(No Model.) 2 Sheets—Sheet 1.

F. A. HUNTINGTON.

CENTRIFUGAL CRUSHING MILL.

No. 318,117. Patented May 19, 1885.

Fig. 1.

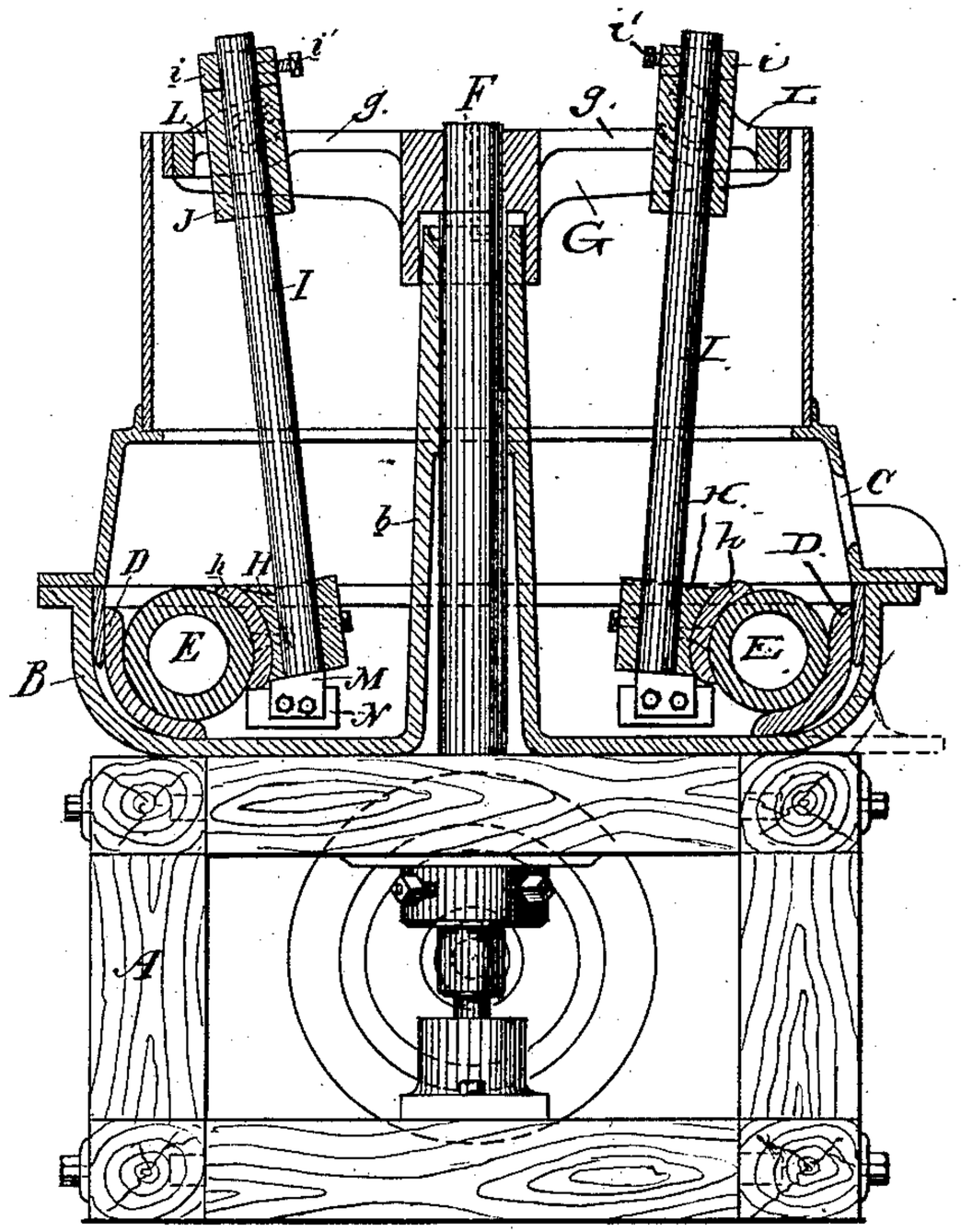
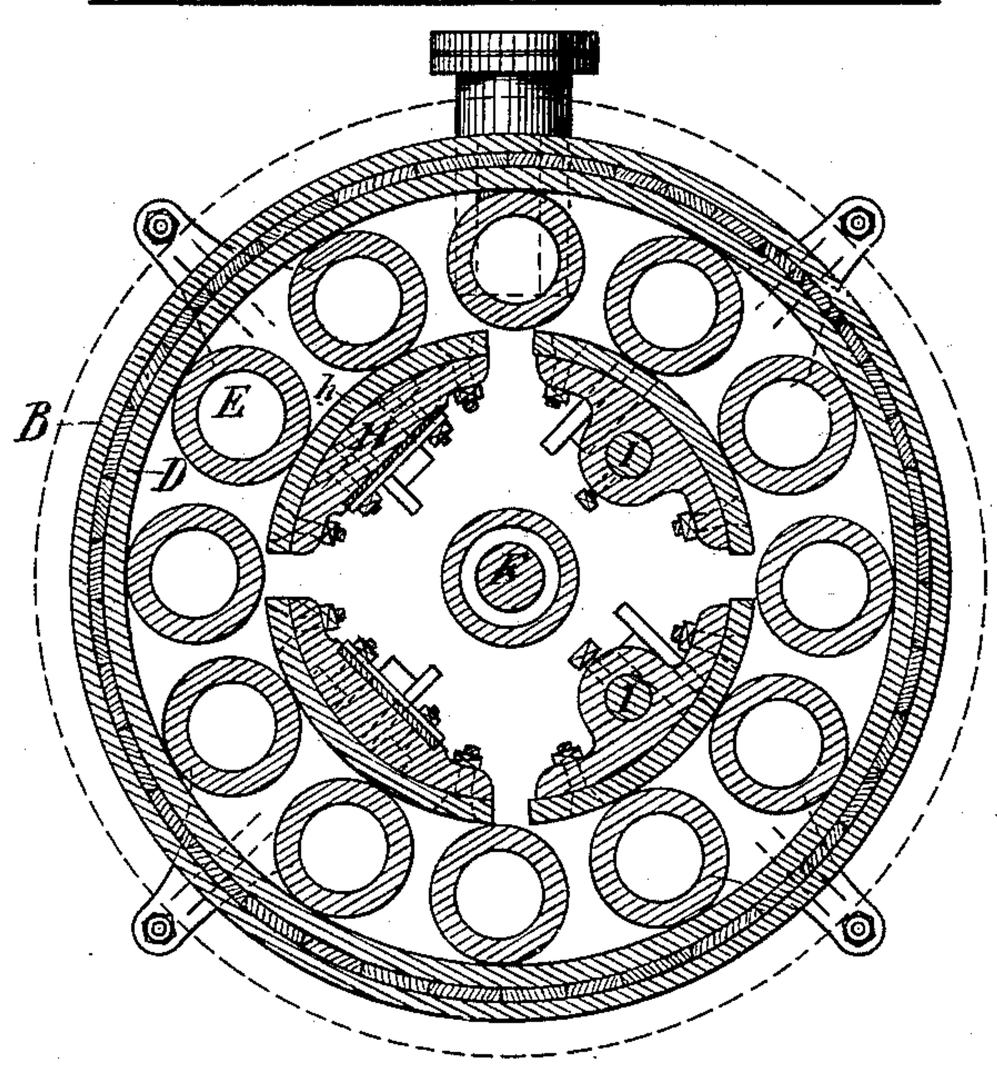


Fig. 2.



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(No Model.) 2 Sheets—Sheet 2.

F. A. HUNTINGTON.

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Fig. 5.

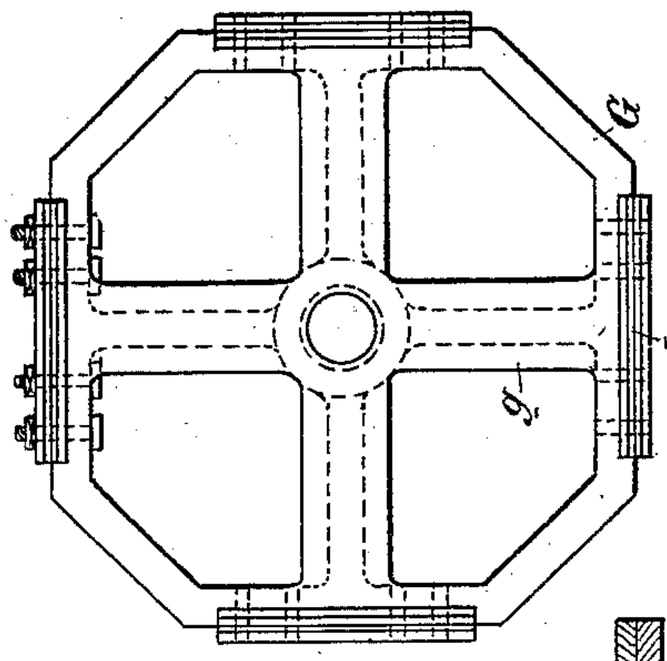
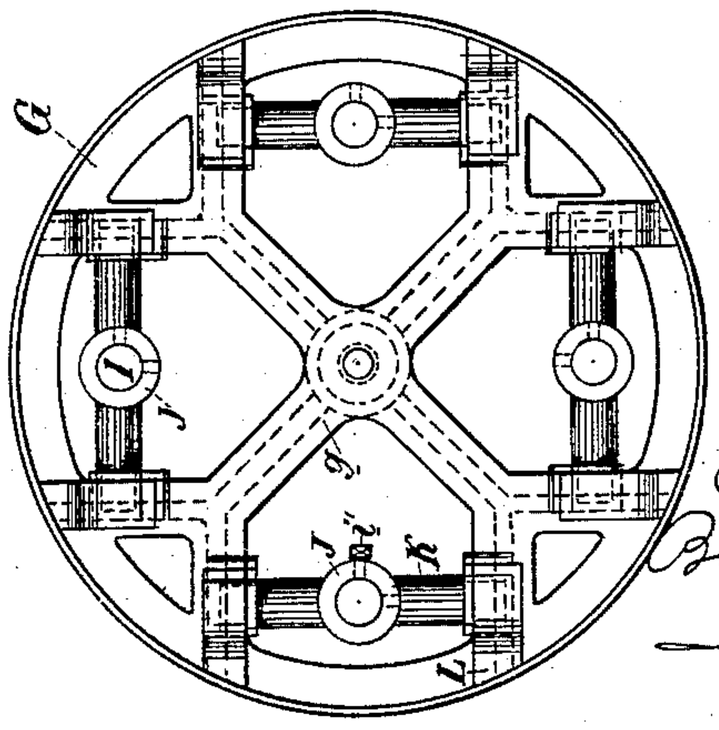


Fig. 4.

Fig. 3.



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UNITED STATES PATENT OFFICE.

FRANK. A. HUNTINGTON, OF SAN FRANCISCO, CALIFORNIA.

CENTRIFUGAL CRUSHING-MILL.

SPECIFICATION forming part of Letters Patent No. 318,117, dated May 19, 1885.

Application filed October 2, 1884. (No model.)

To all whom it may concern:

Be it known that I, FRANK. A. HUNTINGTON, of the city and county of San Francisco and State of California, have invented certain Improvements in Centrifugal Crushing-Mills; and I hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to new and useful improvements in crushing-mills; and it consists in combinations of devices, hereinafter described and claimed.

In the said drawings, Figure 1 is a vertical section of my mill. Fig. 2 is a horizontal section through the bed, balls, and mullers. Fig. 3 is a plan of the driver. Fig. 4 is a vertical section showing a modified means of hanging the mullers. Fig. 5 is a plan of the driver used in Fig. 4.

The object of my invention is to provide a simple, economical, and effective crushing-mill for quartz, ores, and other substances.

A is the frame, on which is mounted the pan B, provided with the usual discharge-screens, C. In the bed of the pan is the curvilinear or ring die D, in which the balls E operate. Keyed on top of the driving-shaft F, which passes up through the hollow central cone, *b*, of the pan, is the driver G, consisting of a circular plate or frame cast with radial and divergent arms *g*.

H are the mullers, the shoes *h* of which have curvilinear faces, adapting them to bear against the balls. These mullers are bolted to arms I, which extend upwardly and pass loosely through sleeves J, from the tops of which they are suspended by means of collars *i*, set on said arms by screws *i'*. The sleeves are provided with cross-pins or hangers K, the ends of which are turned down to or provided with journals which are mounted in boxes or bearings L on the arms of the driver, Figs. 1 and 3. The mullers are thus suspended from the driver by a pivot-connection, which adapts them to swing in radial planes or lines against the balls as they are propelled outwardly by centrifugal force occasioned by the rotation of the driver. The mullers further have a vertical play through the sleeves, whereby they may properly adapt themselves to their contact with the balls, and are not liable to become injured by a too forcible or uneven impingement therewith. The centrifugal force holds the mullers against the balls, and this contact causes the latter to operate in their die, whereby the quartz or other charge is crushed, not only between the balls and the die, but to a certain extent between the mullers and the balls. Secured to the bottoms of the mullers are wings M, to which are bolted plates N, forming scrapers, which move over the bottom or bed of the pan and prevent the charge from packing. It will be observed that the balls are made hollow. The object of this is as follows: If they are made solid, they presently wear down to a diameter at which their further use is impracticable and they have to be discarded, whence a loss results; but by making them hollow they can be thrown away without loss when the shell wears thin. As the crushing effectiveness of this machine does not rest in the weight of the balls, but in the centrifugal force of the revolving mullers, this hollow construction is no detriment to the working of the mill, which can thus be made cheaper.

I do not confine myself to the means for suspending the mullers I have thus far described. In Fig. 4 I show a simpler means. The arms I are flat springs, the upper ends of which are bolted to the driver G. (Shown in Fig. 5.) The yielding nature of the arms permits the required operation of the mullers and serves the purpose of the pivoted hangers. The driver is operated in the usual manner, as shown in Fig. 4, by the bevel-gears O O' and the driving-shaft P.

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

1. In a crushing-mill, the combination of the balls, a suitable pan or bed provided with a ring-die, the mullers, the arms I, adapted to have a swinging movement in radial lines, and a driver for revolving said mullers to throw them outward by centrifugal force against the balls, substantially as described.

2. In a crushing-mill, the pan B, having the ring-die D, and the balls E, in combination with the rotating driver G above the pan, the mullers H, bearing against the balls, and connections between said driver and mullers, whereby the latter are suspended and revolved, substantially as herein described.

3. In a crushing-mill, the pan B, having the

ring-die D, and the balls E, in combination with the rotating driver G, the mullers H, arms I, and means by which said arms are pivoted to the driver to adapt the mullers to have a movement in radial lines, substantially as and for the purpose herein described.

4. In a crushing-mill, the balls, a suitable pan or bed, the rotating driver G, having boxes or bearings L, and the sleeves J, having cross pins or hangers K journaled in the bearings, in combination with the mullers H and arms I, passing through and suspended from the sleeves, substantially as herein described.

5. In a crushing-mill, the balls and a suitable pan or bed, in combination with the mullers H, arms I, the rotating driver G, and the means for suspending said mullers from the driver and adapting them to have a swinging movement in radial planes, for the purpose described, consisting of the sleeves J, through which the muller-arms loosely pass, the collars *i* on the arms, the cross-pins or hangers K on the sleeves, and the boxes or bearings L on the driver in which the hangers are mounted, substantially as herein described.

6. In a crushing-mill, the pan B, having the die D, and the revolving centrifugally-acting mullers H, in combination with the hollow balls E, between the mullers and die, substantially as and for the purpose herein described.

7. In a crushing-mill, the combination of the balls, the pan having a suitable die, and the revolving centrifugally-acting mullers H, having the scrapers N at their bases operating against the charge in the bottom of the pan, substantially as and for the purpose herein described.

In witness whereof I have hereunto set my hand.

FRANK. A. HUNTINGTON.

Witnesses:
S. H. NOURSE,
C. D. COLE.