

(No Model.)

2 Sheets—Sheet 1.

H. A. DUC, Jr.
GRINDING MILL.

No. 451,112.

Patented Apr. 28, 1891.

Fig. 1.

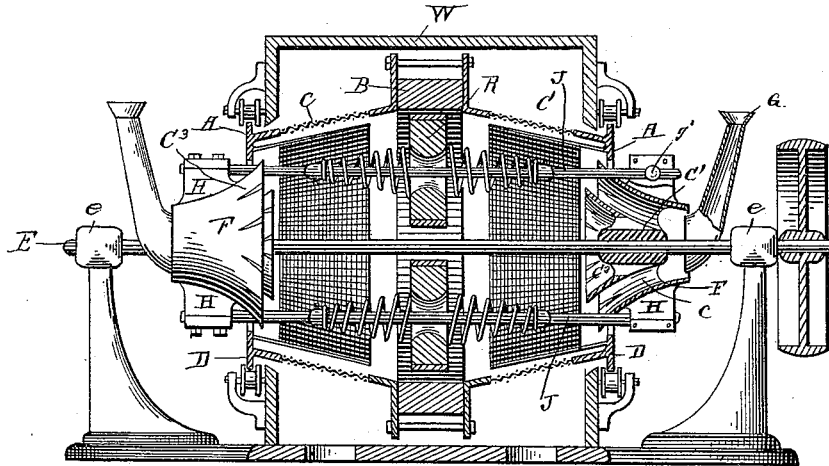
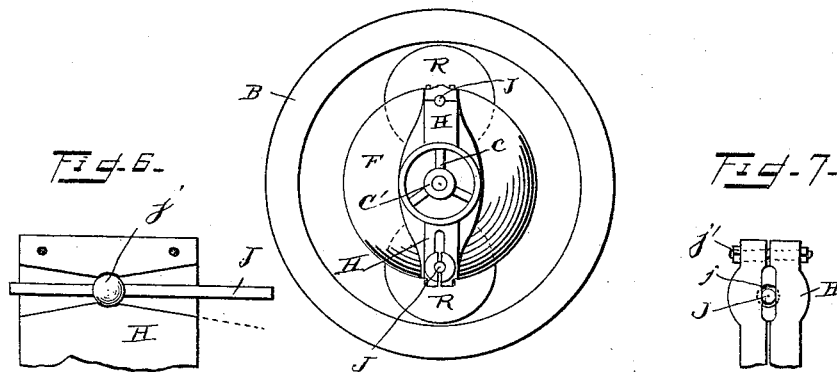


Fig. 2.



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2 Sheets—Sheet 2.

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Fig. 3.

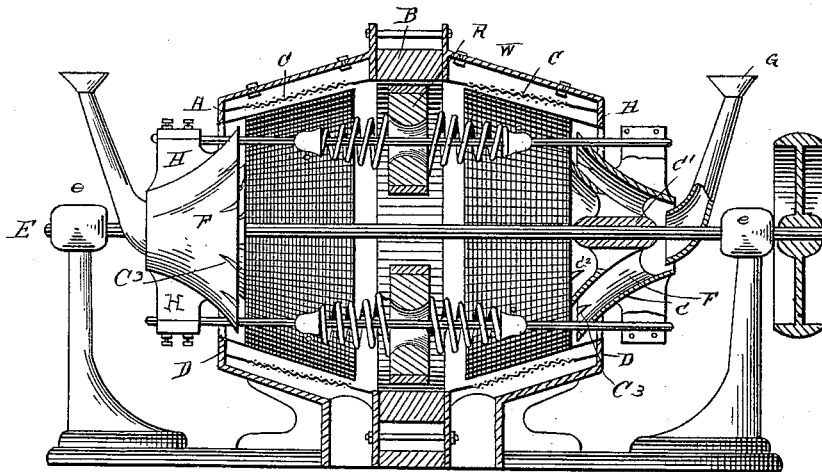


Fig. 4.

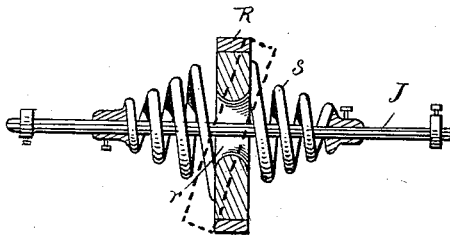
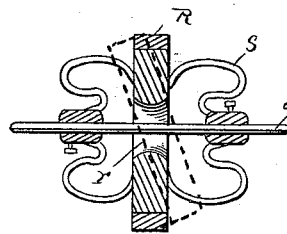


Fig. 5.



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UNITED STATES PATENT OFFICE.

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

GRINDING-MILL.

SPECIFICATION forming part of Letters Patent No. 451,112, dated April 28, 1891.

Application filed September 12, 1890. Serial No. 364,712. (No model.)

To all whom it may concern:

Be it known that I, HENRY A. DUC, JR., of the city of Charleston, in the county of Charleston and State of South Carolina, have invented certain new and useful Improvements in Grinding-Mills; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form part of this specification, in which—

Figure 1 is a central longitudinal section through my improved grinding-mill. Fig. 2 is a detail end view thereof. Fig. 3 is a longitudinal section through a modified form of the mill. Figs. 4 and 5 are detail sectional views illustrating means for mounting the crushing-rollers on the shaft. Figs. 6 and 7 are details.

This invention is an improvement in grinding-mills for ores, &c., wherein revolving crushing-rollers are employed which travel continuously around and against the inner face or periphery of an annulus; and it consists in the novel construction and combination of parts of the mill hereinafter fully described and claimed.

Referring to the drawings by letter, A designates the shell of the mill, consisting of a central annulus B of metal, and two opposite conical screens C C, the larger ends of the frames of which are flanged and bolted together and to the annulus, as shown, constituting therewith a rigid cylindro-conical shell.

D D are annular rims or flanges on the outer ends of screens C, which rest upon and are guided by grooved rollers properly mounted on supports secured to the casing W of the mill, and the shell can be revolved by any suitable mechanism. The friction of the crushing-rollers hereinafter described is sufficient to rotate the annulus and shell, and, if necessary, brakes may be used to prevent too rapid rotation of the latter, and power will not have to be employed except to rotate the shell in a direction contrary to the movement of the rolls.

E designates a shaft passing axially through the shell and supported in journal-bearings *e e* exterior to the shell and driven by any suitable means. F F are similar opposite bell-shaped castings mounted on said shaft at the

opposite ends of the shell, and having their larger ends or mouths projecting slightly within the smaller ends of the screens C, so as to deliver material fed into the smaller ends of the castings by pipes G onto said screens, as indicated. The castings are formed with hubs C', having conical flanges C² on their inner ends, and spoke-wings *c*, which latter may be set at angles to the hub and casting, like propeller-blades, so that when the castings are revolved these wings will direct currents of air through the castings into the shell and also force the material therein.

C³ are curved vanes on the inner and outer surfaces of the cones to direct the dust and material from the same into the shell.

H H are arms projecting radially from the castings F and formed on the exterior thereof. Two such arms are shown diametrically opposite each other, but three or more may be provided.

J J designate horizontal shafts parallel with shaft E, passing through the shell and journaled in bearings in the opposite arms H, as shown. These arms may be split, as in Fig. 7, and enlargements or spherical collars *j* are formed on shafts J and held by the arms so as to give a holding surface on the shafts to prevent their revolving too rapidly and at the same time admit the boxes to be so made as to allow shafts J to have a slight play by reason of their elasticity or resiliency toward and from shaft E. This motion will be restrained to a radial vibratory movement, as the sides of the bearings are to be parallel, while the top and bottom slightly diverge, Figs. 6 and 7. By means of bolts *j'* the split ends of the arms are bound together and the rotation of shafts J regulated.

R R indicate impact or crushing rollers, mounted on shafts J in such position that they will impinge against the inner periphery of annulus B during its revolution or when shaft E is revolved. The material fed into the shell is screened by screen C, and the coarse particles fall onto annulus B, where they are crushed by rollers R, and if any unusually coarse particles get in the path of the rollers the shafts J will spring or yield somewhat, not so readily, however, as to impede the proper grinding action of the rolls. It is desirable to so adjust the position of shafts

J that the rollers R will always be ready to touch the annulus B at any point of their revolution or concentric movement around shaft E.

- 5 In order to more perfectly support the rollers R and prevent injury should they meet with an unyielding large piece of material, and especially if such piece should lie at one side of the annulus, so as to put a twisting
10 strain on the roller, the rolls are made with a large bore, as indicated at r, Figs. 4 and 5, and instead of supporting the rollers directly on the shafts J springs are fastened to the roller and to the shaft, and so arranged that
15 the roller is indirectly connected to supported and centered on shaft J without being directly in contact therewith. The springs might be spirals, as indicated at S, Fig. 4, or curved springs, as at s, Fig. 5, so that the
20 roller can yield somewhat at right angles to the shaft, or turn laterally or diagonally to the shaft when passing over obstructions, as indicated in dotted lines, Figs. 4 and 5. When the rollers are thus mounted, they have a semi-
25 universal play on the shaft, and yet are always thrown into contact with the annulus when the obstacles are removed or crushed.

In Fig. 2 the parts of the mill are about as already described, with the exception that
30 the shell is made stationary or non-revoluble. Having thus described the invention, I claim—

1. The combination, with an annulus, of a shaft passing therethrough, the opposite hollow bell-shaped castings on said shaft and
35 through which the material is fed into the mill, the arms on said castings, the shafts journaled in said arms, and the crushing-rollers carried by said shafts, substantially as specified.
40

2. The combination of the annulus and screens, the shaft passing therethrough, the hollow bell-shaped castings on said shaft, having internal wings, with the shafts mounted

on said castings and passing through the annulus and screen, and the rollers carried by said shafts, substantially as set forth.

3. The combination of the annulus with a crushing-roller, a supporting-shaft passing freely therethrough, and springs at opposite
50 sides of said roller and connecting it to and supporting it upon the shaft to permit it to play thereon, substantially as specified.

4. The combination of a revoluble annulus and screens connected thereto with hollow
55 conical castings having feed-passages and roller-shaft bearings, the supporting-shaft therefor, and the roller-shafts and rolls, substantially as described.

5. The combination of the annulus, the
60 main shaft, the conical castings thereon, having feed-passages and projecting arms, with the roll-bearing shafts journaled on said arms, and the crushing-rolls supported on springs attached to said shafts and revolved there-
65 with, substantially as described.

6. The combination of the annulus and the main shaft with the crushing-rolls, the supporting-shafts for said rolls, having enlarged
70 journals, and the split arms mounted on said main shaft, having flaring bearings receiving the enlarged journals of the roll-shafts, substantially as specified.

7. The combination of the annulus and screens, a shaft passing axially therethrough,
75 and the hollow bell-shaped castings F F on said shaft with the shafts J J, journaled in arms projecting from said castings, and the spring-supported crushing-rolls on said shafts, substantially as specified.
80

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

HENRY A. DUC, JR.

Witnesses:

B. B. FLADGER,
W. F. MICHEL.