

No. 641,346.

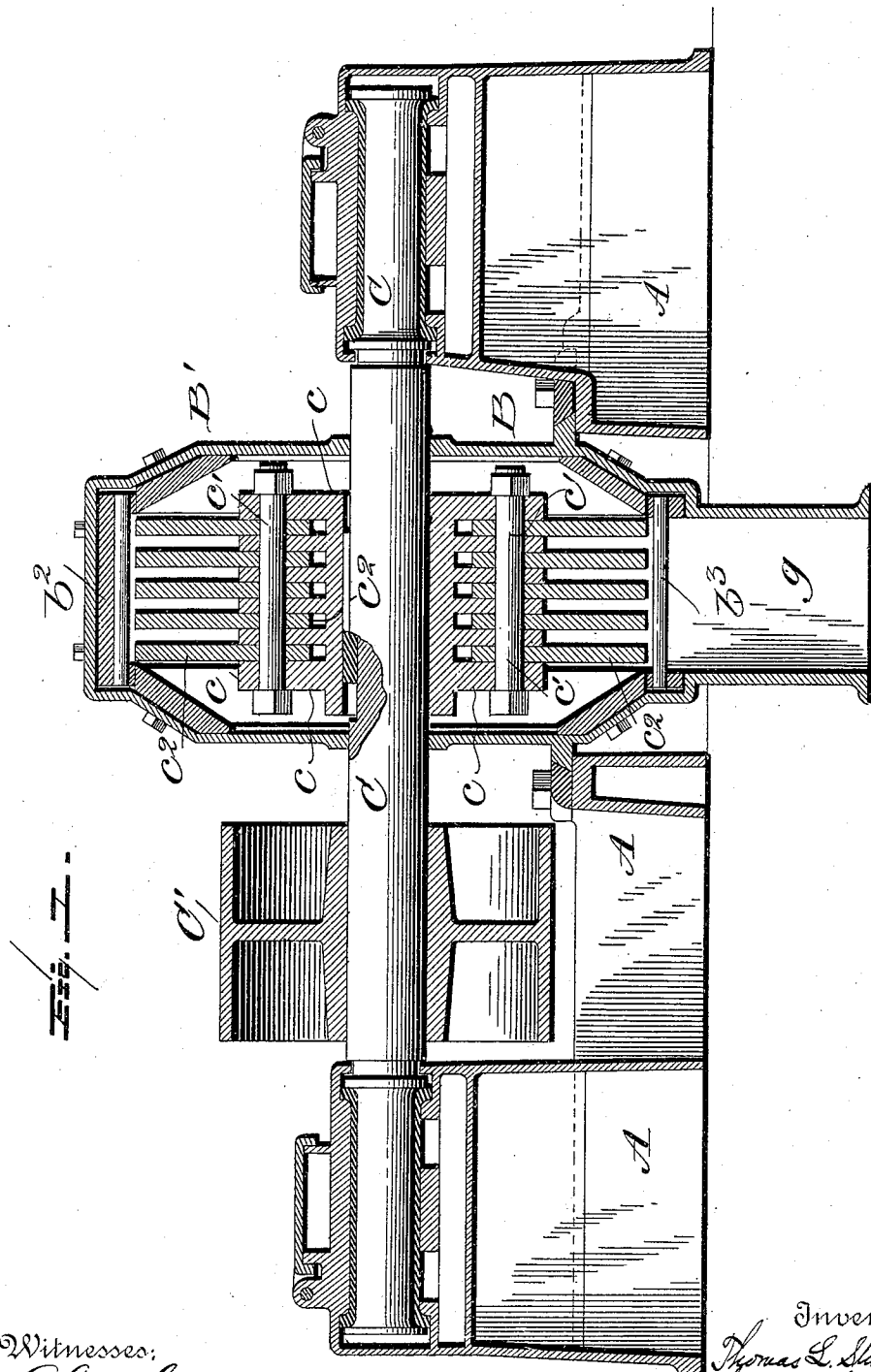
Patented Jan. 16, 1900.

T. L. & T. J. STURTEVANT.
CRUSHING MILL OR DISINTEGRATOR.

(Application filed May 25, 1899.)

(No Model.)

3 Sheets—Sheet 1.



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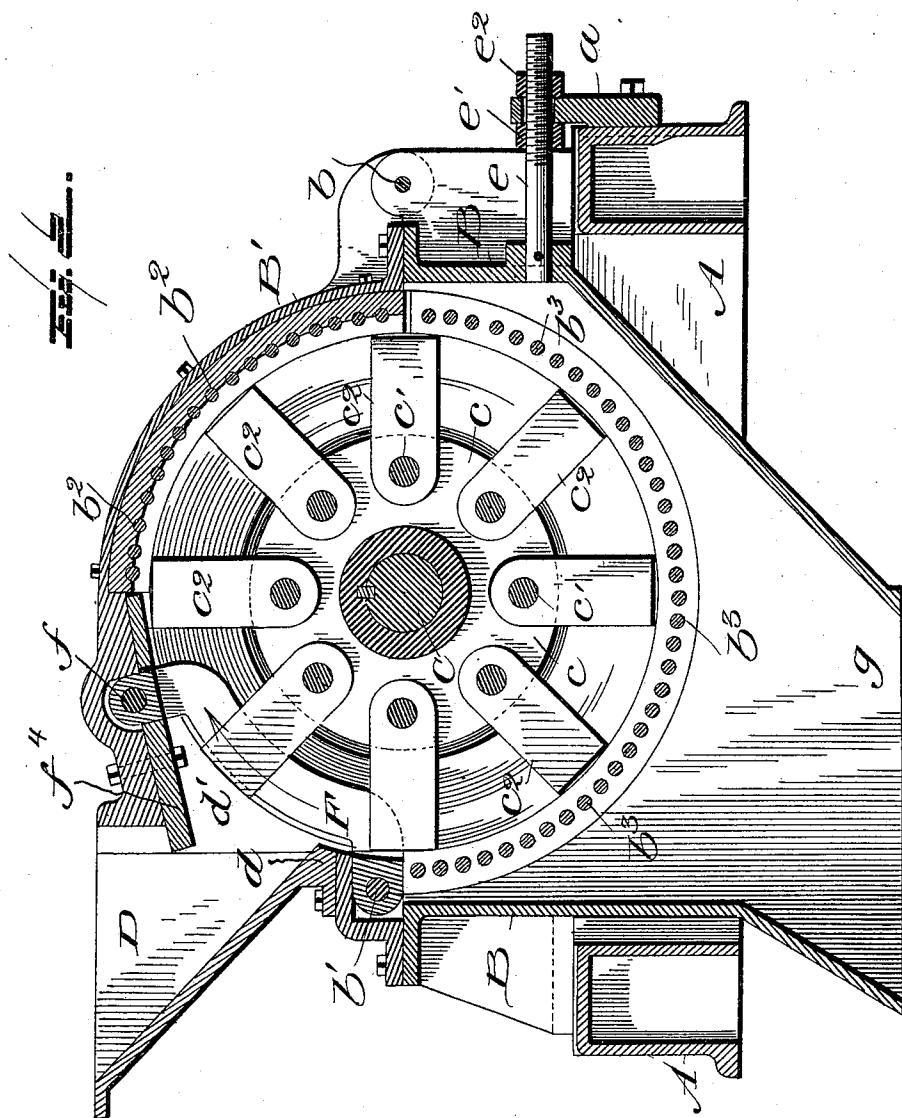
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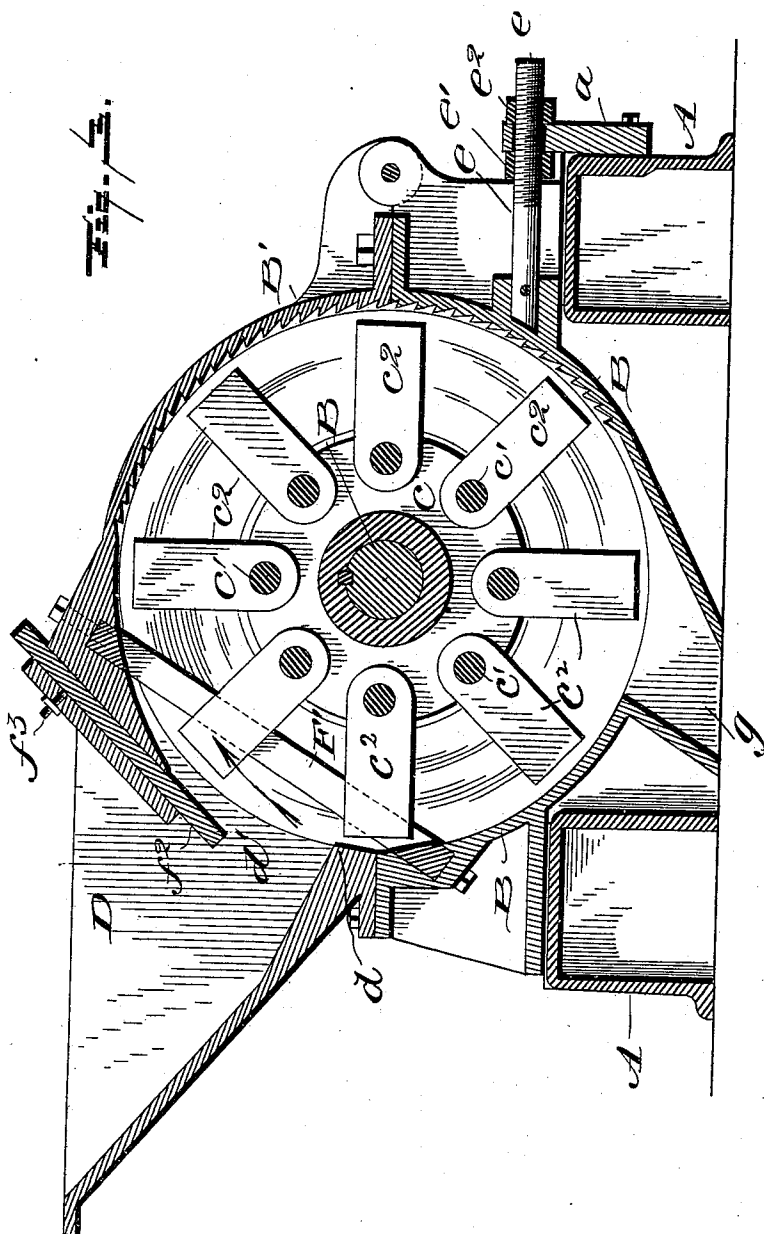
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3 Sheets—Sheet 3.



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UNITED STATES PATENT OFFICE.

THOMAS L. STURTEVANT, OF QUINCY, AND THOMAS J. STURTEVANT, OF
NEWTON, MASSACHUSETTS.

CRUSHING-MILL OR DISINTEGRATOR.

SPECIFICATION forming part of Letters Patent No. 641,346, dated January 16, 1900.

Application filed May 25, 1899. Serial No. 718,348. (No model.)

To all whom it may concern:

Be it known that we, THOMAS L. STURTEVANT, residing at Quincy, in the county of Norfolk, and THOMAS J. STURTEVANT, residing at Newton, in the county of Middlesex, State of Massachusetts, citizens of the United States, have invented certain new and useful Improvements in Crushing-Mills or Disintegrators, of which the following is a specification, reference being had therein to the accompanying drawings.

Our invention relates to that class of crushing and pulverizing-mills in which the material is disintegrated by pivoted revolving beaters or hammers, which serve to crush the material by percussive action. In this our improved mill we preferably employ a grated hopper somewhat similar to that shown in our application, Serial No. 715,026, filed April 29, 1899, the beaters or hammers extending between and through the bars of the grate of the hopper, so as to break up the material to a certain fineness before it enters the casing in which the hammers or beaters revolve.

In the present instance, however, the hammers or beaters are designed to rotate upwardly on the hopper side of the machine, and the upper portion of the mill-casing, over toward which the material is carried by the revolving beaters, is toothed or corrugated, so as to cooperate with the beaters in further crushing the material carried into the casing. In the present instance the lower portion of the casing in which the hammers or beaters revolve is preferably formed as a screen, the meshes or spaces between the bars of which determine the degree of fineness to which the material will be reduced before it can escape from the mill-casing. To regulate the crushed output of the mill, as also to compensate for the wear of the revolving beaters or hammers, the casing within which the said beaters or hammers revolve is preferably made adjustable toward or from the shaft by which the beaters are carried, so that portions of the corrugated parts of said casing, as also portions of the screen, may be brought into any desired proximity to the ends of the revolving beaters or hammers. The grated hopper is also preferably movable with the said casing toward and from the re-

volving shaft carrying the beaters or hammers, so that the adjustment of the casing will also regulate the distance which the revolving beaters or hammers can project through the bars of the grate into the hopper, thereby determining the amount of duty imposed upon the beaters or hammers when the mill is in operation, according to the power which may be desired to be applied to drive the mill or the amount of output of the latter.

In this class of mills employing revolving beaters or hammers it has heretofore been found impracticable to revolve the beaters or hammers upward toward the hopper for the reason that such upward running of the beaters or hammers would cause such a volume of dust to pour out of the hopper as to be suffocating to the attendants, so that they could not work in proximity to the mill. We have avoided this difficulty in the present instance by so constructing the hopper-entrance to the chamber of the mill that the revolving beaters or hammers instead of blowing the dust out of the hopper will induce a suction down through the hopper, and thus the dust will be drawn down through the chamber of the mill and forced out at the discharge portion of the casing, while fresh air is constantly drawn in through the hopper.

In the accompanying drawings, Figure 1 is a vertical longitudinal section of a crushing-mill embodying the present improvements, and Fig. 2 is a cross-section thereof. Fig. 3 is a cross-section of a slightly-modified form of our invention.

In the drawings, A denotes the base or frame, on which is slidingly mounted the lower portion B of the mill-casing and with which lower portion B the upper portion B' of the said casing is preferably connected at one side by a hinged bolt b, so that the said upper portion of said casing may be turned back for access to the beaters or hammers when the fastening-bolts b' on the opposite side of the casing have been removed.

C denotes the revolving driving-shaft, provided with a flanged hub c, between the flanges of which are pivotally mounted by means of bolts c' the revolving beaters or hammers c², the said driving-shaft C being provided with a

pulley C'. The casing inclosing the revolving beaters is preferably toothed or corrugated on a portion of its inner side, this corrugation being formed in the construction shown in Fig. 2 by transverse rods or bars b^2 in the upper portion of the casing, and the lower portion of the chamber within which the revolving beaters or hammers work is preferably formed as a screen, this screen in the present instance being afforded by the transverse rods or bars b^3 , preferably arranged in a semicircle at the lower part of the chamber in which the beaters or hammers rotate.

D is the hopper, through which the material is fed into the mill, the said hopper being so constructed that its inner lower portion d is brought into comparatively close proximity to the paths described by the outer ends of the revolving beaters, while the upper portion of the entrance-mouth d' of the hopper to the chamber of the casing in which the beaters revolve is constructed to flare outward and is contracted at its inner part near the ends of the revolving beaters, so that as the latter move upward when rotated in the direction indicated by the arrows in Figs. 2 and 3 an inward suction of air through the hopper will be induced, which will cause a blast through the discharge portion of the casing, thereby preventing dust from being forced outward at the hopper-entrance to the mill-casing, but causing all the dust to be forced outward at the discharge portion of the mill.

F denotes the grate, which is preferably attached to the upper portion B' of the casing, as by bolts f , and the bars of said grate, as shown in Fig. 2, are curved to conform to the arc of the circle described by the outer ends of the revolving beaters or hammers, which latter are arranged to extend through between the bars of the grate, so as to crush the material in the hopper and carry portions of the crushed material through the grate-bars into the chamber in which the said revolving beaters or hammers work, and in which chamber the material will be further crushed or disintegrated by impact against the corrugated inside part of the casing, as also against the rods or bars b^3 , forming the screen.

The entire casing B and B' is adjustable relative to the supporting-frame A by means of a threaded bolt e , attached to the lower portion B of the casing, and adjusting-nuts $e' e^2$, said bolts abutting against opposite sides of a projection a on the base or frame A. Thus by turning the nuts $e' e^2$ the entire casing B B' may be adjusted in a direction transverse to the longitudinal axis of the driving-shaft C, thus bringing portions of the corrugated part of the casing, as also portions of the screen at the lower portion of the beater-chamber, nearer to or farther from the ends of the revolving beaters or hammers. This adjustment will also cause the beaters or hammers to project more or less through between the bars of the grate F into the space

of the hopper D, so as to have a greater or less bite upon the material in the hopper.

Instead of making the casing corrugated by providing transverse rods, as shown in Fig. 2, the corrugations may be formed directly on the casing wall or plate, as shown in Fig. 3, in which last-named figure the corrugated part of the casing is shown as being extended down onto the lower portion of the casing, and the screen shown in Fig. 2 at the lower portion of the beater-chamber is omitted. In this construction (shown in Fig. 3) the bars of the grate F' are straight instead of being curved, as in Fig. 2, and the outwardly-flaring inwardly-contracted mouth d' at the upper portion of the hopper is formed partly by an adjustable and removable feed plate or slide f^2 , which may be raised and lowered to regulate the feed of the material to the mill and also the air-draft to the mill-case and which is held in any desired position of adjustment in the ways formed for it in the upper part of the mill-casing by a set-screw f^3 .

The outwardly-flaring and inwardly-contracted mouth d' , above referred to, which, in connection with the upwardly-moving hammers or beaters, serves to form an indraft or suction of air from the hopper into the casing of the mill, is the space between the grate-bars F or F' and the feed-plate or casing-wall and feed-plate above them. This space or chamber, to distinguish it from the chamber of the hopper and the chamber of the mill in which the beaters or hammers rotate and which is located between the hopper-chamber and mill-chamber, we will term a "grate-chamber," and this grate-chamber, constructed as described, serves, in connection with the upwardly-moving hammers or beaters and also, preferably, in connection with the deflecting-plate d , an important function in creating an indraft of air through the hopper.

In the operation of our improved mill the material is fed into the hopper D and the beaters are revolved in the direction indicated by the arrows in Figs. 2 and 3, so as to move upwardly on the hopper or feed-entrance side of the casing, or in a direction opposite to the natural feed of the material. By this upward-rotating movement of the beaters or hammers the material is disintegrated in the hopper, and as it is broken by the beaters or hammers it is carried through between the bars of the grate into the chamber of the mill, where it is further disintegrated or pulverized by being knocked about by the beaters or hammers and against the corrugated inner portion of the casing, as also against the bars of the screen in the lower portion of the beater-chamber, where such screen is employed. The objection heretofore existing owing to the escape of suffocating dust from the hopper is entirely obviated in the present improvement by the peculiar construction of the entrance-mouth of the hopper, in that the deflecting-plate or inwardly-extending lower portion thereof, as d , has a tendency to so deflect any

upwardly-moving air-currents that they will not be forced out of the hopper, but will be sucked inward by the outwardly-flaring and inwardly-contracted mouth or grate-chamber at *d'*, leading from the hopper to the chamber of the casing, thus, as hereinbefore stated, inducing suction down through the hopper and a draft through the mill-casing, which will expel the dust through the discharge-spout *g* of the mill. This discharge-spout is preferably tangential to the circle of rotation of the beaters or hammers, inclining away from the paths of said revolving beaters or hammers in the general direction of their rotation.

In Fig. 2 the feed-plate *f*⁴ is shown as being bolted to the casing *B'* and is thus adapted to be removed and a similar longer or shorter feed-plate be substituted therefor to change the feed of material to the mill, as also to regulate the indraft of air.

We do not wish to be understood as limiting our invention to the details herein shown, as these may be varied widely without departing from the spirit of our invention.

Having thus described our invention, we claim and desire to secure by Letters Patent—

1. In a crushing-mill, the combination with pivoted revolving beaters or hammers, of a casing in which said beaters or hammers are inclosed and which is provided with a hopper, a grate interposed between the chamber of said hopper and the chamber of said casing, and between and through the bars of which grate the ends of said revolving beaters or hammers extend, and means for inducing an indraft of air from the said hopper-chamber into the chamber of said casing.

2. In a crushing-mill, the combination with pivoted revolving beaters or hammers, of a casing in which the said beaters or hammers are inclosed and which is provided with a hopper, a grate adjacent to said hopper and between and through the bars of which the ends of the pivoted revolving beaters or hammers extend, and an outwardly-flaring and inwardly-contracted grate-chamber between the chamber of said hopper and the chamber of said casing and which serves, in connection with the said revolving beaters or hammers, to induce an indraft of air from the said hopper into the chamber of said casing.

3. In a crushing-mill, the combination with pivoted revolving beaters or hammers, of a casing in which the said beaters or hammers are inclosed and which is provided with a hopper, a grate adjacent to said hopper and between and through the bars of which the ends of the pivoted revolving beaters or hammers extend, an outwardly-flaring and inwardly-contracted grate-chamber between the chamber of said hopper and the chamber of said casing, and a deflecting-plate at the lower side of said hopper cooperating with said grate-chamber and revolving beaters or hammers, to induce an indraft of air from

the said hopper-chamber to the chamber of the mill.

4. In a crushing-mill, the combination with a casing provided with a hopper, the said mill having an outwardly-flaring and inwardly-contracted grate-chamber between the chamber of said hopper and the chamber of said casing, of a grate adjacent to said hopper, and pivoted revolving beaters or hammers extending between the bars of said grate and rotating in a direction to cause them to move upward on the hopper side of the casing.

5. In a crushing-mill, the combination with a casing provided with a hopper, of a grate adjacent to said hopper, an outwardly-flaring and inwardly-contracted grate-chamber between the chamber of said hopper and the chamber of said casing, pivoted revolving beaters or hammers rotating in a direction to cause them to move upward on the hopper side of the casing, and a deflecting-plate at the lower side of said hopper and closely adjacent to which the ends of the upwardly-moving beaters or hammers extend.

6. In a crushing-mill, the combination with a casing having a hopper at one side of the upper portion thereof, of pivoted revolving beaters or hammers rotating within the chamber of said casing and running upward on the hopper side of said casing, the latter having on the side opposite said hopper a corrugated interior portion, and a grate interposed between the chamber of said hopper and the chamber of said casing and between and through the bars of which grate the ends of the said beaters extend.

7. In a crushing-mill, the combination with a casing provided with a hopper and having at its lower part a tangential discharge-outlet, of a grate adjacent to said hopper, the said mill being provided with an outwardly-flaring and inwardly-contracted grate-chamber between the chamber of said hopper and the chamber of said casing, and pivoted revolving beaters or hammers rotating in a direction to cause them to move upward on the hopper side of the casing.

8. In a crushing-mill, the combination with a casing provided with a hopper, of a grate adjacent to said hopper, the said mill having an outwardly-flaring and inwardly-contracted grate-chamber between the chamber of said hopper and the chamber of said casing, pivoted revolving beaters or hammers rotating in a direction to cause them to move upward on the hopper side of the casing, and an adjustable or removable feed-plate whereby the feed of the material and the indraft of air to the casing may be governed.

9. In a crushing-mill, the combination with pivoted revolving beaters or hammers, of a casing provided with a hopper, a grate fixed relative to said casing and interposed between the chamber of the hopper and the chamber of said casing, the said mill having an outwardly-flaring and inwardly-contracted grate-chamber between the hopper-chamber and

casing-chamber, pivoted revolving beaters or hammers within the casing-chamber and arranged to extend between and through the bars of the said grate, and means for adjusting said casing and grate to cause the said
5 beaters or hammers to project more or less through the bars of the grate.

In testimony whereof we affix our signatures in the presence of two witnesses.

THOMAS L. STURTEVANT.

THOMAS J. STURTEVANT.

Witnesses:

W. H. ELLIS,

LLOYD MAKEPEACE.