A. & E. LISTER.

Mill for Grinding Bones.

No. 107,184. Patented Sept. 6, 1870.

Fig. 2.

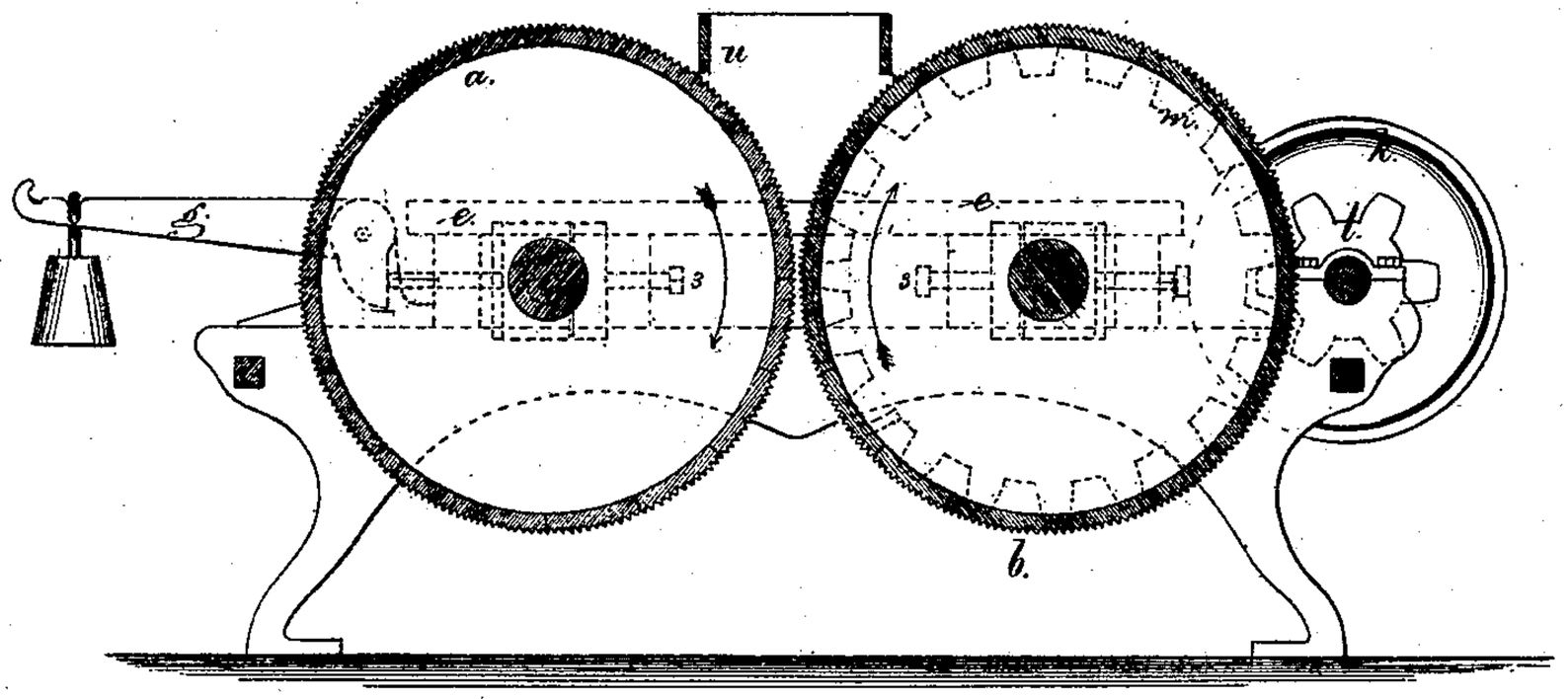
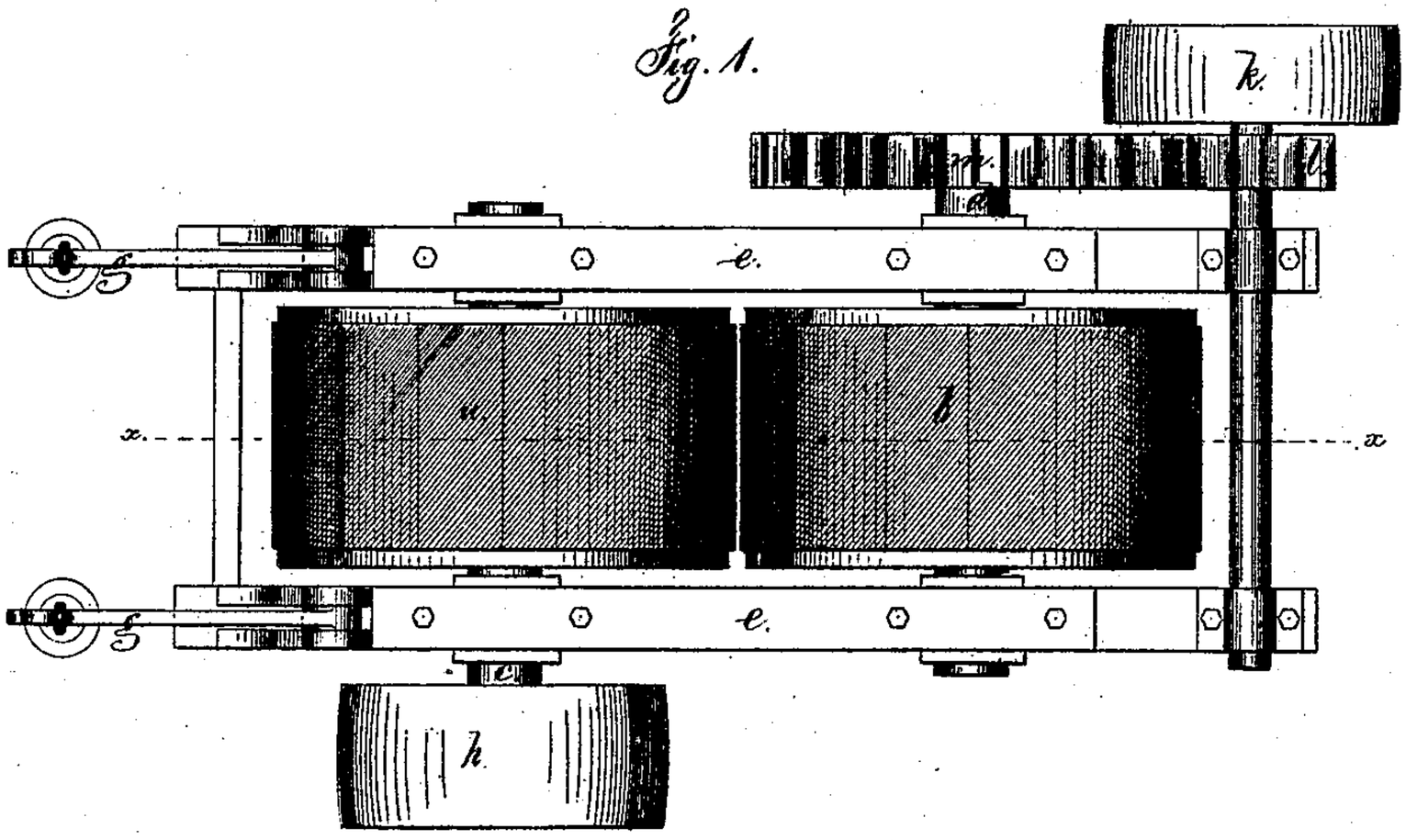


Fig. 1.



Witnesses,

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United States Patent Office.

ALFRED LISTER AND EDWIN LISTER, OF NEWARK, NEW JERSEY.

Letters Patent No. 107,184, *dated September* 6, 1870. Antedated, Sept. 5. 1870.

IMPROVEMENT IN MILLS FOR GRINDING BONES.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that we, ALFRED LISTER and EDWIN LISTER, of Newark, in the county of Essex and State of New Jersey, have invented and made a new and useful Improvement in Mills for Grinding Bones and other articles; and the following is declared to be a correct description thereof.

Bone is a highly-concentrated fertilizer or restorative of worn-out land, but its production is slow, because no adequate means have before been devised for reducing the bone to a powder with rapidity and cheapness.

Bones have heretofore been cracked and broken up by rollers into lumps of various sizes, and employed as manure. In this state the action of the manure is very slow, because the bones do not decompose with rapidity, and the fertilizing elements are not easily dissolved.

Efforts have been made to reduce the bones to a fine flour or powder, so that they may become soluble, and hence be absorbed by vegetation. These efforts have not been successful, because the mills heretofore employed are liable to become clogged and inoperative, in consequence of the adhesive nature of the bone, particularly when warmed by the friction in grinding.

A pair of rollers will not pulverize the particles of bone sufficiently fine, because the bone is very tough and the mass passes through without being sufficiently reduced to a powder.

Our invention consists in a grinder, made of a cylinder with cutting-edges upon its periphery, and revolved rapidly, so as to be moving downward at the cutting point, in combination with another cylinder with cutting-edges, and revolved so that its surface at the cutting-point moves upwardly.

By this construction, the surfaces, moving upward and downward, act as shears to cut the bone or other material up into a fine powder, and the cutters do not become clogged by the bone, because there is no jamming or compression of the particles of bone, the rising cutting-surface relieving the particles by lifting them; hence there is only a rapid shearing action, that cuts the bone or other material up into very fine particles, with great rapidity, and the centrifugal action keeps the cutting-edges from becoming full of the fine bone or other flour.

In this construction of mill a hopper is applied between the two cylinders, and said hopper can be filled with material to be ground, and the grinding operation will proceed with great rapidity, the cylinders being revolved as aforesaid.

In the drawing—

Figure 1 is a plan of the grinding-mill, without the containing-hopper, and

Figure 2 is a vertical section of the apparatus, at the line *x x*.

The cylinders *a* and *b* are mounted on shafts *c* and *d*, and the peripheries of the cylinders are made of plates, with cutting-edges formed by ribs upon the surfaces of said plates. The ribs are at an inclination, so that the cutting-edges act as shears at the grinding-point where the surface of the cylinder *a* descends and that of *b* ascends, as represented by the arrows.

The plates are secured upon the heads of the cylinders by countersunk bolts, or otherwise, and the size of the ribs and the intervening grooves are deeper or more shallow, according to the grade of fineness required in the article ground.

The shaft *d* is set in adjustable boxes in the frames *e e*, (see dotted lines in fig. 2,) and the shaft *c* is also set in boxes in the frames *e*, but these latter boxes are allowed to yield, so as to prevent injury to the cylinders by any foreign substance that may get in between them, the levers *g* and weights, acting upon said boxes, serving to keep the rollers *a b* toward each other, but they are not allowed to actually touch, the adjusting-screws 3 forming stops.

The cylinder *a* is propelled rapidly by a belt to the pulley *h*, or otherwise, and the pulley *k* and gears *l m* may be employed to rotate the cylinder *b*.

The hopper *u* is to set closely upon the edges of the cylinders, and receives the bones, or small pieces of bones or other material to be ground up into powder of flour, as aforesaid.

Our improvement, although especially intended for grinding bones, may be used for grinding plaster, logwood, charcoal, and many other articles, with great rapidity, and with but little risk of clogging.

We claim as our invention—

The revolving grinding-cylinders *a b*, the surfaces of which are composed of diagonal cutting-edges, moving in opposite directions, substantially in the manner and for the purposes specified.

Dated this 15th day of January, A. D. 1870.

ALFRED LISTER.
EDWIN LISTER.

Witnesses:
JOHN B. RUSSELL,
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