

(No Model.)

3 Sheets—Sheet 1.

A. LISTER.  
BONE GRINDING MACHINE.

No. 419,462.

Patented Jan. 14, 1890.

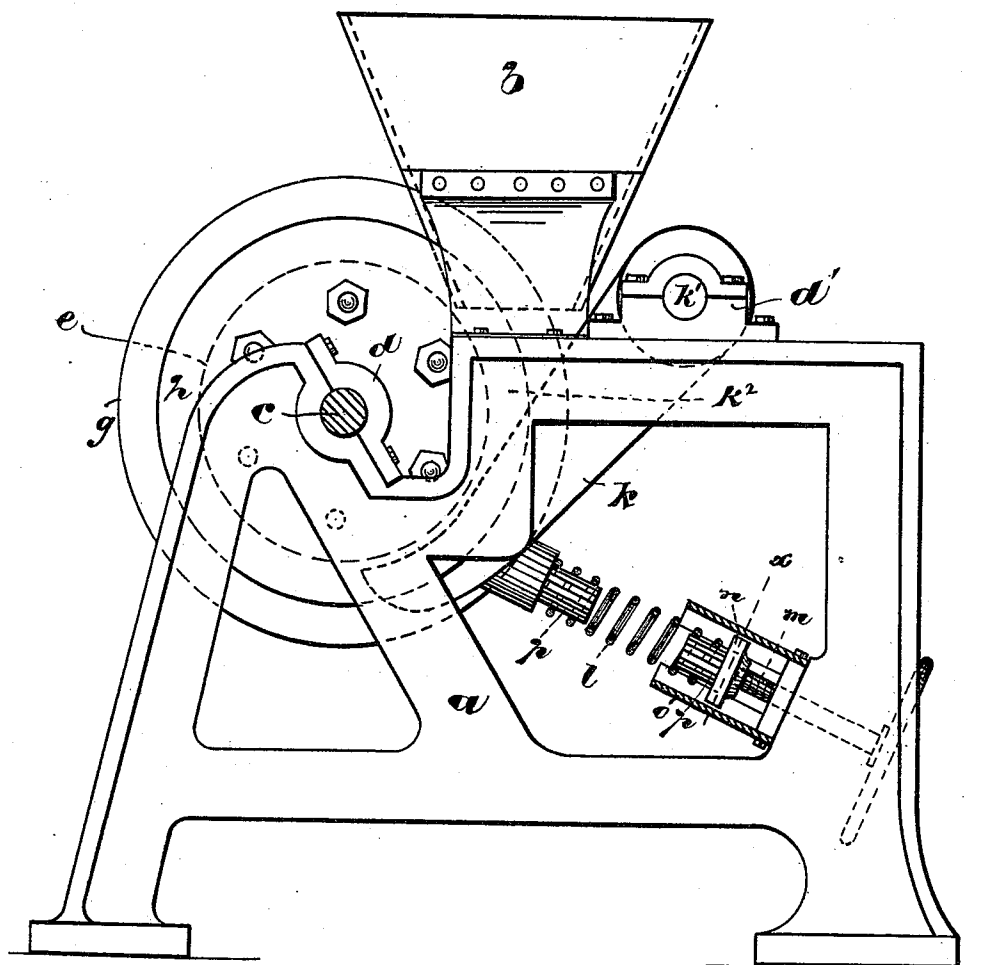


Fig. 1.

Witnesses  
E. L. Sheiman  
Alfred Hartman

Inventor  
**Alfred Lister,**  
By his Attorneys  
Drake & Co

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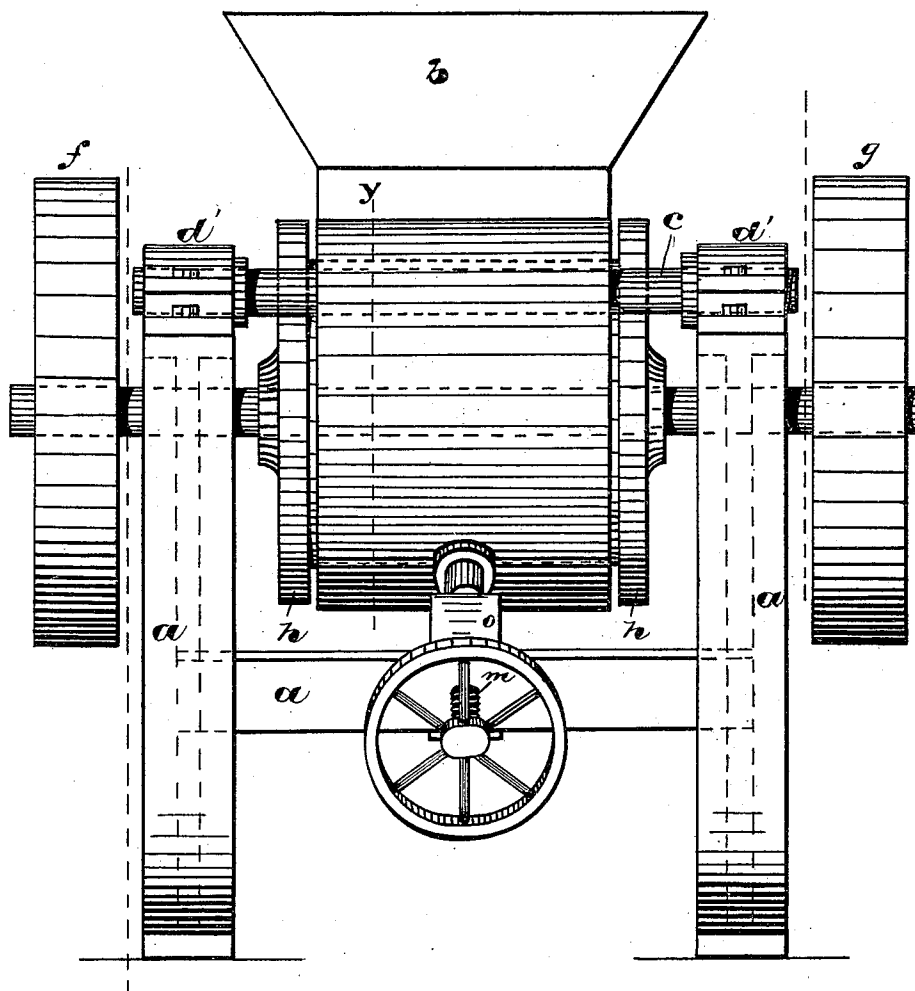


*Fig. 2.*

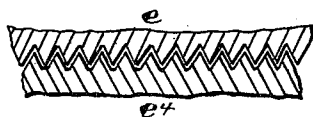


*Fig. 3.*

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*Drake & Co.*

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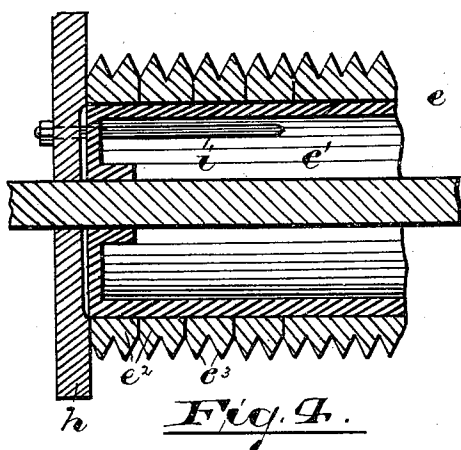


Fig. 4.

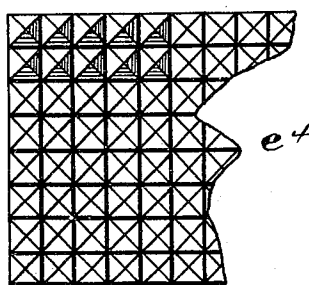


Fig. 5.

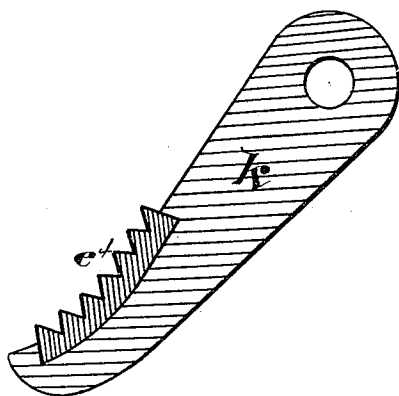


Fig. 6.

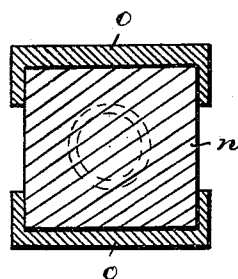


Fig. 7.

Witnesses  
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Alfred Sartner

**Alfred Lister,**  
By his Attorneys  
DRAKE & CO.

Inventor

# UNITED STATES PATENT OFFICE.

ALFRED LISTER, OF NEWARK, NEW JERSEY.

## BONE-GRINDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 419,462, dated January 14, 1890.

Application filed July 10, 1888. Serial No. 279,581. (No model.)

*To all whom it may concern:*

Be it known that I, ALFRED LISTER, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Bone-Grinding Machines; 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, reference being had to the accompanying drawings, and to letters of reference marked thereon, which a part of this specification.

The object of this invention is to produce a machine for grinding bone, rock, &c., more especially for fertilizing purposes; to reduce the cost of construction and the number of parts, and thus simplify and render the machine more durable; to reduce the amount of power heretofore required to do a given amount of work, and to secure a more perfect grinding at a single working of the material.

The invention consists in the improved grinding-machine and in the arrangements and combinations of parts thereof, substantially as will be hereinafter set forth, and finally embodied in the claim.

Referring to the accompanying drawings, in which like letters of reference indicate corresponding parts in each of the several figures, Figure 1 is a side elevation of the improved device, partly in section. Fig. 2 is a front elevation of the same; and Figs. 3, 4, 5, 6, and 7 are detail views, which will be duly explained, Fig. 6 being a section taken on line *y* in Fig. 2, and Fig. 7 a section on line *x* in Fig. 1.

In said drawings, *a* indicates a suitable frame, which may be of cast metal, and furnishes bearings or supports for the movable parts. At the upper part of the frame is arranged a hopper *b*, by means of which the bone or rock to be ground is fed to the grinding mechanism.

*c* indicates a shaft having its bearings in the frame, as at *d*, on which is formed or arranged a grinding wheel or roller *e*, a belt wheel or pulley *f*, and a balance-wheel *g*. The said roller consists of a cylindrical bed-roller *e'*, on which is disposed a series of rings *e<sup>2</sup>*, provided with pyramidal lugs or grinding-teeth *e<sup>3</sup>*. (Shown more clearly in Figs. 3 and

4.) Said lugs or teeth extend in rows around the periphery of the wheel or roller, as indicated, and have V-shaped notches or grooves between, corresponding with and adapted to receive similarly-shaped lugs or teeth on a plate *e<sup>4</sup>*, adapted to co-operate with the said roller in reducing the bone or rock to powder or particles. Said pyramidal teeth are made by forming serrations in the surface of the said rings and in the plate *e<sup>4</sup>* at right angles with one another, as will be understood upon reference more particularly to Fig. 5. The rings *e<sup>2</sup>*, after having been arranged in place on the cylindrical plate, as shown in Fig. 4, are held in place by end plates *h h*, which are tied together by bolts *i i*, which extend through the cylinder, as indicated. The said end plates project beyond the periphery of the rings *e<sup>2</sup>* *e<sup>2</sup>* and form flanges, by means of which the bones, &c., are prevented from working laterally from between the grinding-surfaces underground. The co-operating segmental grinding-plate is made adjustable in its relation to the roller, and is provided with a surface that is concentric or nearly concentric with relation to the roller, so that the surface will have an extended grinding-surface. Said grinding-plate is carried on or forms a part of a pivoted plate *k*, which has a tangential relation to the roller, and forms a hopper-shaped receptacle *k<sup>2</sup>*, as indicated in Fig. 1, which receives the bone, &c., from the hopper *b* proper. Said grinding-plate *e<sup>4</sup>* is preferably separable or removable from the plate or arm *k*, so that when the teeth are worn the said plate *e<sup>4</sup>* may be replaced by a new one without removing the arm or plate from its pivotal bearings. Said plate *e<sup>4</sup>* forms a dovetailed joint with the plate *k*, so that it is firmly held in place, but can readily be slid from its operative position when a substitution is to be made. The teeth in the plate are arranged in parallel series, as in case of those on the roller, and alternate with the latter, as indicated in Fig. 3, the teeth of one part lying in the groove of the other, so that the edge of one pyramidal tooth is presented to that of the other, and thus produces something like a cutting action, such as is produced by ordinary shears. By this arrangement it will be observed that the teeth of the roller travel for a considerable distance

through the grooves in the segmental plate  $e^4$ , and thus a large number of cutting or grinding edges, far exceeding those in any of the ordinary machines, are presented to the bones as they travel between the grinding-surfaces, so that the bones are very perfectly pulverized by the time they pass from the machine.

The pivoted plate  $k$  is carried by a shaft  $k'$ , held in bearing  $d'$ , and is held against or nearly against the roller by means of spring  $l$ , by which means, should any unusually hard substance, &c., get between the grinding parts, the said plate will be allowed to give, and thus accommodate itself to the unusual condition. The spring may be set up or loosened by means of the adjusting-screw  $m$ , so as to bring the surfaces into more intimate relation or to separate the same, as may be desired, so as to secure various grades of the ground products. The spring may be arranged to secure the desired results in any suitable manner; but I prefer the peculiar arrangement of parts shown, in which case the set-screw is arranged in connection with a sliding plate  $n$ , arranged in the box  $o$ , formed or arranged on the frame. The spring is arranged in studs  $p$ , formed in connection with the pivoted grinding-plate  $k$  and the sliding plate  $n$ , as will be understood.

In operation the bone, &c., is thrown into the hopper, and is conveyed thereby to the re-

ceptacle  $k^2$  between the roller and the plate  $k$ , from which it passes between the grinding-surfaces and is ground, after which the ground matter may drop to the floor or be conveyed from the machine by suitable ducts to any desirable position for packing and shipment.

Having thus described the invention, what I claim as new is—

In a bone grinding or pulverizing machine, the combination of a cylindrical bed-roller  $e'$ , a series of rings  $e^2$ , having pyramidal grinding-teeth extending in rows around and lengthwise of said roller, a pivoted arm or plate  $k$ , carrying pyramidal teeth corresponding and co-operating with those on said roller, as described, and plates  $h$ , projecting beyond the periphery of said rings to prevent lateral escape of the substance being ground, and bolts  $i$ , to hold said plates and rings in firm connection with said roller, said parts being arranged with relation to one another and operating substantially as described, for the purposes set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 5th day of June, 1888.

ALFRED LISTER.

Witnesses:

CHARLES H. PELL.  
C. H. BALDWIN.