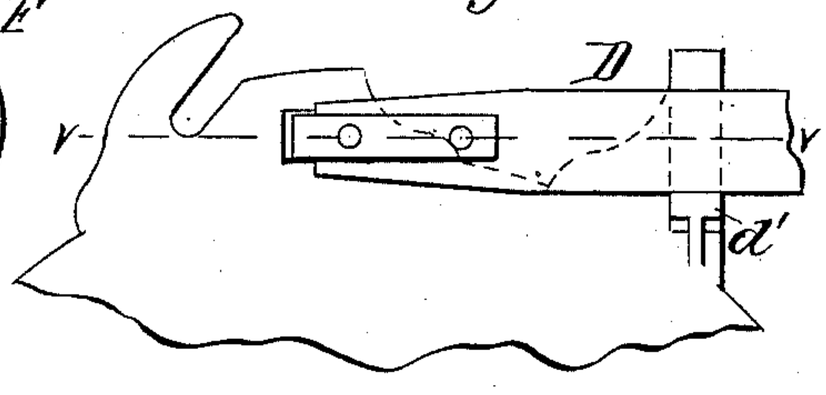
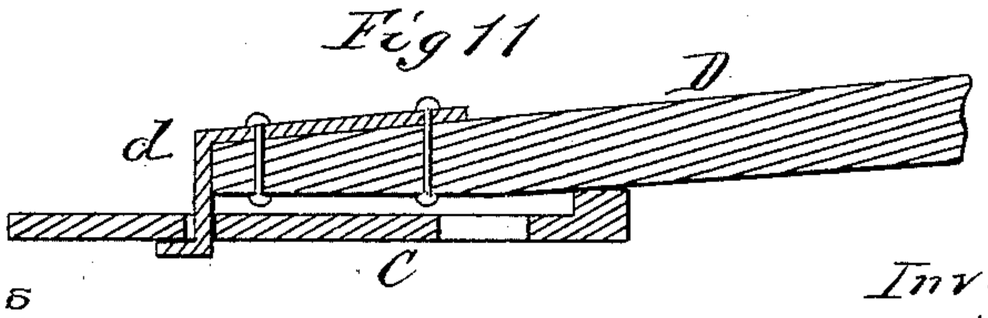


Fig 11



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UNITED STATES PATENT OFFICE.

HENRY A. ADAMS, OF SANDWICH, ILLINOIS.

GRINDING-MILL.

SPECIFICATION forming part of Letters Patent No. 348,607, dated September 7, 1886.

Application filed March 29, 1886. Serial No. 197,028. (No model.)

To all whom it may concern:

Be it known that I, HENRY A. ADAMS, a citizen of the United States, and residing at Sandwich, in the county of De Kalb and State of Illinois, have invented a certain new and useful Improvement in Grinding-Mills, which is fully set forth in the following specification, reference being had to the accompanying drawings, in which—

Figure 1 is a plan view of a grinding-mill embodying my improvement; Fig. 2, a sectional view of the same, taken on the line *x x* of Fig. 1; Fig. 3, a detail side elevation of the grinding-shaft and its supporting and adjusting mechanism; Fig. 4, a detail plan section taken on the line *y y* of Fig. 2; Fig. 5, a sectional view taken on the line *z z* of Fig. 1; Fig. 6, a detail view, partly in section, of the gear-train; Fig. 7, a plan section taken on the line *u u* of Fig. 5. Fig. 8 is a detail bottom plan view of one of the gear-wheels; Fig. 9, a detail plan view of one of the gear-wheels; Fig. 10, a detail plan view showing the connection between the sweep and the master-wheel, and Fig. 11 a sectional view of the same, taken on the line *v v* of Fig. 10.

Like letters refer to like parts in all the figures of the drawings.

My invention relates to grinding-mills, and more particularly to that class of grinding-mills which are used in combination with horse-power, its object being to produce a construction in which the parts shall be arranged relatively to each other in the most advantageous manner, while at the same time the speed imparted to the grinding-disk shall be increased; and to these ends my invention consists in certain novel features, which I will now proceed to describe, and will then particularly point out in the claims.

In the drawings, A represents the base of the machine, which may be of wood or other suitable material.

B is the supporting-frame, upon which the various parts of the mechanism are mounted. This supporting-frame is preferably constructed of iron, and consists of a bottom plate or grating, B′, and a top plate or grating, B², the former being provided with posts or supports *b*, upon which the latter rests, the two being connected by bolts *b′*, passing through the whole.

C indicates the main or master wheel, to which the horse-power is attached. This wheel is entirely open at the center, being without arms or spokes, and is supported, in the manner hereinafter described, between the upper and lower plates of the supporting-frame B. The sweep D, to which the animals are attached, is connected to the master-wheel in any suitable manner, but preferably in that shown more particularly in Figs. 1, 10, and 11, in which each sweep is shown provided with an L-shaped locking-piece, *d*, which is inserted through a suitable slot in the master-wheel C, the said sweep being supported at its sides by means of a lug, *d′*, and being further held in place by means of a brace or rod, D′, which leads from its outer end to a suitable hook or projection, *d²*, on the periphery of the master-wheel, over which hook a link, D², suitably connected to the brace-rod, catches, as clearly shown in Fig. 1 of the drawings.

The master-wheel C is provided with internal gear-teeth, *c*, and these gear-teeth mesh with the teeth of two pinions, E, arranged within the master-wheel at the sides thereof, at points diametrically opposite each other. The pinions E are each provided at their lower edge with a flange, *e*, which flanges serve as as the main support for the master-wheel C, to prevent the same from dropping, while, at the same time, the pinions E keep the master-wheel in a proper position relatively to the center of the mechanism in an obvious manner. Each pinion E is provided with a central hexagonal bore or recess, as shown more particularly in Fig, 7 of the drawings, within which recess fits the correspondingly-shaped upwardly-projecting hub *e′* of a gear-wheel, E′, which thus carries and supports the pinion E. Of course it is obvious that instead of the hexagonal shape of hub and recess shown and described any other other suitable well-known means of connecting the pinion and gear may be adopted, although I prefer that shown. Each gear-wheel E′ is mounted to revolve upon a suitable circular sleeve, E², which passes centrally through its hub and has its extremities arranged in suitable seats, *e²*, in the top and bottom plates of the supporting-frame B. A bolt, E³, passes through the two plates and through the hollow sleeve, thereby serving more firmly to connect the whole.

F indicates a central pinion with which the gear-wheels E′ mesh, the said pinion being provided with a flange, *f*, at its lower edge to give additional support to the gear-wheels E′. This pinion is shown in detail in Fig. 9 of the drawings and has a central recess or bore, *f′*, hexagonal in shape, within which the correspondingly-shaped lower extremity, f^2, of the central gear-wheel, F′, fits. This gear-wheel F′ is mounted on a central sleeve, F^2, the extremities of which are arranged in suitable seats in the top and bottom plates of the supporting-frame B in the same manner as the sleeves E^2 are mounted, a through-bolt, F^3, serving to give additional security to the whole. The gear-wheel F′ is provided on its under side with a bevel-gear or set of bevel gear teeth, f^3, which mesh with a bevel-pinion, *g*, on the inner end of a horizontal shaft, G, which shaft may be suitably connected to any machinery which it is desired to operate by means of the horse-power. The central gear-wheel, F′, is provided, in addition to the bevel-gear *f′*, with peripheral gear-teeth f^4.

H indicates a grinding-disk shaft, which is arranged, as shown, between the center and the periphery of the master-wheel, extending entirely through the same. This shaft has its lower bearing in the bottom plate of the supporting-frame B, as shown at *h*. The upper end of this shaft has its bearing at *h′* in the bottom of the casing I, which surrounds the grinding-disks, the said casing being mounted upon supports or standards I′, attached to the top plate, B^2, of the supporting-frame B. The shaft H has attached to it near its lower end a pinion, H′, which meshes with the gear-teeth f^4 of the central gear F′, by which means a rotary motion is imparted to the grinding-disk shaft. The revolving grinding-disk J is attached to the upper end of the grinding-disk shaft H, the fixed grinding-disk J′ being attached to the under side of the top of the casing I, as clearly shown in Fig. 2 of the drawings. A suitable, hopper, K, and slide *k*, provide means for feeding the substance to be ground to the grinding-disks, while scrapers *j*, on the under side of the revolving disk J, serve to carry the ground material to the discharge-spout *i*. A platform, K′, mounted on a bracket, *k′*, attached to the top plate, B^2, is provided to receive the receptacle into which the ground material is discharged.

The grinding-disk shaft H is vertically adjustable in its bearings, for the purpose of properly regulating the distance between the grinding-disks, and for this purpose passes loosely through the said bearings. This shaft is supported and adjusted by means of a lever, L, one end of which passes underneath the platform K′ and rests upon a bowed or arch-shaped spring, L′, the ends of which are supported in suitable seats, *l*, on the bracket *k′*, or on any other suitably-fixed portion of the frame. This spring L′ forms the fulcrum of the lever L, which is raised and lowered to adjust the grinding-disk shaft and disk by means of a screw, L^2, which passes through its other end, which may be screw-threaded to receive it, or may be provided with a nut, *l′*, as shown. The adjusting-screw L^2 may also be provided with a lock-nut, l^2, to secure the same after adjustment, and the lower end of the said adjusting-screw bears upon some fixed portion of the frame—as, for instance, in the manner shown in Figs. 2 and 3 of the drawings, so that by rotating the said adjusting-screw the adjusting and supporting lever L may be raised or lowered in an obvious manner. The shaft H passes through the lever L, which is provided with an enlarged aperture, l^3, to receive the same, the said shaft being provided above the said lever with a fixed collar, *i′*.

M indicates a sleeve arranged between the collar and the lever, its lower surface, which rests upon the lever, being rounded transversely, as shown in Figs. 2 and 3 of the drawings, and the adjacent surface of the lever being correspondingly curved or rounded to receive the said sleeve, the two cylindrical surfaces thus permitting the sleeve and shaft to move freely in a vertical direction, and the lever to move at the same time upon its fulcrum, without destroying the contact between the lever and the sleeve. This construction also prevents the sleeve from being rotated along with the shaft, and thereby prevents any friction between the sleeve and lever. The upper surface of the sleeve M is preferably cup-shaped, as shown at *m*, to receive the oil or other lubricant material, and a washer, *m′*, is preferably interposed between the collar *i′* and the sleeve M.

The main support of the master-wheel C is, as hereinbefore stated, obtained by means of the pinions E; but additional supports, N, may be provided at the front and rear, to prevent excessive tipping of this wheel, and one or more lugs or projections, *n*, may be employed, if desired, to prevent any lateral movement of the master-wheel. The upper plate, B^2, of the frame B extends out over the master-wheel C, as clearly shown in the several figures of the drawings, and prevents any upward movement of the said wheel beyond the proper limits.

Heretofore in grinding-mills of this description the grinding-disk shaft, or, in other words, the shaft which carries the revolving grinding-disk, has been identical with or arranged directly in line with the central shaft of the driving mechanism. Owing to this construction the speed imparted to this shaft has been identical with that of the central shaft of which it forms a part, and this speed is limited, owing to the particular arrangement of gear-wheels which it is necessary to adopt to secure the desired compactness of arrangement in gearing of this description. It will be observed that by the use of an open master-wheel without spokes or arms I am enabled to arrange the grinding-disk shaft at one side of the central shaft, or rather the central gearing of the

driving mechanism and between the said center and the internal periphery of the master-wheel. By reason of this location of the grinding-disk shaft I am enabled to employ a large central gear-wheel meshing with the small pinion on the grinding-disk shaft, whereby a greatly increased speed is imparted to the said shaft and to the revolving grinding-disk, while at the same time the mechanism loses none of its compactness, being arranged within the same space as, and in fact within a smaller space than, that occupied by the mechanism heretofore known.

The operation of my improved grinding-mill will be readily understood from the preceeding description, and needs no detailed explanation here. The power is transmitted from the master-wheel to the central gear-wheel, F′, in an obvious manner, and thence to the grinding-disk shaft, as just described. It will be observed that this latter shaft is vertically adjustable by means of the lever L, and the other adjusting and supporting mechanism hereinbefore described, in order to adjust the revolving grinding-disk relatively to the fixed disk J′, and it will be further seen that since the supporting-lever L is itself supported upon a spring, as a fulcrum, the support of the grinding-disk is a yielding support, so as to allow this latter to yield downward in case any hard substance gets between the two disks, which would tend to injure the same.

Although I have shown and described a particular train of gearing for transmitting the motion of the master-wheel to the grinding-disk shaft, still it is obvious that other forms of mechanism may be employed without departing from the principle of my invention, which consists, as hereinbefore stated, more essentially in the location of the grinding-shaft between the center and periphery of the master-wheel. It is also obvious that various modifications in the details of the construction may be made without departing from the principle of my invention, and I therefore do not wish to be understood as limiting myself strictly to the precise details hereinbefore described and shown in the drawings.

I am aware that heretofore horse-powers for use in connection with grinding-mills, as well as other machines, have been constructed in which an open master-wheel is employed, or at least a wheel which may be termed an "open master-wheel," instances of this construction being found in Letters Patent to Lancaster, No. 194,156, granted August 14, 1877; to Ball, No. 155,061, granted September 15, 1874, and to Randall, No. 199,862, granted January 29, 1878. In this construction, however, the master-wheel is a fixed wheel, and not a revoluble one, and is, in fact, not a true wheel, but merely a fixed circular gear. In machines of this description the entire mechanism is mounted upon a revoluble frame, so that the grinding-mill or other machine to be operated travels around with the moving parts of the machine, whereas in my construction the grinding mechanism is fixed, the advantages of this feature being obvious.

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

1. In a grinding-mill, a revoluble, open, or armless master-wheel, in combination with a grinding-disk shaft arranged within the said wheel between its center and inner circumference, and suitable gearing for transmitting motion from the master-wheel to the grinding-disk shaft, substantially as and for the purposes specified.

2. In a grinding-mill, a revoluble, open, internally-geared master-wheel, a central gear-wheel, and a suitable train or trains of gears connecting the said central gear-wheel and master-wheel, in combination with a grinding-disk shaft arranged within the master-wheel between its center and inner circumference and provided with a pinion to mesh with the central gear-wheel, substantially as and for the purposes specified.

3. In a grinding-mill, a longitudinally-movable grinding-disk shaft, in combination with the supporting-lever L, which carries the said shaft, the bowed or arched spring L′, upon which one end of the lever rests to form a fulcrum therefor, and the adjusting-screw L^2, substantially as and for the purposes specified.

4. The combination, with the grinding-disk shaft H, having collar *i*′, of the lever L, through which the said shaft passes, and the sleeve M, arranged between the collar and lever and provided with a cylindrical under surface, the lever having a correspondingly-shaped seat to receive the said cylindrical under surface, substantially as and for the purposes specified.

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