(No Model.) 2 Sheets—Sheet 1.

J. F. WINCHELL.

CRUSHING AND GRINDING MILL.

No. 396,448. Patented Jan. 22, 1889.

Fig. 1.

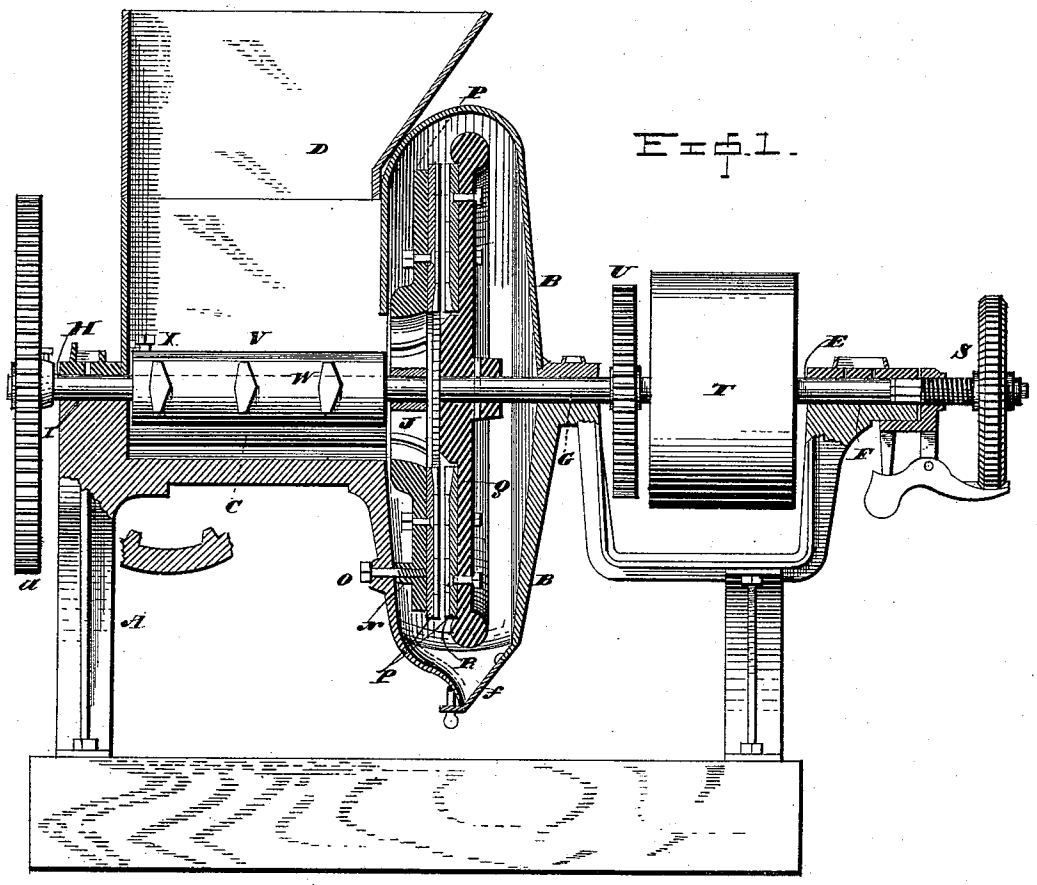
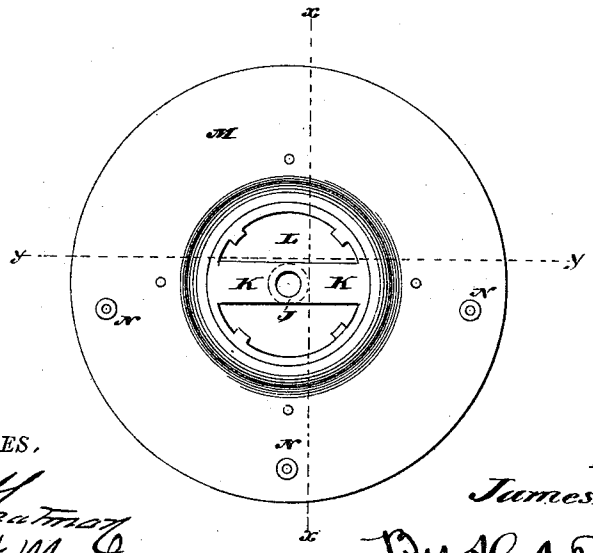


Fig. 5.



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(No Model.) 2 Sheets—Sheet 2.

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CRUSHING AND GRINDING MILL.

No. 396,448. Patented Jan. 22, 1889.

Fig. 2.

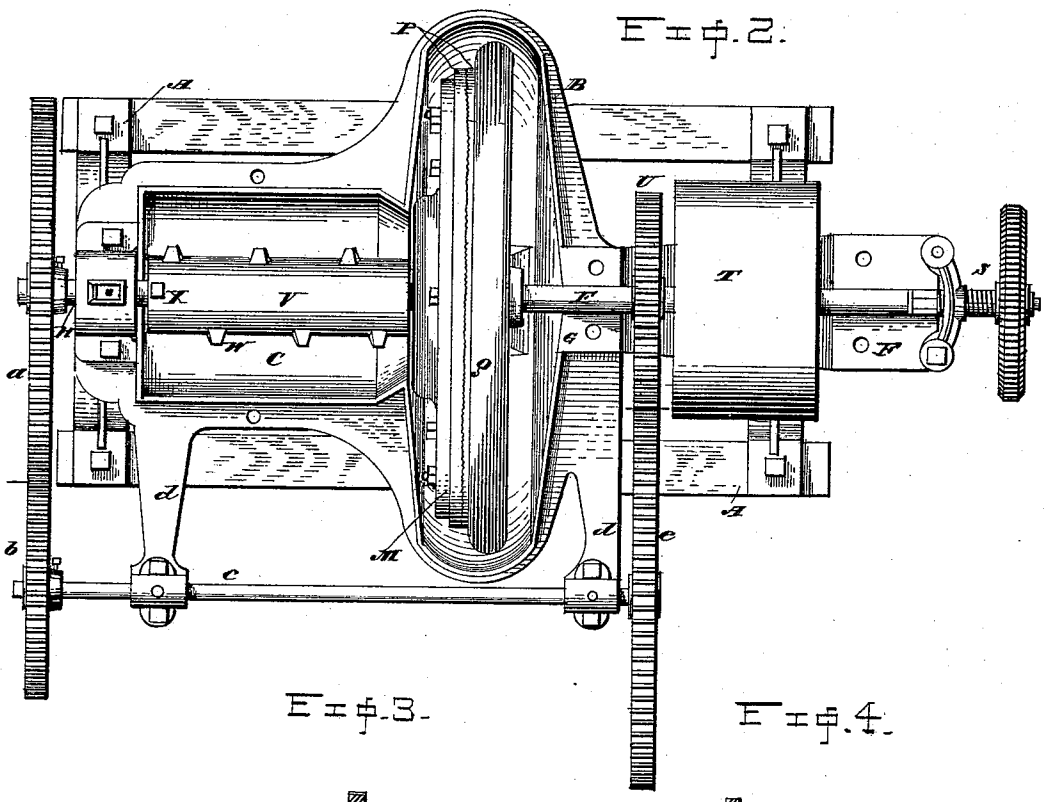


Fig. 3.

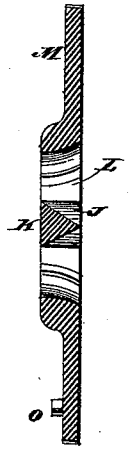
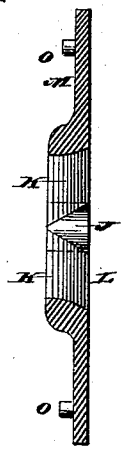


Fig. 4.



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UNITED STATES PATENT OFFICE.

JAMES F. WINCHELL, OF SPRINGFIELD, OHIO, ASSIGNOR TO THE FOOS MANUFACTURING COMPANY, OF SAME PLACE.

CRUSHING AND GRINDING MILL.

SPECIFICATION forming part of Letters Patent No. 396,448, dated January 22, 1889.

Application filed July 27, 1887. Serial No. 245,395. (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 consists, essentially, of a divided main shaft, or a main shaft and an auxiliary shaft, of grinding mechanism, the rotating portion thereof being mounted upon one of said shafts, a feeding-crusher mounted upon the other of said shafts, a crushing-chamber in which it feeds and crushes, and intermediate motion-conducting mechanism, which conducts motion from one of said shafts to the other and causes one of them to rotate at a different speed from that of the other.

The invention also consists in so constructing the motion-conducting mechanism that a change in the speed of the motion which it conducts from one of said shafts to the other may be made, if desired.

The invention further consists of certain details of construction and arrangement, which will hereinafter more fully appear.

In the accompanying drawings, on which like reference-letters indicate corresponding parts, Figure 1 represents a vertical sectional view of my improved mill frame and casing and the grinding mechanism, and an elevation of the divided shaft or the shafts, the feeding-crusher, the shaft-adjusting mechanism, the driving-pulley, and a gear-wheel and pinion; Fig. 2, a plan view of the mill with the upper portion of the casing and the hopper removed; Fig. 3, a detailed sectional view of the stationary head which supports the stationary grinding-plates and forms a bearing for one end of one division of the main shaft or auxiliary shaft on the line x x of Fig. 5; Fig. 4, a horizontal sectional view of the same head on the line y y of Fig. 5; Fig. 5, an elevation of said head.

This mill is of the general character of that shown and described in Letters Patent granted to me May 18, 1886, numbered 342,311, for crushing and grinding mills and assigned to The Foos Manufacturing Company. The differences in the arrangement in the parts which are common to that mill and to this one will be observed from a comparison of the drawings and from the description now about to be given.

The letter A designates the general frame of the mill, which is mounted upon suitable sills, and consists, essentially, of a casing, B, for the grinding mechanism, a feeding and crushing chamber, C, and a hopper, D, preferably made of cast-iron.

The letter E refers to the main shaft of the mill, which has bearings at F and G, and is divided so as to form a section or auxiliary shaft, H, so that in using the term "auxiliary shaft" hereinafter it will be understood that said shaft is either a section of the main shaft and in line with it or is a shaft so placed with respect to axis of the main shaft as not to be properly called a "section" of the main shaft. The auxiliary shaft has a suitable bearing at I and another bearing at J in a box supported by two or three spider-arms, K, which extend across the eye L of the stationary head M. This head is composed of a disk of cast-iron, which is bolted or otherwise secured to the casing B, as seen in Fig. 1, having bosses N projecting therefrom, which rest against the casing, and bolts O, which pass through the casing and into the bosses and head. In Fig. 5 three, the preferred number of these bosses, are shown.

The spider-arms are preferably V-shaped in cross-section, as seen in Fig. 3, for the purpose of preventing any material passing from the feeding and crushing chamber to the grinding mechanism from lodging thereon, as the inclined position of the upper and lower faces of the spider-arms insures the natural dislodgment of such material. To this head are secured in any approved manner the usual or any of the approved grinding-plates, P.

The letter Q designates the other grinding-head, which is rigidly mounted upon the main shaft E, and has its periphery fashioned after the manner of the rim of a fly or balance wheel, for the purpose of giving said head the quality of such a wheel. This saves the expense of a separate fly-wheel and rather tends to

strengthen the revolving head. To this head are secured any number of any approved grinding-plates, as by bolts or otherwise. The degree of reduction of the material by the grinding mechanism is determined by the longitudinal adjustment of the main shaft, which is done by the adjusting mechanism shown at S, but which forms no part of the present invention, being shown and described in the patent already referred to. The main shaft also carries a driving-pulley, T, and a pinion, U. The function of the latter will presently appear.

Secured upon the shaft H is a feeding-crusher, V, having feeding and crushing lugs W, being of the character also shown and described in my said Letters Patent. This feeding-crusher may be secured by a set-screw, X, or otherwise. The form shown is the preferred form; but other forms may be used, and I desire, therefore, to be understood as not limiting myself to any particular construction of this element of the machine. If this device merely performs the function of feeding the material without crushing it, it is still within what I contemplate, though I prefer that it shall perform both of these functions.

The letter *a* designates a gear-wheel mounted upon the auxiliary shaft H and intergearing with a pinion, *b*, carried by a motion-conducting shaft, *c*, having bearings in the projections *d* of the mill-frame (or otherwise supported) and carrying a gear-wheel, *e*. This latter gear meshes with the pinion U. Thus it will be seen that when the main shaft is rotated by means of a belt over the pulley T rotary motion will be imparted from it and the pinion U to the gear-wheel *e*, and by it, the shaft *c*, and the pinion *b* the motion is conducted to the gear *a*, and thence to the auxiliary shaft H and the feeding-crusher. As the pinion U is smaller than the gear-wheel *e*, and the pinion *b* also smaller than the gear-wheel *a*, it follows that the speed of rotation of the feeding-crusher is slower than that of the grinding mechanism. This is true, as illustrated in Fig. 2; but it is obvious that various changes in the relative diameters of the several pinions and gears may be made, so as to rotate the feeding-crusher and grinding mechanism at different relative speeds. It is preferred, however, to secure the gear-wheel *a* and pinion *b* upon the shafts H and *c* in a detachable manner, so as to interchange them from shaft to shaft, which will cause a corresponding change in speed of rotation of the feeding-crusher.

Of course, the gear-wheel *a* and pinion *b* may be substituted by other interchangeable gear-wheels and pinions of varying relative diameters, as set forth in an application filed by me July, 1887, Serial No. 247,270, for improvements in crushing and grinding mills. That case, however, is designed to secure this variation in the speed of the feeding and crushing mechanism with respect to the speed of the grinding mechanism broadly. The fact that a change in the speed of the rotation of the feeding-crusher may be made in the present case should properly be mentioned, however.

The plate *f* in the lower part of the casing is removable for the discharge of the ground material by manipulating the screw in the lower end thereof, and which impinges the side of the adjacent portion of the casing.

When the material is fed into the hopper and down upon the feeding-crusher, it conveys it toward and to the grinding-plates through the eye L in the stationary head M, at the same time reducing the material more or less by crushing it between the lugs W and the walls of the chamber C and the rib or bead therein. Thus the device V has the quality both of feeding and crushing. If, however, it were deprived of one or the other of these functions, it would still come within the purview of my invention when associated with the elements of the hereinafter-appearing claims. I prefer, however, that it should have these two qualities, and have therefore constructed it with these capabilities and have so termed it.

Among the advantages of rotating the feeding-crusher at a lower speed than the grinding mechanism may be mentioned the fact that it prevents choking the grinding mechanism by an overfeed of the material to it, which is possible to occur when the material is more or less damp or wet, or when it is in a green state, should the feeding-crusher run at the same or nearly the same speed as the grinding mechanism. The feeding of the material by the feeding-crusher, when done lengthwise to it, is slower and slower as the speed of the rotation of the feeding-crusher is reduced, and so this distinction will be made between the foregoing remarks as to the slower feed of the feeding-crusher when rotated at a lower speed and the remarks in the application above alluded to, which refer to the increased feed of the material by lessening the speed of the feeding-crushers, the feed spoken of in that part of that case being the feed which is crosswise to the axis of the feeding-crushers, while in this case the feed spoken of is lengthwise with the feeding-crusher.

Aside from not confining myself to specific details of the construction, I desire to observe that the rotating head Q need not necessarily be constructed at its periphery after the manner of the fly or balance wheel, though such construction is preferred.

While I have shown and described the motion-conducting mechanism as consisting of a shaft and a gear-wheel and a pinion, meshing, respectively, with a pinion and a gear-wheel carried by the main shaft and an auxiliary shaft, it is obvious that the substitution of belts and pulleys for these gear-wheels and pinions would be within my invention.

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

1. In a crushing and grinding mill, the combination, with the main shaft and grinding mechanism carried thereby, of an auxiliary shaft mounted opposite the center of the grinding mechanism independently of the main shaft, a feeding-crusher mounted on the auxiliary shaft, a chamber in which the feeding-crusher operates, and motion-conducting mechanism interposed between the main shaft and the feeding-crusher, and consisting of a shaft geared to the main and auxiliary shafts through interchangeable gearing, whereby the relative speed of the main and auxiliary shafts may be varied and motion conducted from one of them to the other.

2. In a crushing and grinding mill, the combination, with the main frame, the casing, the chamber, and the main and auxiliary shafts mounted upon the frame substantially in line with each other, of a stationary grinding-head within the casing, a rotary grinding-head carried by main shaft, and a feeding-crusher within said chamber and carried by the auxiliary shaft, a pinion on the main shaft, a gear-wheel on the auxiliary shaft, and motion-conducting mechanism transmitting motion at different speeds from one shaft to the other, consisting of a shaft mounted upon said frame, a gear-wheel carried thereby and meshing with the said pinion, and a pinion carried thereby and meshing with the first-named gear-wheel.

3. In a crushing and grinding mill, the combination, with the main shaft and grinding mechanism, of an auxiliary shaft mounted substantially in line with the main shaft, a feeding-crusher mounted thereon and arranged to feed the material longitudinally to the grinding mechanism, a chamber in which the crusher operates, and a shaft geared to the main and auxiliary shafts and rotating the latter at a different speed from the former.

4. In a crushing and grinding mill, the combination, with the main frame and casing, of an auxiliary shaft mounted at one end in the frame and at the other within the eye of a grinding-head, and a grinding-head secured to the casing and having an eye therein, and spiders extending across the eye and having the upper and lower faces thereof at an angle to a horizontal plane.

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

JAMES F. WINCHELL.

Witnesses:

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A. A. YEATMAN.