

(No Model.)

G. S. KNAPP.
CRUSHING AND GRINDING MILL.

No. 472,367.

Patented Apr. 5, 1892.

FIG. 1.

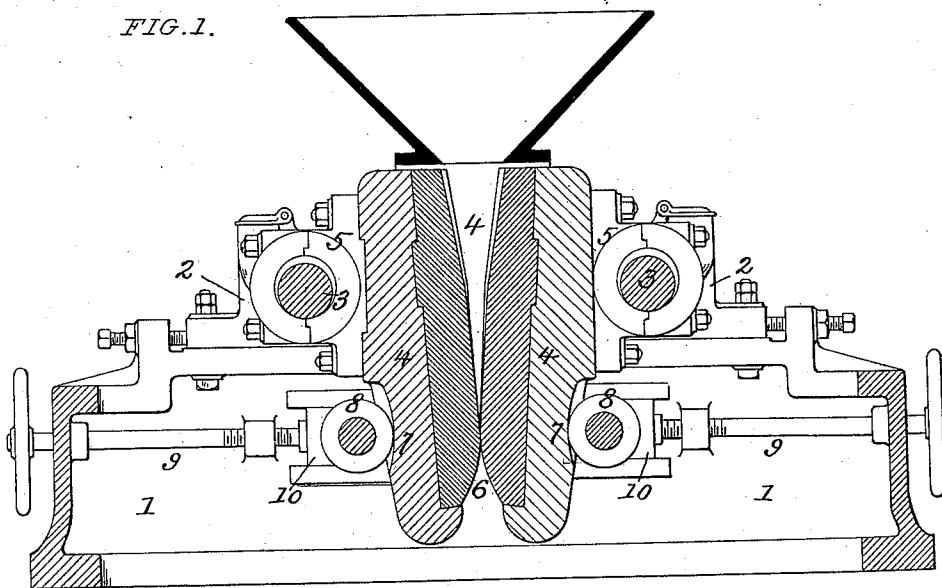
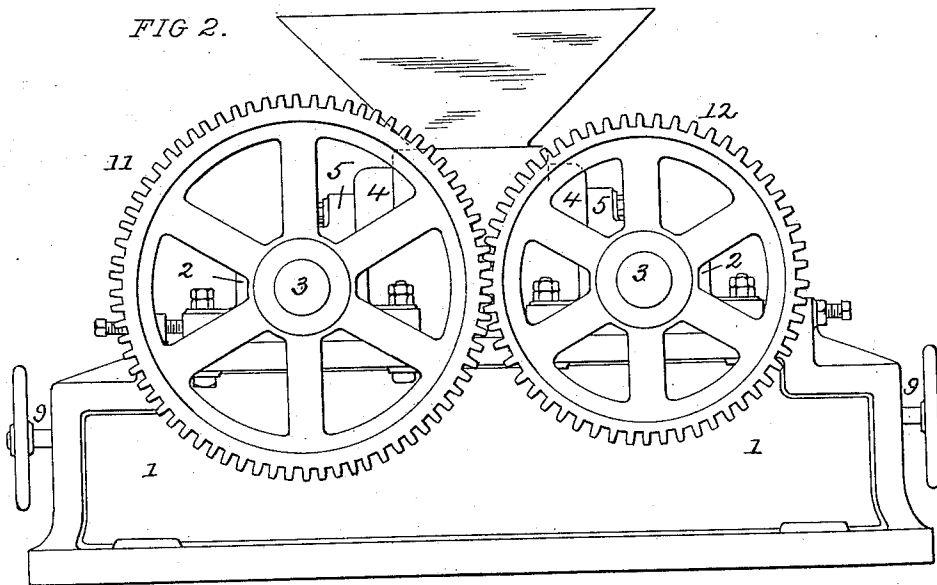


FIG 2.



ATTEST:

Geo. H. Arthur.....

W. H. Holmes.....

INVENTOR:

Geo. S. Knapp,

by *Robert Burns*.....

Attorney.

UNITED STATES PATENT OFFICE.

GEORGE S. KNAPP, OF CHICAGO, ILLINOIS.

CRUSHING AND GRINDING MILL.

SPECIFICATION forming part of Letters Patent No. 472,367, dated April 5, 1892.

Application filed May 21, 1891. Serial No. 393,621. (No model.)

To all whom it may concern:

Be it known that I, GEORGE S. KNAPP, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Crushing and Grinding Mills; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to that type of crushing and grinding mills for ore, stone, and like materials, in which motions to and from each other and up and down past each other are imparted to the pair of jaws by operative eccentric shafts journaled to the said jaws.

The objects of the present invention are twofold: first, to provide an improved formation of the jaws and the use in connection therewith of bearing-rollers for the lower ends of the jaws, whereby the opening or space between the lower ends of the jaws is preserved of a uniform size, regardless of the relative positions of the jaws with relation to each other or to a fixed part of the machine, and in consequence a reduction or crushing of the ore to a uniform degree of fineness will be effected before passing out of the machine; second, to provide an improved gearing connection between the operating eccentric shafts of the jaws, whereby a differential movement is imparted to the same, accompanied with a constant change in the opposing surfaces of the same, by which means a greater durability is imparted to the wearing or grinding faces of the jaws, due to a constant change in the surface thereof exposed to the greatest wear. I attain such objects by the construction and arrangement of parts illustrated in the accompanying drawings, in which—

Figure 1 is a longitudinal vertical section of a crushing and grinding mill constructed in accordance with my present invention; and Fig. 2, a side elevation of the same, illustrating my improved differential gearing connection between the eccentric operating-shafts of the mill.

Similar numerals of reference indicate like parts in both views.

Referring to the drawings, 1 represents the main stationary housing or frame of the mill,

having suitable boxes 2 for the bearings of the pair of eccentric driving-shafts 3, that impart motion to the counterpart jaws 4 of the usual sectional construction, the eccentric shafts 3 also turning in boxes 5 on the back of the jaws 4, as shown. In the present invention the lower portion 6 of the face of each jaw is of a curved formation, and the lower portion 7 of the back of each jaw is of a similar curved formation and constitutes a curved bearing-track for the friction or bearing roller 8, a pair of which are employed to hold the lower end of the jaws 4 4 in proper relative position.

The curved formation of the lower portion of the face and back of the jaws, as above described, imparts a uniform transverse thickness to the jaws at a horizontal line drawn between the axis of the rollers 8, at which point is the lower or discharge opening between the jaws, regardless of the vertical position of said jaws with relation to each other or the oblique position of the jaws with relation to vertical parts of the machine. I thereby obtain a uniform size of the opening between the jaws under all conditions, and in consequence can attain a uniform degree of fineness of the crushed product of the mill, the degree of fineness being gaged by the adjustment of the rollers 8 to or from each other by means of adjusting-screws 9 and adjustable boxes 10, that support the end trunnions of said rollers.

Another part of the present improvement relates to rotating the eccentric driving-shafts 3 3 at different speeds relatively, so that the one shaft and its jaw will have a faster movement relatively than the other shaft and jaw, and by this means attain a constant change in the opposing surfaces of the pair of jaws. This is best accomplished by means of a pair of spur-gears 11 and 12 upon the shafts 3 3, the one 11 being of a larger pitch diameter than the other. Various equivalent modifications in the gearing between the two shafts to attain a like result may be used without departing from the spirit of this part of my invention.

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

1. A crushing and grinding mill for ores,

&c., comprising, in combination, a pair of converging crushing-jaws 4, held together at their lower ends by guides or rollers 8, and their upper ends attached to eccentric driving-shafts 3, that are geared together so as to have a differential rotation, for the purpose set forth.

2. A crushing and grinding mill for ores, &c., comprising, in combination, a pair of converging crushing-jaws 4, held together at their lower ends by guides or rollers 8 and their upper ends attached to eccentric driving-shafts 3, that are connected together by a pair of spur-gears 11, having different diameters, for the purpose set forth.

3. A crushing and grinding mill for ores, &c., comprising, in combination, a pair of converging crushing-jaws 4, having the lower portion of their face and back curved, as described, the rollers 8 for holding the lower

ends of the jaws together, and the eccentric driving-shafts 3, connected to and operating the upper ends of the jaws, for the purpose set forth.

4. A crushing and grinding mill for ores, &c., comprising, in combination, a pair of converging crushing-jaws 4, having the lower portion of their face and back curved, as described, the rollers 8, made adjustable to and from each other and adapted to hold the lower ends of the jaws together, and the eccentric driving-shafts 3, connected to and operating the upper ends of the jaws, for the purpose set forth.

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

GEORGE S. KNAPP.

Witnesses:

ROBERT BURNS,

GEO. H. ARTHUR.