

(No Model.)

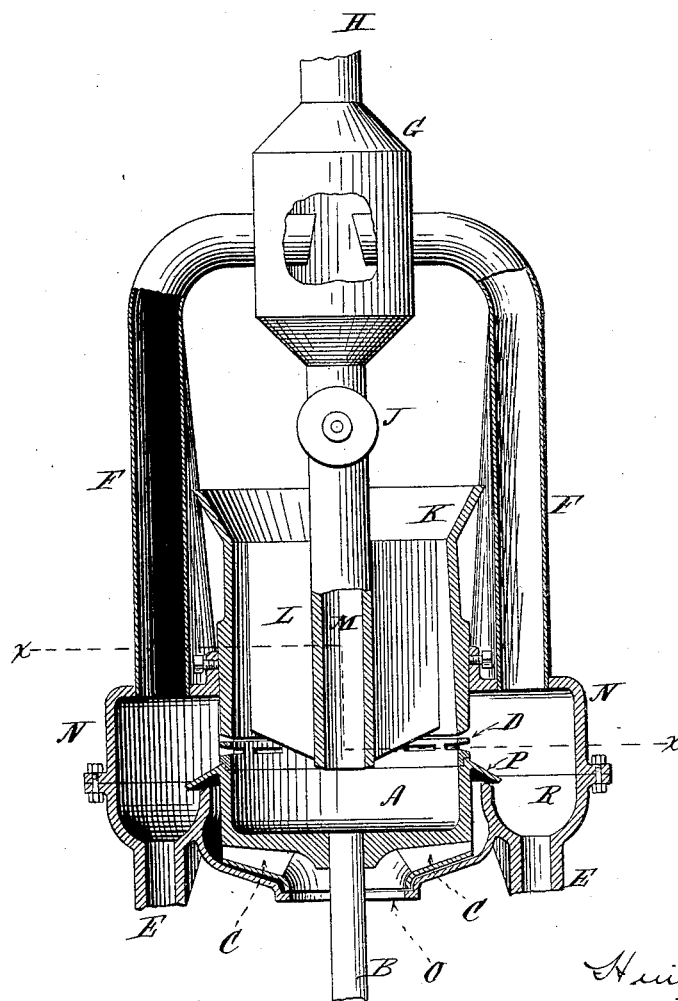
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H. A. DUC, Jr.
ATTRITION MILL.

No. 429,679.

Patented June 10, 1890.

Fig. 1.



Witnesses:
Wm. A. Harris
Sidney Johnson

H. A. Duc Jr.
Inventor:
Dickinson Foster & Freeman
attys

(No Model.)

2 Sheets—Sheet 2.

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Fig. 2.

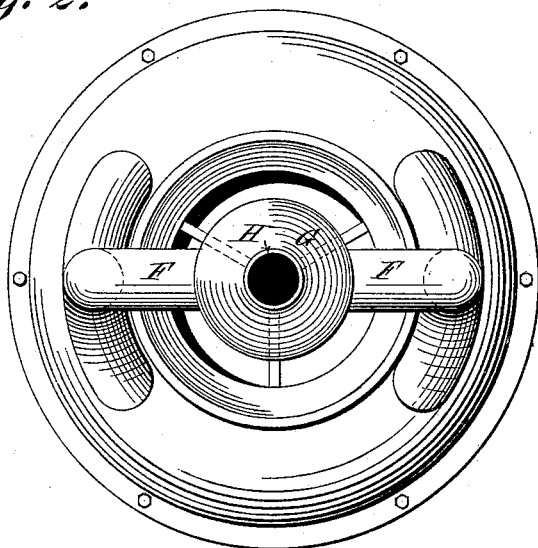
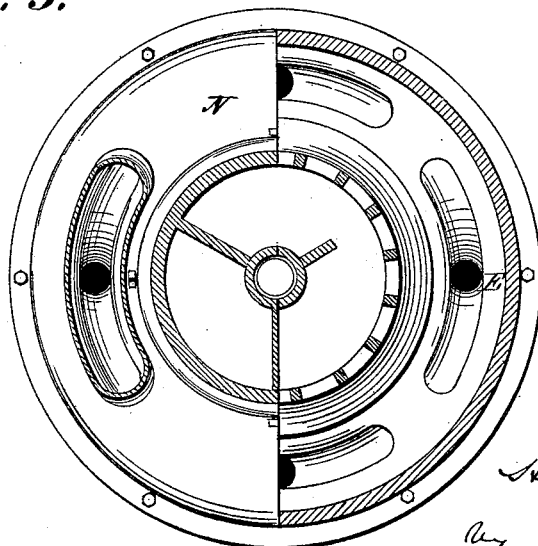


Fig. 3.



Witnesses:

Wm A. Barnes
Sidney Johnson

Henry A. Duc Jr
Inventor:

By
Dickerson & Foster
Attorneys

UNITED STATES PATENT OFFICE.

HENRY A. DUC, JR., OF CHARLESTON, SOUTH CAROLINA.

ATTRITION-MILL.

SPECIFICATION forming part of Letters Patent No. 429,679, dated June 10, 1890.

Application filed June 24, 1887. Serial No. 242,375. (No model.)

To all whom it may concern:

Be it known that I, HENRY A. DUC, Jr., of Charleston, in the State of South Carolina, have invented a new and useful Improvement in Attrition-Mills, of which the following is a full, true, and exact description, reference being had to the accompanying drawings.

This invention relates to an improvement in that class of mills in which the ore is ground by attrition against itself solely, and not by grinding between wearing-surfaces.

It consists generally in a stationary hopper, through which the ore is fed by gravity, beneath which hopper a revolving cup-shaped mill is caused to rotate at a high velocity, and the ore or material to be ground falling into the cup is thereby caused to rotate in contact with the descending material above. Between the fixed hopper and the revolving cup a circular opening is arranged, and the cup itself is provided with additional openings, through which the material, when sufficiently reduced, escapes. A continuous air-current is caused to flow down and through the hopper and to escape through the openings, thereby facilitating the passage of the ground material from the revolving cup into the surrounding receiving-chamber.

My apparatus will be readily understood from the accompanying drawings, in which similar letters refer to similar parts.

Figure 1 is a vertical view, partly in section, of my mill; Fig. 2, a plan view of the same; Fig. 3, a section through Fig. 1 on the line *x x*.

The mill itself consists of a supporting-frame N, in the lower central part of which the cup A revolves by means of the shaft B, upon which it is supported. This cup has a plain interior surface free from projections and is provided with wings C at its lower portion, and the casing is provided with an outlet O to the air. The cup is likewise provided with a circular shed P, as shown, and with a wear-ring D at its upper portion. The shed P revolves in the chamber R, which delivers at the bottom through pipes E and extended funnel-shaped openings, as shown. Two pipes F F connect with its upper portion and deliver into the separating-drum G, from which the delivery-pipe H proceeds. A

lower pipe M likewise communicates with this separating-drum and delivers into the center of the cup, as shown. The hopper K is provided with a series of wings L, past which the material is delivered. These wings prevent the revolution of the material in the hopper.

J is a feeding device, which may be made automatic, so as to deliver through the tube M the material falling into the separator G, when a sufficient amount has been there retained.

The operation of my mill can now be understood. The material is fed into the hopper K, filling the hopper and lodging in the cup. The revolution of the cup causes the material lying in it to be rapidly revolved in contact with the material fixed in the hopper. The cup likewise by its fan attachment causes a draft of air to pass upward through the chamber R and through the pipes F; thence to the separator G, carrying up the fine particles, which may be delivered above or through the wearing-ring D. The cup itself acts to a certain extent as a fan and blows out an air-current through its periphery, which air is supplied partly through the material in the hopper and partly through the pipe M. The heaviest particles escape through the openings in the ring D and the lighter particles through the channel between the ring and the hopper.

The lower part of the hopper may be furnished with adjustable wearing-surfaces, if desired. The heavier particles so escaping fall into the bottom of the chamber R. The lighter particles pass upward through the pipes F into the separator G, where another separation occurs, and only the lightest dust passes upward through the pipe H, the heavier particles returning again to the mill through the pipe M.

The pipe H may communicate with a settling-chamber, from which another pipe may communicate with the opening O, so as to make a closed air-circuit. The shed P prevents the heavier particles escaping through the openings in the ring D from falling into the air-passage O.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination, in an attrition-mill, of

a horizontal revolving cup-shaped vessel, a vertical hopper feeding downward toward the bottom of the same, and a surrounding separating-chamber with contracted communicating openings between the two and provided with downward and upward openings, through one of which the coarser particles are delivered, through the other of which the finer particles are drawn, and means for creating a current through the upward openings, substantially as described.

2. The combination, in an attrition-mill, of a revolving cup-shaped vessel, a vertical hopper over the same, an annular aperture between the hopper and the vessel, one or more openings in the periphery of the vessel, and a surrounding separating-chamber, substantially as described.

3. The combination, in an attrition-mill, of a revolving cup-shaped vessel, a wearing-plate secured to the upper portion, a vertical hopper over the same, but not in contact therewith, thereby forming an annular aperture between the hopper and the ring, and a surrounding separating-chamber, substantially as described.

4. The combination, in an attrition-mill, of a horizontal revolving cup-shaped vessel having a plain inner surface, a vertical hopper delivering into the open mouth of the same,

and stationary guide-wings extending down into the hopper for preventing the revolution of the material in the hopper, substantially as described.

5. The combination, in an attrition-mill, of a revolving cup-shaped vessel, a hopper feeding into the same, delivery-tubes passing from the delivery of the vessel to a separating-chamber, a connection from the separating-chamber through the hopper into the revolving vessel, and means for causing a current of air to pass through the delivery-tubes, substantially as described.

6. The combination, in an attrition-mill, of the vessel A, hopper K, pipes F, separating-drum G, return-pipe M, and delivery-pipe H, substantially as described.

7. The combination, in an attrition-mill, with the casing having an opening O and a chamber R, of a revolving vessel A, provided with fanners C and shed P, substantially as described.

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

HENRY A. DUC, JR.

Witnesses:

GEO. S. SMITH,

A. C. SHIRER.