E. J. STECKLE.

CRUSHING MACHINE.

APPLICATION FILED MAY 31, 1911.

1,006,143.

Patented Oct. 17, 1911.

2 SHEETS—SHEET 1.

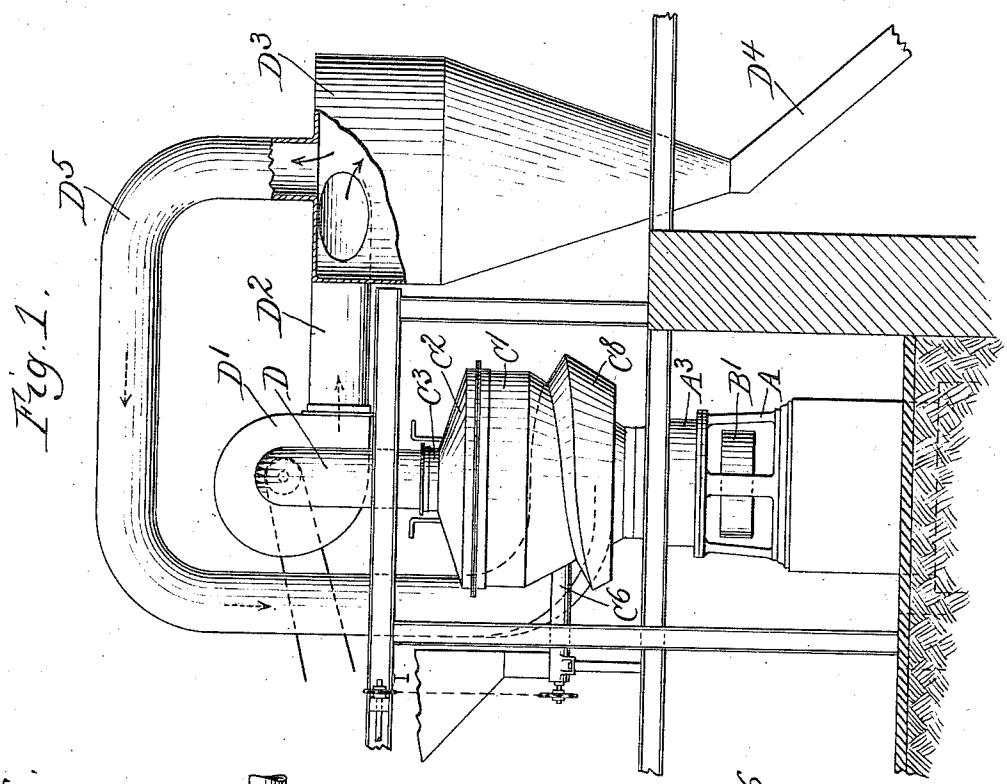


Fig. 1.

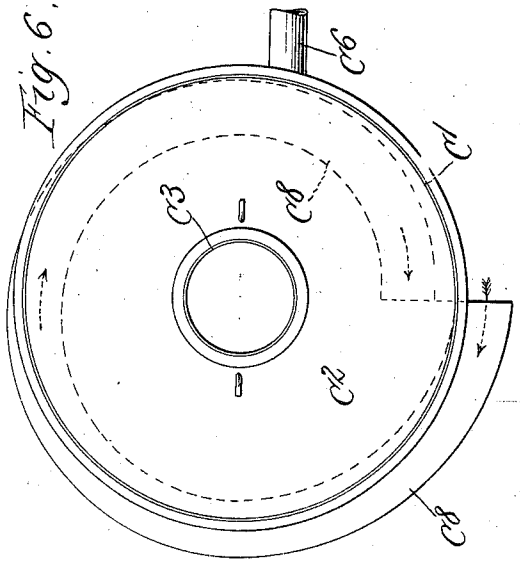


Fig. 6.

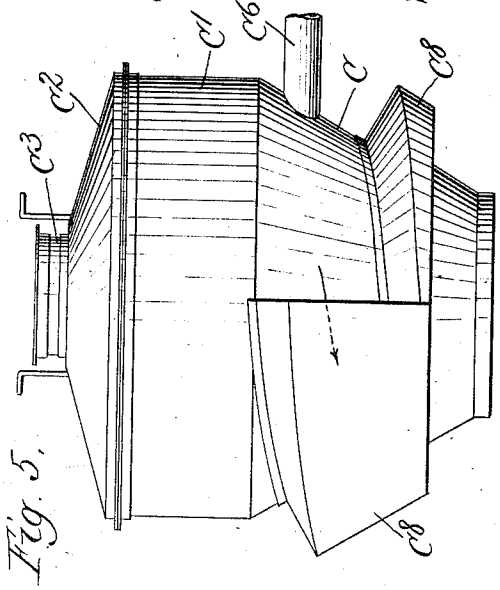


Fig. 5.

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2 SHEETS—SHEET 2.

Fig. 2.

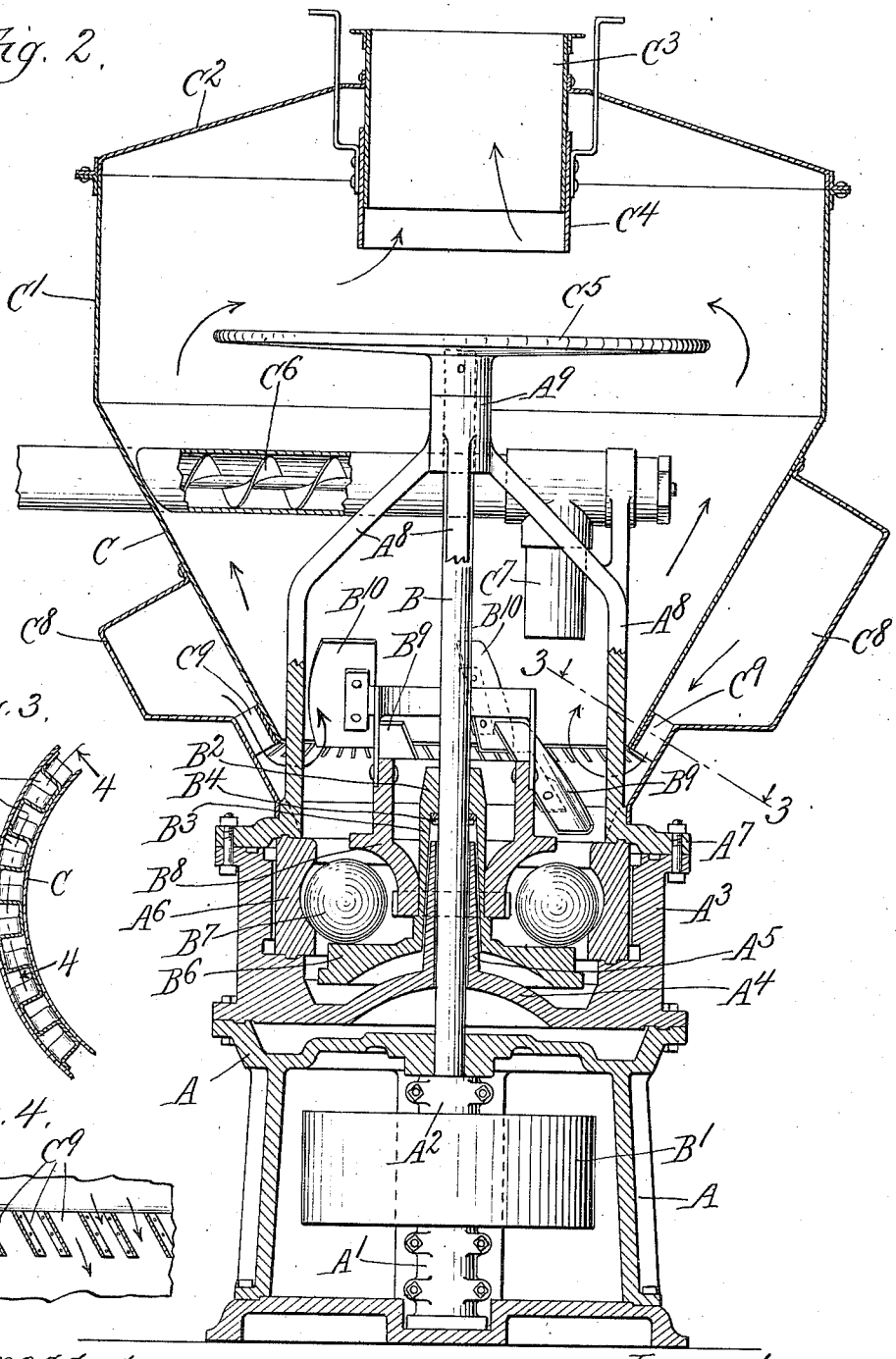


Fig. 3.

Fig. 4.

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UNITED STATES PATENT OFFICE.

EDWARD J. STECKLE, OF DIXON, ILLINOIS, ASSIGNOR OF ONE-THIRD TO CHARLES J. REILLY, OF SYRACUSE, INDIANA, AND ONE-THIRD TO WILLIAM E. WUERTH, OF DIXON, ILLINOIS.

CRUSHING-MACHINE.

1,006,143. Specification of Letters Patent. Patented Oct. 17, 1911.

Application filed May 31, 1911. Serial No. 630,332.

To all whom it may concern:

Be it known that I, EDWARD J. STECKLE, a citizen of the United States, residing at Dixon, in the county of Lee and State of Illinois, have invented a certain new and useful Improvement in Crushing-Machines, of which the following is a specification.

My invention relates to improvements in pulverizing machinery and is illustrated diagrammatically in the accompanying drawings, wherein—

Figure 1 is an elevation view with the entire installation; Fig. 2 is a section through the pulverizing machine; Fig. 3, a section along the line 3—3 of Fig. 2; Fig. 4 a section along the line 4—4 of Fig. 3; Fig. 5 a detail elevation of the hood; Fig. 6 a detail plan view of the hood.

Like parts are indicated by like letters throughout the several figures.

The open base A which carries the bearings A^1, A^2, supports the annular ring or frame A^3 having the closed bottom A^4 and the centrally located bearing A^5 and containing the annular crushing ring A^6 held in position therein by the collar A^7 from which projects upwardly and inwardly the spider arm frame A^8 terminating in the bearing A^9. The shaft B upon which is mounted the pulley B^1 and which is supported in the bearing A^1 and rotates within the bearings A^2 A^5 and A^9 is provided with the collar B^2 which supports the cylinder B^3 held against rotation about the shaft B by the key B^4. The cylinder B^3 which surrounds the bearing A^5 supports the laterally extended annular disk B^6 upon which are mounted the crushing balls B^7 in opposition to the crushing ring A^6. The frame B^8 is mounted upon the cylinder B^3 and carries the fans B^9 B^{10} in two groups, one above the other and located each group above the crushing ring A^6. The conical hood C which is mounted upon the collar A^7 incloses the spider arm frame A^8 and is provided with the upwardly extending cylindrical extension C^1 having the perforated top C^2 in which is located the fixed sleeve C^3 carrying the slidably mounted sleeve C^4. The circular baffle plate C^5 which is mounted rigidly upon the shaft B is interposed between the sleeve C^3 and the spider arm frame A^8. The screw conveyer C^6 is supported in one end in the conical hood C, at the other end on the spider arm frame A^8 and discharges by means of the spout C^7 downwardly against the fans B^9 B^{10} and the crushing balls B^7. The spiral conduit C^8 which is disposed about the outer portion of the conical hood C and is of constantly increasing cross sectional area communicates with the interior of the hood by the inclined passage ways C^9 which discharge downwardly toward the crushing zone. The conduit D leads from the sleeve C^3 to the fan or blower D^1 from which leads a discharge pipe D^2 to the cyclone separator D^3. A discharge chute D^4 leads from the bottom of the separator to any suitable receptacle not shown and the air conduit D^5 leads from the center of the top of the separator to the spiral conduit C^8.

It will be evident that while I have shown in my drawing an operative device still many changes might be made in size, shape and arrangement of parts without departing materially from the spirit of my invention.

The use and operation of my device are as follows: The material to be crushed or pulverized is fed to the machine by the screw conveyer which discharges into the hood above the rotating fans and beneath the rotating baffle plate, whence it passes down into the crushing ring where it is pulverized by the rotating balls which are held centrifugally against the ring. The rotation of the fans sets up a suction and drives a current of air through the mill in the direction indicated by the arrows. This action of the fans or paddles is aided by the blower fan which discharges into the cyclone separator as indicated. The suction of the air picks up the loose particles from the pulverizing zone and carries them forward about the baffle plate through the discharge sleeve and into the cyclone separator through which the crushed particles are discharged from the chute as indicated and from which the air returns to the pulverizer. It will be evident that by controlling the velocity of the current, only such particles as are of a certain predetermined size will be picked up by the air and therefore no particles will leave the mill until they have been reduced to the desired size. The baffle plate which rotates with the main shaft on the crushing machine is so arranged that any large particles which may be by chance caught up by the fans or even by the air current will strike the plate and be thrown

out by centrifugal force to the outer part of the machine from whence they will slide down back to the crushing zone. The slidably mounted sleeve as indicated above the baffle plate provides a further means for adjusting the size of the particles by controlling the cross sectional area of the discharge aperture. It will be evident that under ordinary circumstances most of the adjustment as to size of the particles will be done by varying the rate of feed to the mill and by varying the amount of air passing through the separator and mill. The arrangement of the air duct or passage leading from the separator to the mill is such that the velocity and amount of air fed to the mill at any point thereabout is substantially equal to that at any other point, this being done by decreasing the cross sectional area of the air passage as it encircles the mill.

It will be evident that by the arrangement shown I am no longer dependent upon the usual separating screen which has a tendency to wear out and permit ever increasing sizes of particles to pass through and at the same time has a tendency to become stopped up when moist or sticky materials are used.

A^3 may be called the crushing chamber, within which is the crushing zone and the vertically placed crushing ring with the centrifugally operated balls traveling thereon. Immediately above the crushing chamber is the stirring or separating case, in which is the agitation zone wherein by any desired means, but as here shown, by the rotating fans, the crushed material is tossed and violently agitated. Into this stirring case is discharged, preferably uniformly thereabout, a current or currents of air which are forced through the agitation zone and proceed onward carrying more or less of the crushed or pulverized material, but more or less separating the same in such agitation zone. Above the stirring case is a further separating chamber, preferably upwardly enlarging and provided with a baffle, so that the heavier materials or those not sufficiently ground, are permitted to drop from the currents of air, while the air carrying the finely ground material passes out of the adjustable opening at the top. The air may be introduced so as to pick up or agitate the ground material, and then such air introduction means may be a substitute for the fans.

I claim:

1. In a crushing machine, the combination of a downwardly closed crushing chamber adapted to retain the material in process of being crushed, and having a crushing ring therein with centrifugally operated balls traveling in such ring, a stirring and separating case above the crushing chamber provided with means for violently agitating the crushed material above the crushing zone, and wth air inlets about such stirring case to force the air through the agitation zone therein, and a further separation chamber above the agitation zone.

2. In a crushing machine, the combination of a downwardly closed crushing chamber adapted to retain the material in process of being crushed, and having a crushing ring therein with centrifugally operated balls traveling in such ring, a stirring and separating case above the crushing chamber provided with inclined rotating fans for violently agitating the crushed material above the crushing zone, and with air inlets about such stirring case to force the air through the agitation zone therein, and a further separation chamber above the agitation zone.

3. In a crushing machine, the combination of a downwardly closed crushing chamber adapted to retain the material in process of being crushed, and having a crushing ring therein with centrifugally operated balls traveling in such ring, a stirring and separating case above the crushing chamber provided with means for violently agitating the crushed material above the crushing zone, and with air inlets about such stirring case to force air in uniform and regularly distributed quantities through the agitation zone therein, and a further separation chamber above the agitation zone.

4. In a crushing machine, the combination of a downwardly closed crushing chamber adapted to retain the material in process of being crushed, and having a crushing ring therein with centrifugally operated balls traveling in such ring, a stirring and separating case above the crushing chamber, provided with means for violently agitating the crushed material above the crushing zone, and with air inlets about such stirring case to force the air through the agitation zone therein, and a further separation chamber upwardly enlarging above the agitation zone.

5. In a crushing machine, the combination of a downwardly closed crushing chamber adapted to retain the material in process of being crushed, and having a crushing ring therein with centrifugally operated balls traveling in such ring, a stirring and separating case above the crushing chamber provided with means for violently agitating the crushed material above the crushing zone, and with air inlets about such stirring case to force air through the agitation zone therein, a further separation chamber upwardly enlarging above the agitation zone, and a baffle plate therein.

6. In a crushing machine, the combination of a downwardly closed crushing chamber adapted to retain the material in process

of being crushed, and having a crushing ring therein with centrifugally operated balls traveling in such ring, a stirring and separating case above the crushing chamber, provided with means for violently agitating the crushed material above the crushing zone, and with air inlets about such stirring case to force air through the agitation zone therein, a further separation chamber above the agitation zone, and an adjustable outlet from such latter chamber.

7. In a crushing machine, the combination of a downwardly closed crushing chamber adapted to retain the material in process of being crushed, and having a crushing ring therein with centrifugally operated balls traveling in such ring, a stirring and separating case above the crushing chamber, provided with means for violently agitating the crushed material above the crushing zone, and with air inlets about such stirring case to force air through the agitation zone therein, a further separation chamber above the agitation zone, and a baffle plate in such chamber and an adjustable outlet above the same.

8. In a crushing machine, the combination of a crushing chamber adapted to retain the material in process of being crushed, with a vertical crushing ring therein, balls centrifugally operated adapted to travel in the said ring, a stirring and separating chamber above the crushing chamber, rotary agitators or stirrers in such chamber adapted to create a zone of agitation for such crushed or pulverized material, air inlets about the same to provide currents of air above the crushing zone but through the agitation zone, an upwardly enlarging further separation chamber, a baffle plate there-across, and an adjustable outlet therefor above the baffle plate.

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Witnesses:
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