J. B. KNOBLOCK.

PULVERIZER.

APPLICATION FILED JUNE 3, 1913.

1,104,121.

Patented July 21, 1914.

2 SHEETS—SHEET 1.

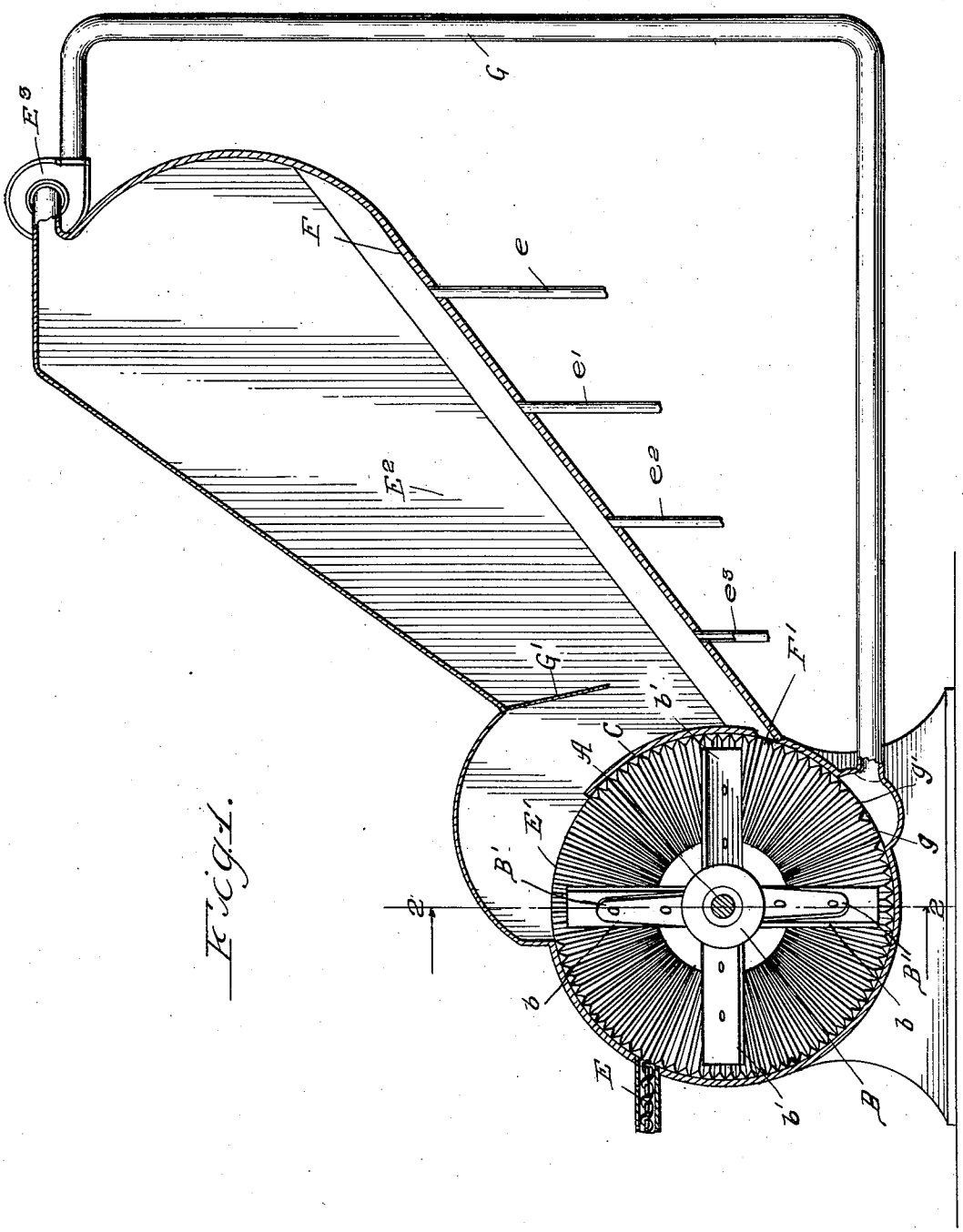


Fig. 1.

Witnesses:

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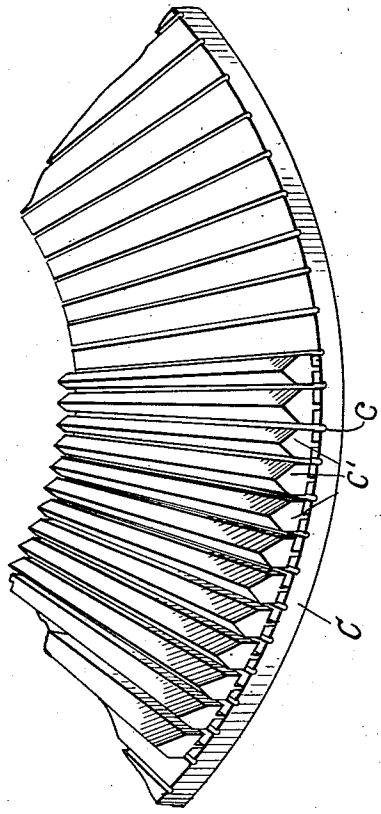


Fig. 3.

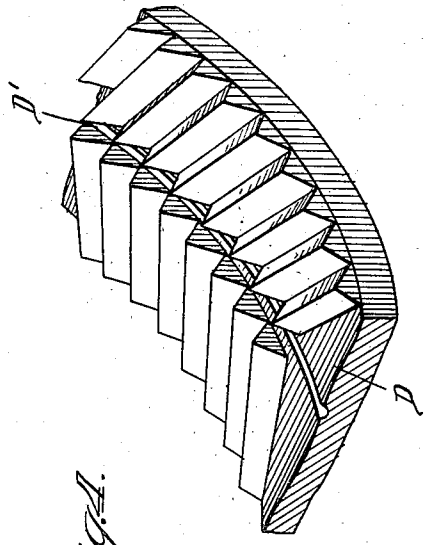


Fig. 4.

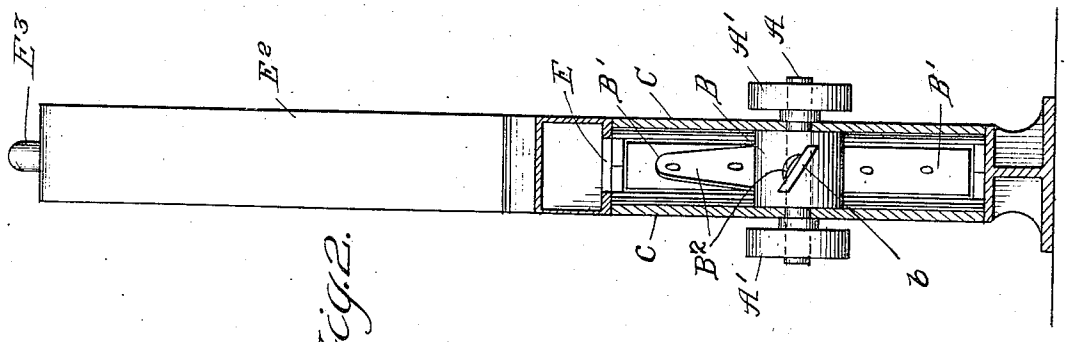


Fig. 2.

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UNITED STATES PATENT OFFICE.

JAMES B. KNOBLOCK, OF CHICAGO, ILLINOIS.

PULVERIZER.

1,104,121. Specification of Letters Patent. Patented July 21, 1914.

Application filed June 3, 1913. Serial No. 771,457.

To all whom it may concern:

Be it known that I, JAMES B. KNOBLOCK, a citizen of the United States, residing at Chicago, Cook county, Illinois, have invented certain new and useful Improvements in Pulverizers, of which the following, taken in connection with the drawings, is a description.

My invention has for its object an apparatus having means whereby rock, grain, coal or any material substance substantially dry, may be pulverized and disintegrated exceedingly fine, and means whereby the same may be graded and sized by gravity. The particles of material to be treated are fed in suspension between rapidly revolving blocks acting as fans, which throw the material against corrugated side heads and a corrugated peripheral casing and is disintegrated by the force of the impact. The sizing is accomplished by air-currents which carry the product in suspension lengthwise of an inclined separating chamber, having the shape of a quadrilateral frustum, in which the product is dropped according to its size and specific gravity. These and other features of novelty and construction will be hereinafter more particularly described in the following specification.

The accompanying drawings illustrate what I now consider the preferred form of my invention, though it is obvious many of the details may be changed without departing from the spirit of my invention.

Figure 1 is a longitudinal sectional view of my invention. Fig. 2 is a transverse sectional view through the pulverizer. Fig. 3 is an enlarged detail of one of the end heads. Fig. 4 is an enlarged detail of the peripheral face of the pulverizing chamber.

Referring to the drawings, A represents a shaft extending through the pulverizer; A′, A′ are pulleys mounted on ends of shaft A, by means of which the apparatus is driven by any suitable source of power.

B, is a hub mounted on shaft A, having cast thereon four arms B′, B′, B², B². Secured to these are the blocks *b*, *b*, *b′*, *b′*, arranged to travel in a circle equidistant apart, or 90° of a circle, with the face of each block approximately 45 degrees to the line of motion. The faces of the blocks alternate in angle one from the other, so that block *b* throws to the right, block *b′* throws to the left, block *b* throws to the right and block *b′* throws to the left.

C, C are castings forming the outside frame work, or end heads, to which the casing hereinafter described is secured on the inner side of which, and immediately under the slots and grooves *c*, concave channels are cast to carry the product peripherally into the connecting corrugations D′.

C′, C′, are grizzlies on the end heads C, C, which form the interior sides of the disintegrating chamber and extend parallel with the longitudinal surfaces of the blocks. The grizzlies are constructed in sections most convenient for rapid removal and replacement, and are held in position by bolts extending through the end heads C C of each section. The peripheral end of each grizzly fastens to the exterior casing D, and is provided with a narrow foot rest under each grizzly against C C, with open space between the permanent head C C and grizzlies C′, C′. The bottoms of the concave surfaces between the grizzlies are provided with slots or grooves *c*, approximately one eighth inch wide near the center of axis and which gradually enlarge toward the peripheral end to ¼ and to one half inch to permit the passage of the air and the finer product carried thereby through the grooves into the open space beneath as hereinafter explained.

D represents the exterior casing: D′ is the interior peripheral casing, provided with corrugations which extend from the end heads toward the center, at an angle of 90° to one another. These corrugations extend to channel midway between the end heads, represented by D², which channel receives the product as it is swept and driven out of the corrugations from either side thereof, to be carried to opening in top of casing for exit.

E represents a feed screw by means of which the material is introduced into the machine.

E′ is an opening in the top of the casing out of which the material is drawn from the pulverizing chamber into the separating chamber E². The walls of the separating chamber E² are arranged upon a longitudinal incline, with the larger end farthest from the pulverizer. By this construction the air-current is gradually diminished as it is drawn toward the fan, thus enabling the

product to settle to the bottom, the coarser particles dropping near the pulverizing chamber, the next finer being carried a short distance farther, and so on. The floor F of the separating chamber is also inclined transversely from the outside toward the center, and is provided with a plurality of openings e, e', e^2, e^3 which permit the removal of the product at these points as may be required.

At the farthest end of the separating chamber from the pulverizer is a suction fan E^3, which supplies the current of air necessary to draw the pulverized material from the pulverizing chamber into the separating chamber.

Communicating with the suction fan E^3, is an air pipe or flue G, which extends from the fan to the pulverizing chamber, through the openings g, g' in the grizzly.

G′ is a deflecting plate extending from the top of separating chamber, which deflects the air and product downwardly after drawing it out of the disintegrating chamber so that the larger particles will at once drop by gravity to the bottom to reënter the machine and be treated over again.

The operation of my pulverizer is as follows: The product is fed to the machine through screw conveyer E, of practically $\frac{3}{4}$ inch dimensions. The shaft is rotated at 900 to 1500 revolutions per minute. While there is a small degree of disintegration of the product by direct contact of the blocks with the larger pieces, the fine pulverization is effected wholly by the impact of the particles following the air-currents thrown against the corrugations and grizzlies, as herein explained with such terrific velocity as to disintegrate it.

The faces of the blocks b, b, and b', b', alternate in angle, one from the other, about forty five degrees more or less to the line of motion, and run approximately one inch from the end grizzly and side corrugations respectively. As the product is fed through the screw conveyer E it drops into the blocks at high speed, and disintegration begins both by physical contact of the blocks with the larger particles, and by the air currents carrying the product in its throw from the ends or tips of the blocks, and from their longitudinal surfaces. Every available surface space, both side and end, present corrugated surfaces against which it is thrown to effect disintegration. In operation one block b, suctions the air carrying the product, from the left side end head grizzly and throws or projects it against the right side end head grizzly C′ from its longitudinal surface. The larger particles of the load thus carried and thrown will rebound and be suctioned by the block b', following it, to the opposite or left hand side, to be thrown in the same manner. The smaller particles so disintegrated will pass through the grooves c, into the concave channels immediately beneath the grooves in the end head C. These channels at their peripheral ends coördinate with and run into the corrugations of casing D′, and by virtue of the gradual enlargement of grooves c peripherally, the product and material underneath the grizzlies will be peripherally or tangentially projected and carried into the casing corrugations D′, as explained.

The currents running from the end or tip of block b into the corrugations D′, will strike by direct throw and impact that part of said corrugations which stands parallel with the tip of block b. The same block will tend to sweep clear of its contents so much of said corrugations as extend at right angles to its tip or end. The tip of block b' standing at opposite angle to that of b has a reverse throw, with the result that all corrugations on the right side of channel D^2 are thrown in by the two tips of blocks b. The corrugations on the left side of channel D^2 are swept clean of product by these two blocks, and the two blocks b', b' having a reverse angle from b, b will have the reverse throw. Immediately following the throw or impact from the tip of one block, there is a rebound and suction of the air and its contents from the corrugated surface encountered, which is picked up and thrown to the opposite side, with the result that the drive or throw zigzags sidewise as well as endwise of the blocks.

The smooth channel D^2 midway between the casing corrugations D′, permits the pulverized material when sufficiently fine to be freely carried around to the top opening E′, to make its exit in suspension with the air current. The separation of the coarser material is effected by gravity in the first instance, as the air and its contents leaves the opening E′, strikes the plate G′, and is deflected toward the bottom of separating chamber E^2, drops to the bottom and thence slides back into the pulverizer by gravity.

The suction fan E^3, creates a continuous forced draft through and out of the pulverizing chamber, into the separating chamber E^2. As the air, laden with the fine product travels through the separating chamber, it settles to the bottom according to its size and specific gravity as near as may be, to be withdrawn from openings e^3, e^2, e', e, as required. The air is carried through the fan E^3 and return pipe G and enters the pulverizer at g, g', thus completing the cycle. The air as it is drawn through the rapidly revolving blocks, obstructs the tendency of the blocks to drag the air around a circle, and it thereby accelerates the drive

or throw of each block into both grizzlies on the end heads C′, C′, and peripheral casing D′.

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

1. In a pulverizer, the combination of a casing provided with a feed opening, the end walls of said casing being provided with corrugated grizzlies extending radially from the center thereof, and having grooves extending parallel with said corrugations, corrugated grizzlies in the peripheral wall of said casing, revoluble blocks mounted upon a shaft in said casing, each of said blocks arranged at an angle to the one next to it, means for creating an air current in said casing whereby the material being operated upon while in suspension is driven in different directions and thrown against the grizzlies to effect the pulverization, and means for withdrawing the finely pulverized material out of said casing, substantially as described.

2. A pulverizer comprising a casing forming a circular chamber having a feed opening and an exit opening, corrugated grizzlies forming a lining for the end heads of said casing, said grizzlies having slots or grooves extending radially from the center of each side to the periphery, a peripheral casing having corrugations extending angularly toward the center to form a central peripheral channel, a shaft extending transversely through said channel, blocks carried thereby, each of said blocks so arranged that its face is disposed at an angle following its path of travel and to the line of motion, and means for creating an air current in said pulverizing chamber wherein the material is thrown, and while in suspension is forcibly driven against the corrugated grizzlies and is disintegrated by force of the impact, and means for withdrawing the pulverized material from the chamber, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

JAMES B. KNOBLOCK.

Witnesses:
PHILIP SAMPSON,
PAGE W. EATON.