

(No Model.)

3 Sheets—Sheet 2.

J. F. WINCHELL.
CRUSHING AND GRINDING MILL.

No. 395,413.

Patented Jan. 1, 1889.

Fig. 3.

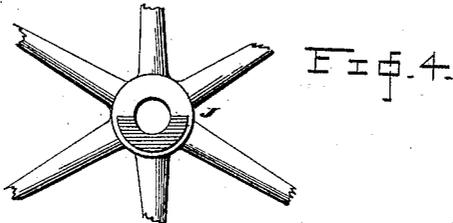
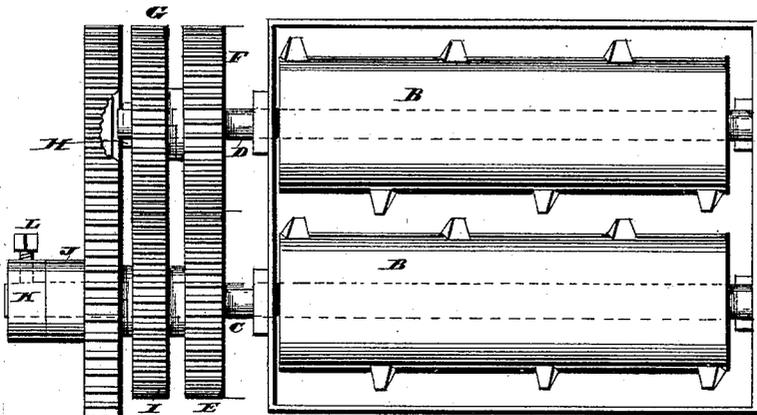


Fig. 5.

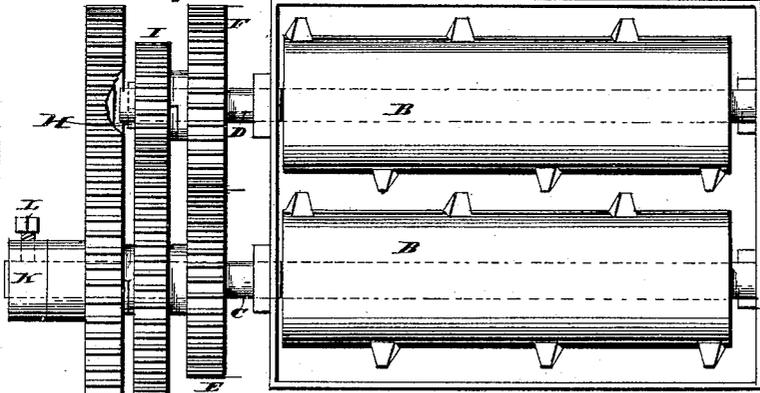
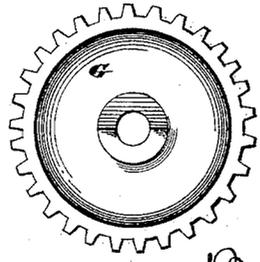


Fig. 6.



WITNESSES,

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INVENTOR

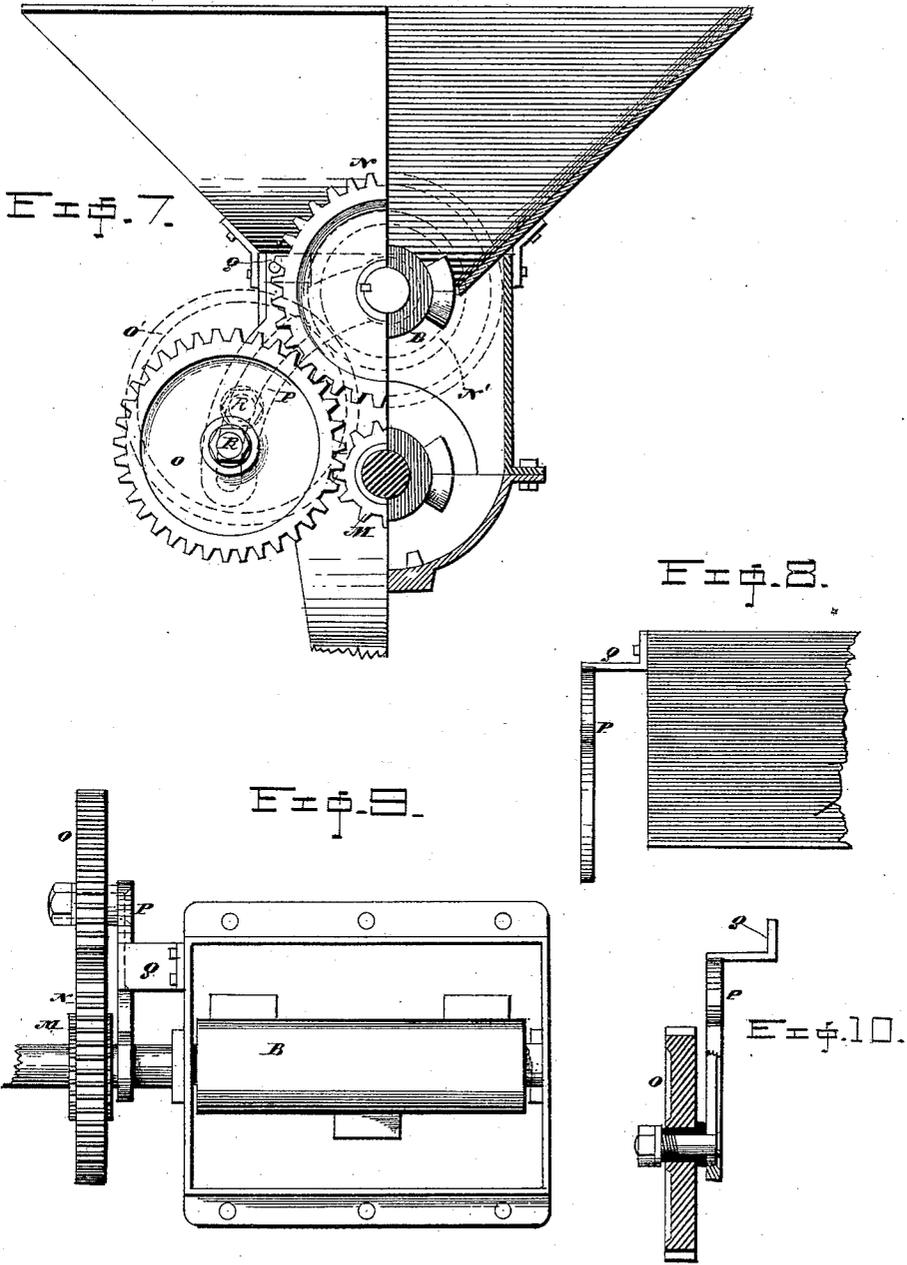
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UNITED STATES PATENT OFFICE.

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CRUSHING AND GRINDING MILL.

SPECIFICATION forming part of Letters Patent No. 395,413, dated January 1, 1889.

Application filed July 14, 1887. Serial No. 244,270. (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.

10 This invention relates to improvements in crushing and grinding mills.

Practice has developed the fact that in the art of grinding, particularly in grinding substances considerably larger than cereals—such as corn-cobs, roots, bark, bones, &c.—mills which have the capacity of feeding and of crushing these substances to a partial state of reduction before they reach the grinding mechanism, and then of grinding them, will operate successfully with some given higher speed—as the speed which can be had from a ten-horse-power engine—but will not grind successfully, and will frequently choke and stop, when run at a lower speed—as the speed which can be had from an eight-horse-power engine. These remarks have reference to mills in which the mechanism for feeding and effecting the partial reduction of the material has a fixed speed of rotation with respect to the speed of the rotation of the grinding mechanism proper, for it is found that the grinding mechanism must be maintained at a certain speed compared to the quantity of material which is fed to it, and that the feeding and crushing mechanism is not so sensitive in its operation to a change in its speed from any given standard. Indeed, in such it is found that the feeding and crushing mechanism is inclined to feed and crush more material when run at a moderate speed than when run at higher speeds. Therefore, if this mechanism has a fixed relation to the grinding mechanism, it will be crushing at its greater capacity when the grinding mechanism is grinding at its lesser capacity. For these reasons I have in view the changing of the speed of the feeding and crushing mechanism with respect to speed of the grinding mechanism.

50 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 and partial side view of a mill substantially of the character which is the subject of Letters Patent granted to me March 15, 1887, for crushing and grinding mills, and numbered 359,588, showing speed-changing gears in connection therewith; Fig. 2, a plan view of the feeding-crushers, showing the gears in section; Fig. 3, a plan view of the same parts, save a change in the relative size of some of the gears; Fig. 4, a detail view of a portion of the driving gear-wheel; Fig. 5, a like view to Fig. 3, showing another change in the relative size of the same gears; Fig. 6, a detached view of one of the gears, showing the clutch end of the hub; Fig. 7, a partial end and vertical sectional view of the upper portion of a mill of the character shown and described in an application filed by me September 21, 1886, Serial No. 214,176, for crushing and grinding mills, illustrating the speed-changing gearing therefor; Fig. 8, a detail view of a portion of the casing and the gear-bracket; Fig. 9, a plan view of Fig. 7 with the hopper removed, and Fig. 10 a detail view showing the manner of mounting the gear-wheel in the slotted bracket.

The letter A designates a mill of the character shown in the patent already referred to, in which the main shaft, the fly-wheel, the driving-pulley, the pinion, the crushing-conveyer, the grinding-plates, and the adjusting-wheel and its dog are substantially the same as in said patent. The hopper and the flap hinged therein, (the latter being used or not,) and the feeding-crushers B are also preferably the same as there shown and described. The shafts C and D of these crushers have intergearing pinions E and F keyed or otherwise secured thereon, as clearly shown in Fig. 2. The outer face of the hub of the pinion F is formed with a clutch-face, as shown in dotted lines in the said Fig. 2, and as shown in Fig. 6, and on shaft D is an idler gear-wheel, G, having a hub, also made with a clutch-face and forming a counterpart to that of the pinion F, whereby they are locked together. The pin H or other device maintains this wheel in engagement with the pinion-clutch. On the shaft C is loosely mounted a driving-pinon,

I, which meshes with the gear-wheel G, and which also has a clutch-face at one side thereof, which engages a corresponding clutch-face of a driving gear-wheel, J, also mounted loosely on the shaft C and maintained thereon by a collar, K, and set-screw L, or other means. This wheel meshes with a pinion, M, on the main shaft of the mill and from it receives rotary motion, which motion it transmits to the driving-pinion I, thence to the idler-gear G, and from it to the pinion F, and thence to the pinion E, and from these pinions to the feeding-crushers B.

It will be observed that the speed of the feeding-crushers B with respect to that of the grinding mechanism will depend upon the relative sizes of the gears described. As a matter of convenience and cheapness, I prefer that the pinions E and F and the driving-gear J and pinion M should be of some predetermined relative size, and the change of size made in the relative diameter of the driving-pinion I and the idler G. As shown in Figs. 1 and 2, the crushers will travel quite slow with respect to the speed of the main shaft, because the increased size of the driving-gear J over the size of the pinion M and the increased size of the idler G over the driving-pinion I gear down the speed progressively from the main shaft.

In order that the pinion I and idler G may be removed and others substituted having a different relative diameter, the wheel J and pinion I are removable from the shaft C and the idler removable from the shaft D, the pinion I and idler G being also interchangeable from shaft to shaft, and suggested by a comparison of Fig. 5 with Fig. 2, in which former figure the pinion I is shown on the shaft D and the idler G on the shaft C. This increases the speed of the feeding-crushers B in the same ratio with respect to the speed of the driving-gear J as the speed of the crushers was decreased with respect to that driving-gear as organized in Fig. 2.

Referring to still another change, attention is called to Fig. 3, in which a substitute driving-pinion, I, and a substitute idler, G, are shown of the same diameter, whereby an intermediate speed is imparted to the feeding-crushers B, as compared with either of the speeds, as already described. Thus it will be seen that the low speed and higher speed and intermediate speed, which virtually cover the whole field of speeds required by crushing and feeding mechanism in practice, are secured, and this with only one change in the diameter of the driving-pinion and idler. I have just observed that these changes of speed take place in the crushing and feeding mechanism; and this statement is true, because the feeding-crushers B have also and of necessity a feeding action. I have shown one way of connecting the hubs of the several gears with each other, and one way of securing them on the shaft; but it is obvious that other ways may be employed in these details, and I mean to

be understood as not confining myself to these minute matters.

It should further be observed that the location of the crushing and feeding mechanism is not material so long as the former acts first upon the substances, and is in such position in respect to the latter as to accomplish this end. More than this, the changeable or variable motion-conducting mechanism here described will operate either of the feeding-crushers B if one is removed and a shaft merely left as a support of the gears. Then, too, a change in the size of either of the pinions E and F would change the speed of one feeding-crusher with respect to that of the other.

In Fig. 7 I have applied the same principle of operation to a single feeding-crusher by a modified arrangement of gears, in which the pinion N agrees in function with either of the pinions E or F and the gear-wheel O with the driving-gear J, because it receives motion from the main shaft and transmits it to the roller—in this instance immediately to the crusher-pinion and in the other instance mediately. The pinion N, however, differs from the pinions E and F, in that the former is removable, from its shaft and others of different sizes can be substituted, so as to vary the speed of the single feeding-crusher. The letter P designates a curved bracket having an eye at one end, which fits over the feeding-crusher shaft and is secured by a lug, Q, extending therefrom to the casing of the mill, as more clearly shown in Fig. 9. This bracket is slotted, as seen in dotted lines in Fig. 7, and through the slot the arbor R of the driving-gear O is adjustably mounted, whereby a gear, O', may be adjusted to and from the axis of the feeding-crusher B, so as to mesh with different-sized pinions on the shaft of said feeding-crusher. The manner of mounting the gear-wheel O is seen in Fig. 10.

The dotted circles N' in Fig. 7 indicate a smaller pinion, which may be used in lieu of the pinion N, and the gear-wheel O is placed in the position shown by the dotted circles O'.

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

1. In a crushing and grinding mill, the combination, with the main shaft, a crushing-conveyer thereon, and grinding mechanism, of the crushing and feeding mechanism mounted to crush and feed the material to the said conveyer, a driving gear-wheel geared to the main shaft and to the crushing mechanism, and an interchangeable pinion and idler connecting the said gear-wheel with the crushing mechanism, whereby the speed of the crushing mechanism may be varied with respect to that of the said conveyer and the grinding mechanism at will.

2. In a crushing and grinding mill, the combination, with the main shaft and grinding mechanism, of crushing mechanism mounted to crush and feed the material to the grind-

ing mechanism, a driving gear-wheel geared to the main shaft and to the crushing mechanism, and an interchangeable pinion and idler connecting said gear-wheel with the crushing mechanism, whereby the speed of the crushing mechanism may be varied with respect to that of the grinding mechanism at will.

3. In a crushing and grinding mill, the combination, with the main shaft and the grinding mechanism, of feeding-crushers geared together, a driving-gear on the shaft of one of the said feeding-crushers and operated by the main shaft, and an interchangeable pinion and idler mounted on the shafts of said feeding-crushers and transmitting motion thereto.

4. In a crushing and grinding mill, the combination, with the main shaft, pinion, and a grinding-head carried thereby, and a stationary grinding-head, of two intergeared feeding-crushers, an idler on one and an intergeared pinion of different diameter on the other of the crushing-shafts, and a driving-gear on one of said shafts clutched with the pinion or idler on that shaft (as the case may be) and meshing with the pinion on the main shaft.

5. In a crushing and grinding mill, the combination, with the main shaft and a pinion thereon, of the feeding-crushers, the gear-wheels rigidly secured to the shafts of said crushers, one of said wheels being provided

with a clutch or shoulder, the intermediate gear-wheel or idler, G, having a clutch or shoulder and loosely mounted on the shaft of one of the crushers, a smaller intermediate gear, I, loosely mounted on the shaft of the other crusher and provided with a clutch or shoulder, and a gear-wheel, J, also having a clutch, said wheel being loosely mounted on the same shaft with the last-named intermediate gear-wheel and meshing with the pinion on the main shaft.

6. In a crushing and grinding mill, the combination, with the main shaft and a pinion thereon, of feeding-crushers and gear-wheels rigidly secured to the shafts of said crushers, the intermediate gear-wheel or idler, G, mounted on the shaft of one of the crushers and a smaller intermediate gear-wheel, I, mounted on the shaft of the other crusher, the said gear-wheels G and I being interchangeable from one crusher-shaft to the other, and a gear-wheel, J, also mounted on one of the crusher-shafts and meshing with a pinion on the main shaft.

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

JAMES F. WINCHELL.

Witnesses:

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A. A. YEATMAN.