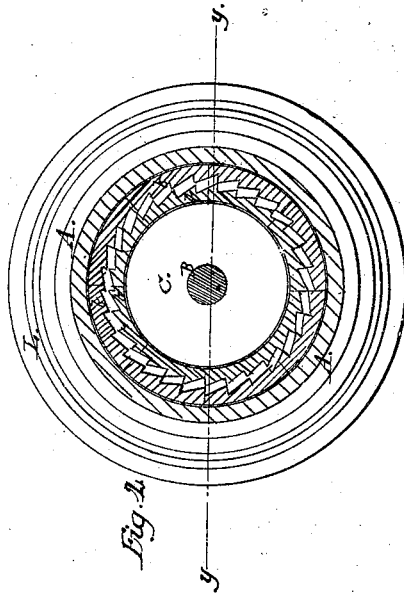
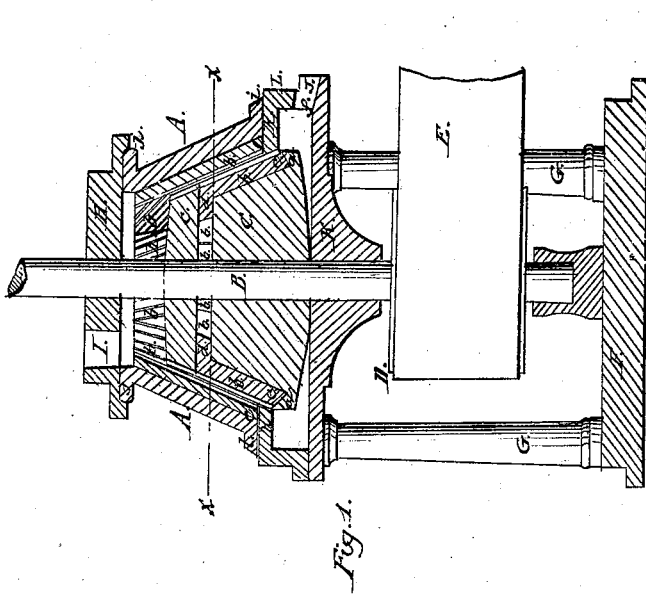
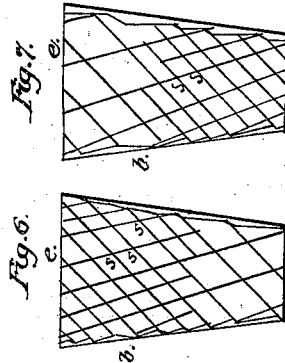
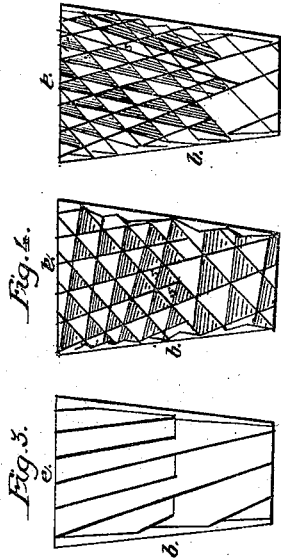


Bone Mill.

No. 46,627.

Patented Mar. 7. 1865.



Witnesses:
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UNITED STATES PATENT OFFICE.

EDWIN P. BAUGH, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN BONE-MILLS.

Specification forming part of Letters Patent No. 46,627, dated March 7, 1865.

To all whom it may concern:

Be it known that I, EDWIN P. BAUGH, of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a new and useful Improvement in Bone-Mills; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is an elevation of a vertical axial section of a mill made according to my invention, the section having been taken on the line *y* of Fig. 2. Fig. 2 is a plan view of a section of my mill, taken on the horizontal line *x* of Fig. 1. Figs. 3, 4, 5, 6, and 7 are detailed views of examples of the sectional dress hereinafter described.

Similar letters of reference indicate like parts.

The object of this invention is to construct a mill suitable for grinding and reducing bones to the fine condition required when they are to be used as a fertilizer, and also for grinding other refractory substances; and it consists, among other things, of a novel construction of the grinding-surfaces, sometimes called the "dress," an improved mode of securing them in the mill, and of other improvements hereinafter set forth.

F represents a floor, from which rise standards G, three or more in number, which support the foundation-plate K of the mill.

The vertical shaft B of the mill is stepped in a bearing, which is secured to the floor F, and it carries a pulley, D, which is driven by a belt, E, from a driving-pulley. (Not seen.) The foundation-plate K is circular in form, and is perforated at its center to receive the shaft B, being also enlarged at its center to form a hub for the purpose of steadying the shaft in its revolutions.

C is a solid piece, somewhat resembling the frustum of a cone, firmly secured to the shaft B, which passes through its center. The base of this conical piece is slightly convex, so that it touches the top of the foundation-plate K only at the line where the shaft B intersects both the plate K and the solid piece C. The base of the said piece C is extended beyond the sides of the piece, so as to form a ledge, *a*, about its lower edge, to receive and sustain

the lower edges of the section *b* of the dress, hereinafter next mentioned.

The solid piece C serves as a foundation for building up the revolving or movable grinding-surface, which is made of sections *b*, whose outline in side view is seen in Fig. 1, their outline in front view being seen in Figs. 3, 4, 5, 6, and 7. The lower edges of the sections are so made as to sit snugly and securely upon the ledge *a*. Their upper ledges lap over the top of the conical piece C, as shown at *d*, while in a transverse direction they are curved, being severally arcs whose curves are concentric with the curved lines described by the sides of the conical piece C. In the representation of the sections *b* in detail they are shown with their bases *e* uppermost; but in placing them in the mill their bases are below, as seen in Fig. 1. The sections *b*, which are fitted to the conical foundation-piece C, are held in place thereon by a plate, *c*, made slightly convex on its upper face, which passes down the shaft B and revolves with it, the said sections being firmly clamped between the ledge *a* and the plate by means of bolts. (Not shown.)

L is a ring which incloses the lower part of the revolving conical grinding-surface of the mill, its lower face, *f*, resting upon the outer part of the foundation-plate K, and its upper face, *h*, forming the support of the outer shell, A, of the mill and of its stationary grinding-surface. The faces *f* and *h* are in horizontal planes, the latter extending inward nearly to the upper rim of the ledge *a* of the conical piece C, and they are united by a vertical ring, *g*. An opening, J, is made through the said ring in its face *f*, for the discharge from the mill of whatever substances have been passed through it, and a groove is cut in the outer edge of the plate K, opposite said opening J, so that the discharge-opening shall be of sufficient capacity for that purpose.

A is a shell, whose exterior form is that of the frustum of a cone, and whose inner and outer sides are parallel to the exterior of the conical foundation C. This shell has a base-flange, *i*, and a top flange, *j*, both extending beyond its sides, the former resting on the top of the face *h* of the ring L, and the latter sustaining the top plate, H, which is to be bolted to the ring L by bolts (not here shown) passing through the flanges *j* and *i*. The shaft B passes centrally through the top plate, and

the said plate has a delivery-opening, I, therein, through which the material to be ground is fed to the mill. The inner diameter of the shell A is such that the sections *b* of the outer stationary grinding-surface may be placed within the said shell A, and against its inner sides, their bases *c* resting upon the inner part of the horizontal face *h* of the ring L. The sections *b* are not fastened to each other nor to the shell A, but are sustained upon the ring L, and are kept from displacement by each other, after the manner of an arch.

The outer surface of the plate *c* is formed so as to be part of the dress of the movable grinding-surface, and the space in the mill inclosed between its convex top and the under surface of the top plate, H, forms a hopper or receptacle for the material fed in through the opening I, the said material sliding off its edges by reason of the centrifugal action imparted by the rotation of the plate, and falling between the movable and stationary grinding-surfaces of the mill. The sections *b* of the movable grinding-surface are retained in place on their conical foundation by means of their lateral contact with each other, and are kept from vertical displacement by means of the plate *c*, which binds them when it is bolted to the ledge *a*, as above mentioned.

The dress of the mill may be of any suitable character, according to the work to be done. By making the grinding-surfaces of metal, in the way above described, I am able to give them any character of dress by "casting" the sections according to the usual practice of the art of molding and casting in metals. This cannot be done when the grinding-surfaces of conical or cylindrical mills are cast in the form of cones or of frustums of cones or of cylinders, because in such cases it is necessary that the dress be in straight lines parallel, or nearly so, with the axis of the casting, in order to withdraw them from the sand with facility, and even when they are cast in one piece it is almost impossible to secure truth of circle in the casting. Therefore, in order to produce a grinding-surface, made by casting, which may have a dress made of irregular and broken lines and surfaces, such as are shown in Figs. 4, 5, 6, and 7, I construct such surface by casting it in sections or divisions *b*. I thereby avoid, among other things, all defects which arise from the unequal contraction of the cylinders in cooling, and am able to secure accuracy in the dress and other surfaces of the castings. An indefinite number of changes may be made in the character of the dress when this mode of constructing cast grinding-surfaces is followed.

The examples of dress given in Figs. 4, 5, 6, and 7 show a series of inclined planes, *s*, of small area, separated from each other by straight lines which are diagonal to each other and to the edges of the sections or divisions. By varying the angles at which the lines intersect each other and their direction in regard to the edges of the castings a different

character is given to the dress. By increasing or diminishing the depth of the lines and by increasing or diminishing the areas of the several planes *s* the dress is also changed in character as to rapidity of action and degree of comminution.

In grinding bones and other substances in which some portions are brittle and some are tough, it is desirable to combine different characters of dress in one and the same mill, or in each of the grinding-surfaces thereof. By making the grinding-surfaces in sections and building them up as above described, I am able to accomplish this result, and by making the dress of the character described in the several Figs. 3, 4, 5, 6, and 7 I am able to secure a great variety in the character of the dress. These figures represent the sections upside down. It is obvious that if the angles of the planes *s* are presented in the direction shown, when the sections are in the mill the lower parts, now the narrowest, should be widened to the width of the bases *e*, and the edges now designated by that letter should be narrowed. By reversing the drawings so that the edges *e* take the positions which they would have in the mill, it will be seen that the direction of the longest lines of the dress is the same in each, and when they are unbroken, as in the example shown in Fig. 3, the material to be ground tends to pass through the mill very rapidly by slipping along the said lines downward toward the base *e*. By means of the dress shown in the other figures this tendency is corrected and the material is retained in the mill sufficiently long to be thoroughly reduced.

When it is necessary to adjust the mill to grind different substances, by changing the distance of the fixed grinding-surface from that which is movable I raise the ring L and the shell A by means of adjusting-screws or other suitable mechanical devices, none of which are here shown, because they are familiar to mechanics, and I do not claim the invention of such devices. The shell may be thus elevated while the mill is in active operation, suitable provision being made to prevent the delivery of the pulverized material at any other place than the discharge-opening J.

When any part of the dress becomes worn out or any section becomes broken, or it is desirable to vary the character of the grinding-surfaces or either of them, or any part of either, such repairs or changes can be made by supplying new or different sections or divisions *b* without disturbing other parts of the mill and without replacing or removing the whole of the grinding-surfaces.

I claim as new and desire to secure by Letters Patent—

1. Making the grinding-surfaces of mills for grinding bone and other substances, when the same are of cast metal, in sections or divisions, so that the outer grinding-surface shall be composed of vertical sections *b*, and the inner grinding-surface shall be composed of

vertical sections *b*, surmounted and held in place by a ring, C, whose periphery is also a grinding-surface, substantially as above described.

2. Making the ring L, which serves as a foundation for the lower edges of the outer grinding-surface, separate and distinct from

the shell A, which surrounds the said outer grinding-surface, substantially as above described.

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Witnesses:

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