2 Sheets—Sheet 1.

A. B. LIPSEY.

PULVERIZING MACHINE.

No. 186,401. Patented Jan. 16, 1877.

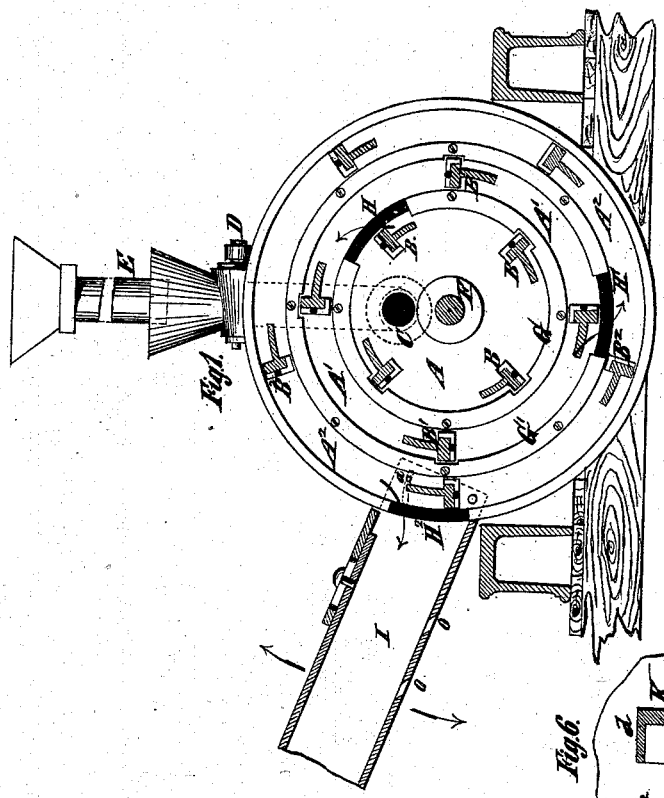


Fig. 1.

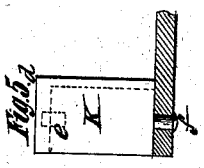


Fig. 5.

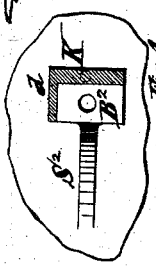


Fig. 6.

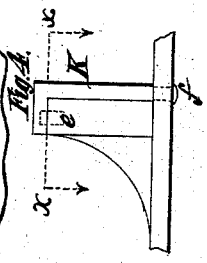


Fig. 4.

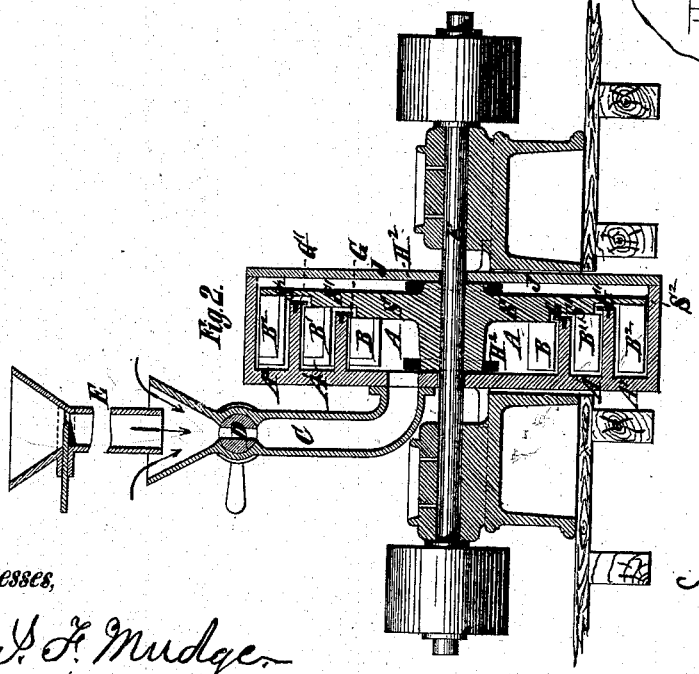


Fig. 2.

Witnesses,

Chas. F. Mudge.

Wm. H. Dieckel.

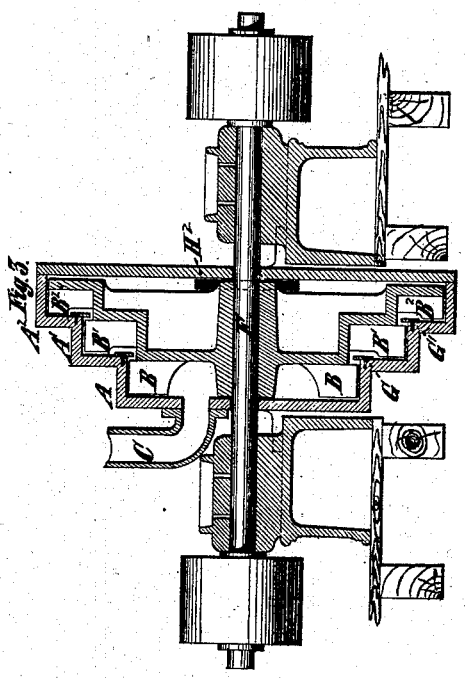
Andrew B. Lipsey
by his Atty.
Edwin H. Brown

2 Sheets—Sheet 2.

A. B. LIPSEY.

PULVERIZING MACHINE.

No. 186,401. Patented Jan. 16, 1877.



Witnesses,
Wm. H. Pinckel
Chas. F. Mudge

Andrew B. Lipsey
by his Attys
Edwin H. Brown

UNITED STATES PATENT OFFICE.

ANDREW B. LIPSEY, OF WEST HOBOKEN, N. J., ASSIGNOR, BY MESNE ASSIGNMENTS, TO LIPSEY PULVERIZING AND MANUFACTURING COMPANY.

IMPROVEMENT IN PULVERIZING-MACHINES.

Specification forming part of Letters Patent No. **186,401**, dated January 16, 1877; application filed December 15, 1876.

To all whom it may concern:

Be it known that I, ANDREW B. LIPSEY, of West Hoboken, in the county of Hudson and State of New Jersey, have invented certain Improvements in Pulverizing-Machines, of which the following is a description:

One improvement consists in the combination of a series of chambers of successively-larger diameter, arranged one outside or beyond the periphery of another, and series of beaters for revolving therein, whereby an extremely-compact, simple, and serviceable pulverizing-machine is produced.

Another improvement consists in the combination, with a chamber provided with a series of revolving beaters, of a chamber of larger diameter, communicating with the former, and provided with a series of beaters, revolving in the same length of time as those in the smaller chamber, and, consequently, moving at a greater speed, producing a partial vacuum and drawing from the smaller chamber the lighter particles of the material therein pulverized, whereby I produce a very simple and superior pulverizing-machine, which may be operated with a very small amount of power.

Another improvement consists in the combination, with a chamber provided with a series of revolving beaters, of a chamber of larger diameter, communicating directly with the smaller chamber, and provided with a series of beaters, supported on the same shaft as those of the said smaller chamber, and revolving in the same length of time as the latter, whereby I produce a simple and exceedingly-compact pulverizing-machine.

Another improvement consists in the combination of two or more chambers, communicating one with another, and provided each with a series of beaters for revolving therein, and also provided with lips overlapping the beaters of each chamber, which communicates with another, whereby material to be pulverized therein is prevented from passing out of one chamber into another, except at the proper place.

Another improvement consists in the combination, with a pulverizing-machine, of an inlet for supplying material to be pulverized, and air, or its equivalent, thereto, of means for regulating or shutting off the supply of material, and air, or its equivalent, whereby provision is afforded for supplying them in the proper relative proportions, in such manner that the air or its equivalent will not interfere with the said material in its passage through the machine, and for entirely shutting off the supply of both when desirable.

Another improvement consists in the combination, with a pulverizing-machine, of an outlet provided, preferably at the lower part, with an opening or openings, and capable of being adjusted, by swinging axially at different angles to provide for separating the finer and lighter from the coarser and heavier particles of the pulverized material in delivering it from the machine.

Another improvement consists in the combination, with a beater extending longitudinally outward from the side of a disk or spider of a renewable shoe, fitting or lapping over over the face, inner edge, and outer end of such beater, a dowel or projection on the outer end of said beater fitting a cavity in the contiguous portion of the shoe, and a rivet or bolt at the inner end of the shoe securing it to the aforesaid disk or spider, whereby provision is afforded for properly securing the shoe in place without perforating, and thereby weakening, the beater transversely.

Other improvements consist in details of construction, to be hereinafter explained.

In the accompanying drawing, Figure 1 is a partly-sectional side view of a pulverizing-machine embodying my improvements. Fig. 2 is a transverse section thereof. Fig. 3 is a transverse section of a pulverizing-machine of slightly-modified form, also embodying my improvements. Fig. 4 is a view of the outer edge of a beater, its shoe, and a portion of a disk supporting it. Fig. 5 is a face view of a beater, its shoe, and a transverse section of a portion of the said disk supporting it; and Fig. 6 is an end view of a beater, a transverse section of its shoe, taken on the plane of the dotted line *x x*, Fig. 4, and looking in the direction indicated by the arrow-heads, also including a portion of the said disk supporting the beaters.

Similar letters of reference designate corresponding parts in all the figures.

A designates a chamber, preferably of cylindrical form externally, as well as internally, and B designates a series of beaters capable of being revolved therein. C designates an inlet for the material to be pulverized, and air, or its equivalent. It is shown as communicating with the chamber A at the side, and is provided with a throttle, D, which may be shifted to regulate the passage of the material to be pulverized, and air, or its equivalent, into the chamber A.

The throttle, though represented as consisting of a simple cock, may consist of a slide, or any other device which may be made to effect the throttling, narrowing, or closing of the inlet.

Above the throttle the inlet is preferably provided with a hopper to receive the material to be pulverized from a feeding-chute, E, and the space between the latter and the hopper affords provision for the entrance of air or its equivalent.

Great advantages result from admitting and regulating the admission of the material to be pulverized and air or its equivalent by the same means into a pulverizing-machine. In this way one continuous passage of both through the machine may be effected, the disturbance of the material to be pulverized by currents of air or its equivalent entering from different points is avoided, and provision is afforded the proper relative proportions of the material to be pulverized, and of the air or its equivalent to carry it through the machine.

The beaters B are preferably provided with renewable shoes, hereafter to be described, and are shown as supported by a spider or disk, S, which is fixed to a suitably-supported rotary shaft, F, and may serve to form one side of the said chamber A. A^1 designates a chamber, which is of larger diameter than the chamber A, communicates therewith, and preferably is also cylindrical externally as well as internally. B^1 designates a series of beaters supported by a spider or disk, S′, fixed to a rotary shaft, F, and capable of revolving within the chamber A^1. A^2 designates a chamber, which is of larger diameter than the chamber A^1, communicates therewith, and is preferably also cylindrical externally as well as internally. B^2 designates a series of beaters capable of being revolved within the chamber A^2.

The chambers A and A^1 communicate, respectively, with the chambers A^1 and A^2, and are shown as communicating therewith at the sides.

G and G′ designate lips, represented as consisting of rings, secured, respectively, to those sides of the chambers A and A^1 which, respectively, communicate with the chambers A^1 and A^2, and projecting or lapping over the outer parts of the beaters B and B^1 of the chambers A and A, so as to prevent the material pulverized in these chambers from passing into the chambers with which they, respectively, communicate.

In order to provide for placing the beaters in their position for work, the inwardly-projecting parts of the lips G G′ are notched, as shown in Fig. 1, to permit them to pass beyond them.

The exit-opening H H^1 of the chambers A and A^1 are shown as being made by leaving off portions of the lips G and G′, and for the sake of clearness are blackened throughout their extent. They may, however, be made in any other suitable manner. Provision is afforded for the exit of the pulverized material and air or its equivalent from the chamber A^2 by two openings, H^2, in its periphery, (shown one in Fig. 1 and both in Fig. 2,) and also blackened throughout their extent. These exit-openings preferably communicate with an outlet, I, supported on the chamber A^2 or otherwise, so that by means of a set-screw, *a*, clamping it to its support—tackle consisting of cords and pulleys or other means—it may be adjusted at different angles without severing its communication with said exit-openings H^2, and may be secured in position.

The outlet I, in order to afford provision for automatically separating fine and light from coarse and heavy particles of the pulverized material, is provided, preferably at the bottom, with an opening or openings, *o*, which may with advantage be rearwardly inclined. When supported as represented, this outlet I is preferably provided with an adjustable top portion, which may be shifted, so that none of the pulverized material can escape under any circumstances. For instance, when the outlet is elevated the main top portion will move inward under the adjustable top portion, and when the said outlet is depressed the adjustable top portion will be moved inward.

As represented in Figs. 1 and 2, the several chambers A A^1 A^2 are made in one piece, and the chamber A^1 is outside the chamber A, and the chamber A^2 outside the chamber A^1; but in Fig. 3 the chamber A^1 is arranged at the side of the chamber A, and the chamber A^2 is arranged at the side of the chamber A^1; but in both examples the spiders or disks for supporting the several series of beaters are shown as made in one piece, and are rotated on the same shaft. They may be made in either of these ways with advantage, especially the former, as thus the greatest compactness may be obtained; but they may also be made separate, if desirable, and the communication between them may be established in any suitable manner.

J designates a cover, which is arranged outside the spiders or disks supporting the beaters and covering them.

An important advantage of making each

or any of the chambers externally cylindrical is, that it may be moved from place to place by rolling.

The operation is as follows: Material to be pulverized and the proper relative proportion of air or its equivalent are admitted, under control of the throttle D, into the chamber A, and the beaters B, revolving therein, draw in the material to be pulverized, and air, or its equivalent, simultaneously entering, they effect, by impact and otherwise, the pulverization of such material. The beaters B^1, revolving in the chamber A^1 in the same length of time as the beaters B in the chamber A, but moving at a greater speed, owing to the increased radii of their revolution, produce a partial vacuum at the exit-opening H of the chamber A, draw from the latter the lighter particles of the pulverized material, and cause them to be pulverized still more. The beaters B^2, revolving in the chamber A^2 in the same length of time as the beaters B and B^1 in the chambers A and A^1, but moving at a greater speed, owing to the increased radii of their revolution, produce a partial vacuum at the exit-opening H^1 of the chamber A^1, draw from the latter the lighter particles of the pulverized material, cause them to be pulverized still more, and discharge them into the outlet I. This outlet may be inclined upward, so that the force of the escaping air, or its equivalent, will be sufficient to carry only the lighter particles out through the end thereof, and the heavier particles will then be discharged out of the openings *o*.

Any number of the said chambers may be used. For pulverizing some materials more may be needed than for pulverizing others.

It will have been seen that by these improvements I provide for making a very simple and exceedingly compact pulverizing-machine, which can be operated with but a small amount of power, and can be easily managed and moved from place to place.

When pulverizing moist material it may be advantageous to arrange the exit-opening of the chamber from which the material is to be delivered near the bottom, and to an apartment below.

It is obvious that additional series of beaters might be arranged on the other sides of the spiders or disks S, S^1, and S^2, to work in another set of chambers without entailing the expense of additional shafting and other parts. It is also obvious that a number of sets of beaters and chambers may be arranged side by side on the same shaft, with economy.

I will now describe the removable shoes or faces K for the beaters, and the means for securing them in place, premising that they are not the only kind that may be used.

These shoes K are preferably made of steel, and cover the faces and the inner sides and the ends of the beaters which are farthest from the spiders or disks S S^1 S^2. By overlapping at the inner sides of the beaters they are secured against outward displacement by centrifugal force. They are secured against movement outward by pins or dowels *e*, projecting into them from the beaters. Rivets *f*, impinging on the outer sides of the disks or spiders, secure them against displacement lengthwise. This manner of securing them is very desirable because of its simplicity and effectiveness.

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

1. The combination of a series of chambers of successively larger diameters, arranged one outside or beyond the periphery of another, and series of beaters for revolving therein, substantially as set forth, whereby a very simple, exceedingly compact, and serviceable pulverizing-machine is produced.

2. The combination, with a chamber provided with a series of beaters for revolving therein, of a chamber of larger diameter, communicating with the former, and provided with a series of beaters for revolving in the same length of time as those in the smaller chamber, and consequently moving at a greater speed, and producing a partial vacuum at the exit of such smaller chamber, substantially as set forth.

3. The combination, with a chamber provided with a series of beaters for revolving therein, of a chamber of larger diameter, communicating directly with the smaller chamber, and provided with a series of beaters supported on the same shaft as those of said smaller chamber, and revolving in the same length of time as the latter, substantially as set forth.

4. The combination of two or more chambers, communicating one with another, and provided each with a series of beaters for revolving therein, and also provided with lips, overlapping the beaters of each chamber which communicates with another chamber, whereby the material to be pulverized therein is prevented from passing out, except at the proper place, substantially as set forth.

5. The combination, with a pulverizing-machine, of an outlet provided (preferably at the lower part) with an opening or openings, and capable of being adjusted axially by swinging at different angles, substantially as and for the purpose set forth.

6. The combination, with a pulverizing-machine and an outlet capable of being adjusted at different angles, of an adjustable top portion, substantially as and for the purpose set forth.

7. The combination, with a pulverizing-machine and an outlet therefor, capable of being adjusted axially by swinging at different angles, of a clamping device for securing it in different positions.

8. The combination, with a beater extend-

ing longitudinally outward from the side of a disk or spider, of a renewable shoe, lapping over the face, inner edge, and outer end of such beater, a dowel or projection on the outer end of said beater fitting a cavity in the shoe, and a rivet or bolt at the inner end of the shoe securing it to the said disk, substantially as set forth.

9. The combination of the series of chambers A A^1 A^2, series of beaters B B^1 B^2, spiders S S^1 S^2, supporting the latter, shaft F, an inlet, and an outlet, substantially as set forth, whereby an improved pulverizing-machine is produced.

ANDREW B. LIPSEY.

Witnesses:

CHANDLER HALL,

CHAS. F. MUDGE.