

J. T. DAVIS.
Ore Crusher and Pulverizer.

No. 229,387.

Patented June 29, 1880.

Fig. 1

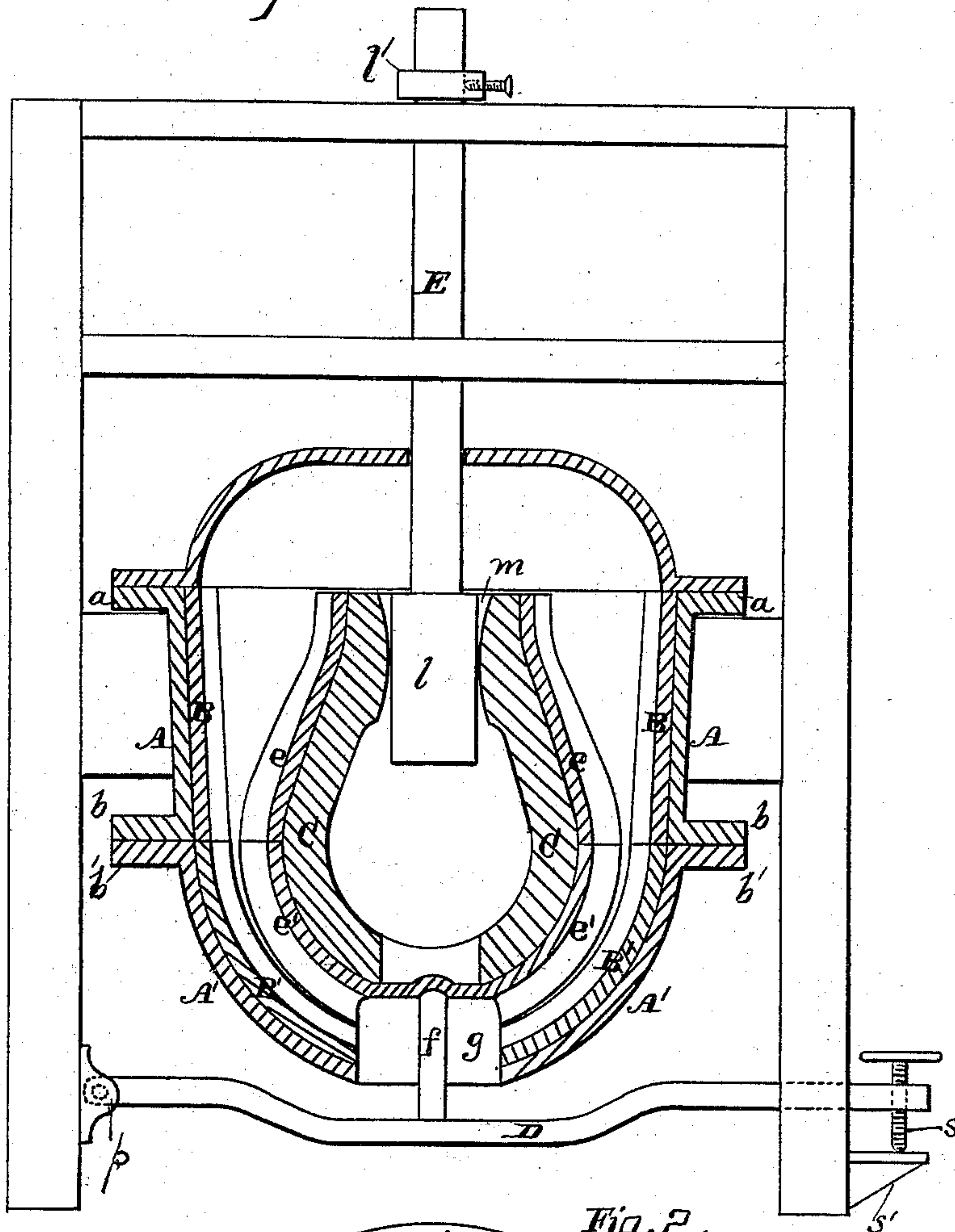
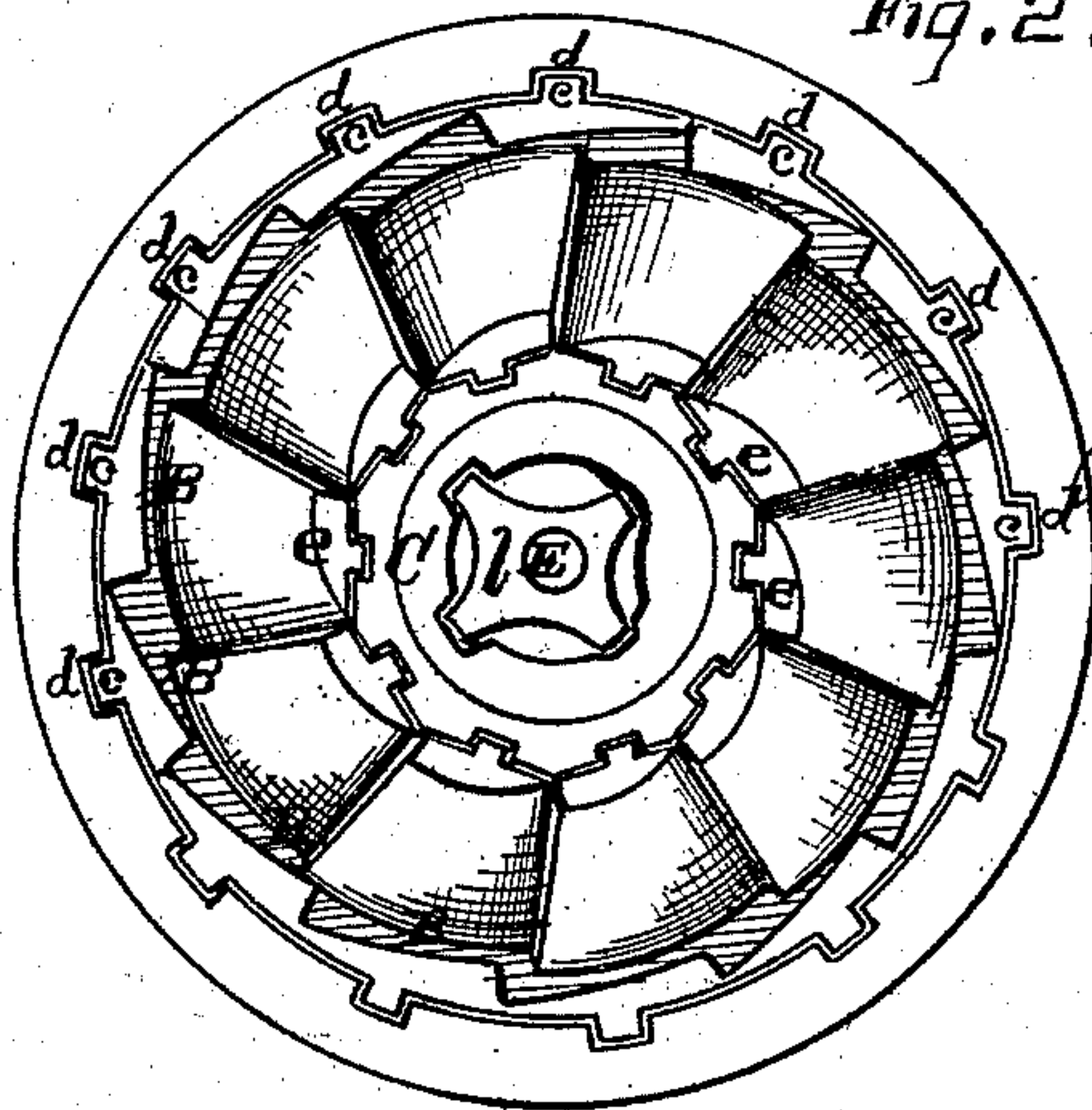


Fig. 2.



Witnesses

Frank A. Brooke
J. T. Davis

Inventor

John T. Davis
By Dewey & Co.
Attys

UNITED STATES PATENT OFFICE.

JOHN T. DAVIS, OF SAN FRANCISCO, CALIFORNIA.

ORE CRUSHER AND PULVERIZER.

SPECIFICATION forming part of Letters Patent No. 229,387, dated June 29, 1880.

Application filed December 15, 1879.

To all whom it may concern:

Be it known that I, JOHN T. DAVIS, of the city and county of San Francisco, and State of California, have invented an Improved Ore Crusher and Pulverizer; and I hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to certain improvements in ore crushers and pulverizers; and my improvements refer more particularly to a device in which a grinder or pestle revolves with an eccentric motion in a mortar.

My improvements consist in certain details of construction, which are more fully described in the accompanying drawings, in which—

Figure 1 is a vertical sectional view. Fig. 2 is a plan view.

The device is composed of an outside case or mortar, A, cylindrical in form, but slightly flaring at the top, so that the dies may be wedged in, as hereinafter described. A projecting flange, a, is formed around the top of this mortar, by means of which it is secured to the frame. This mortar is made in two parts, the bottom A' being removable and being secured to the cylindrical part by means of the flange b', which is bolted to the flange b on the upper cylindrical portion, for the purpose hereinafter described. Inside this mortar are placed the removable dies B B'. These dies are made in sections, and are prevented from turning by the flanges or ribs c on their backs fitting into corresponding grooves d formed in the mortar or case.

The dies B in the cylindrical portion of the mortar extend down to the flange at the lower end of said cylindrical portion. The dies B' are formed separately, and cast to fit into the bowl-shaped portion A' of the mortar. In inserting the dies the ribs c are slipped into the grooves until a solid bearing is reached, when they are held in place.

The die in the bottom or bowl-shaped portion of the mortar wears out most rapidly, the upper die outlasting half a dozen of the lower ones. Were it not for the fact of my being enabled to remove and change the lower one without disturbing or changing the upper one, considerable expense and loss of time would be entailed. As it is, by removing the bolts joining the flanges b b' the lower bowl-shaped portion of the mortar A' can be taken off and

the die renewed as frequently as necessary without touching the upper portion.

The dies B in the upper part, A, of the mortar cannot slip down, as the upwardly-flaring shape of the cylinder keeps them wedged in place. The die B' being replaced, the bottom of the mortar is put back again in position.

The upper die may be removed without touching the lower one by lifting it up out of the cylindrical portion of the mortar. The two dies are so formed that the depth of the depressions between the corrugations gradually decreases toward the bottom, so that the ore will be ground finer at the bottom, as hereinafter described.

The grinder or pestle C is made pear-shaped, rounding at the bottom and tapering toward the top. This grinder is made in one casting; but the shoes e e' are made removable. The lower shoe, e', is made to fit over the lower bulb-shaped portion of the pear-shaped grinder, and the upper shoe, e, slips down like a sleeve over the upper part, both being kept in place and prevented from revolving by ribs or flanges formed on them fitting into grooves, in the same manner as the dies are held in place in the mortar. These shoes have gradually-decreasing spaces between the corrugations, corresponding to those on the dies, and the point of junction of the upper and lower shoe is at the junction of the upper and lower die, as shown. In this way either the upper or lower shoe may be removed and changed without disturbing the other, in the same manner as the dies are changed.

A step, f, is placed at the bottom of the mortar, which projects up through the discharge-opening g, and sustains the weight of the grinder C, fitting into a shallow socket in the center of the bottom of the shoe, as shown. This step is fastened to a cross-bar or lever, D, hinged at p, by means of which it may be raised or lowered through the medium of a screw, s, passing through the free end of D and bearing against a projection, s', on the frame, and thus raise or lower the grinder C, to increase or decrease the discharge and regulate the fineness of the grinding.

An eccentric and rotary motion is imparted to the grinder, giving a rubbing and very effective grinding action at the bottom. The shaft E has an adjustable collar, l', above one

of the girt-timbers, and the weight of the shaft is thus sustained by the collar. At the lower end of this shaft is an eccentric, *l*, fitting into a slot, *m*, formed in the center of the grinder C, as shown, and extending down into the upper end of the grinder. The point of eccentricity is thus placed within the revolving center of the grinder, and this point is adjustable, so as to obtain more or less throw or eccentric motion to the grinder C. The object of this adjustability of the eccentric motion is to regulate the throw of the grinder to suit the character of rock under treatment, and also to keep the opening in the throat the same as the shoes and dies wear away.

When the machine is first started up the collar on the shaft is so adjusted by means of a set-screw that the eccentric just enters the slot in the grinder. The grinder will then move in the radius of a circle struck from the point of the throw of the eccentric diagonally across the grinder to the bottom of the shoe on the grinder, and the form of the bottom of the mortar is in a corresponding curve. As the wear of the shoes and dies comes mostly on the bottom, the lowering of the eccentric into the slot in the grinder by means of the collar and set-screw on the shaft keeps the radius of the circle the same as the iron wears away—that is, the shoes of the grinder may at all times be kept at the same distance from the dies of the mortar, even when shoes and dies both are worn away.

Where very coarse and hard ore is being crushed the eccentric may be kept high, so as to produce only a slight throw. With softer ore, where a more rapid grinding is possible, a greater throw is given to the grinder by lowering the point of eccentricity, as described.

The eccentric on the end of the shaft fits loosely in the slot in the grinder, so that a free vertical motion is allowed the grinder. The machine can thus free itself when overfed. In case too much ore is fed, and there is danger of choking, the packing of ore under the grinder will cause the grinder to lift up. As the grinder thus lifts up the point of eccentricity is lowered and more throw is automatically given, thus increasing the grinding action, and at the same time leaving the discharge-opening below freer, so a more rapid discharge will be attained.

The upper corrugated portions of the grinder and mortar act as an ore-crusher, the ore being crushed and broken at the throat, and as it descends by gravity the space between pestle and mortar decreases, as does the distance between the corrugations, and the ore is gradually reduced. When fine enough to pass under the mortar it is there pulverized by the grinding action as fine as desired, this fineness being regulated by means of the step which raises or lowers the grinder and adjusts the discharge-opening. The necessity of first breaking the ore in a breaker is thus avoided, the breaking, crushing, and pulverizing being accomplished in the one machine.

The corrugations of both shoes and dies gradually decrease in size from top to bottom, and pieces of ore caught are gradually ground finer and smaller and gradually work down toward the bottom, where they are finally discharged.

I am aware that rolling balls, grinders, or pestles have been heretofore used in mortars for crushing ore, and I do not therefore claim, broadly, such device; but

What I do claim as new, and desire to secure by Letters Patent, is—

1. In an ore-crusher, a grinder, C, in combination with the eccentric *l*, secured on the lower end of the vertically-adjustable shaft E, whereby the point of eccentricity is placed within the revolving center of the grinder and is rendered adjustable, so as to obtain more or less throw to the grinder, substantially as and for the purpose herein described.

2. In combination with the grinder C, with its regulating-step *f* and its centrally-extending slot *m*, said grinder having an eccentric rotating motion in the mortar A A', the eccentric *l*, fitting loosely in the slot *m* and secured to the adjustable shaft E, provided with a collar, *l'*, whereby a free vertical motion is allowed the grinder and its action rendered automatically adjustable, substantially as and for the purpose herein described.

In witness whereof I have hereunto set my hand.

JNO. T. DAVIS.

Witnesses:

CHAS. G. YALE,
FRANK A. BROOKS.