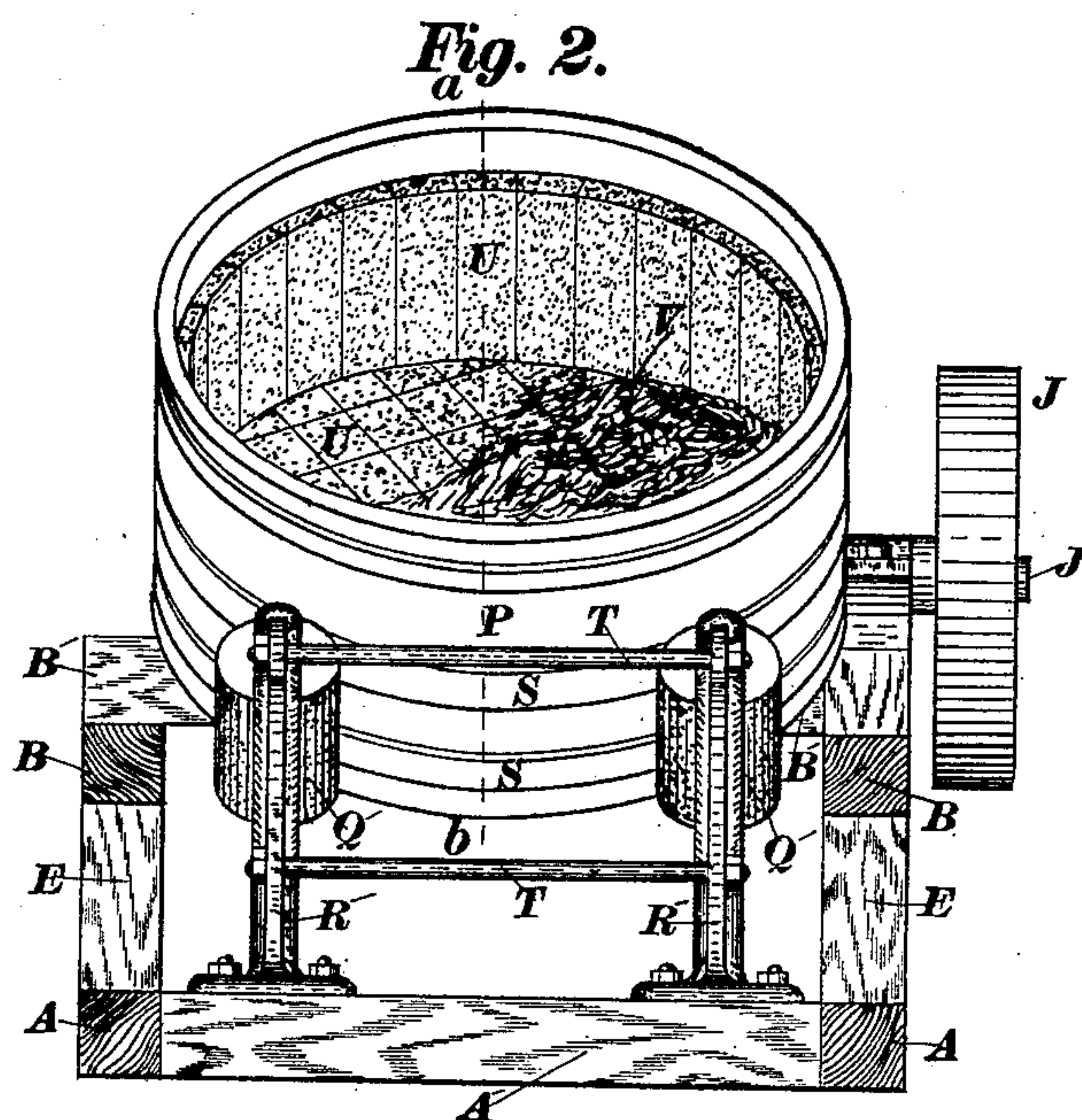
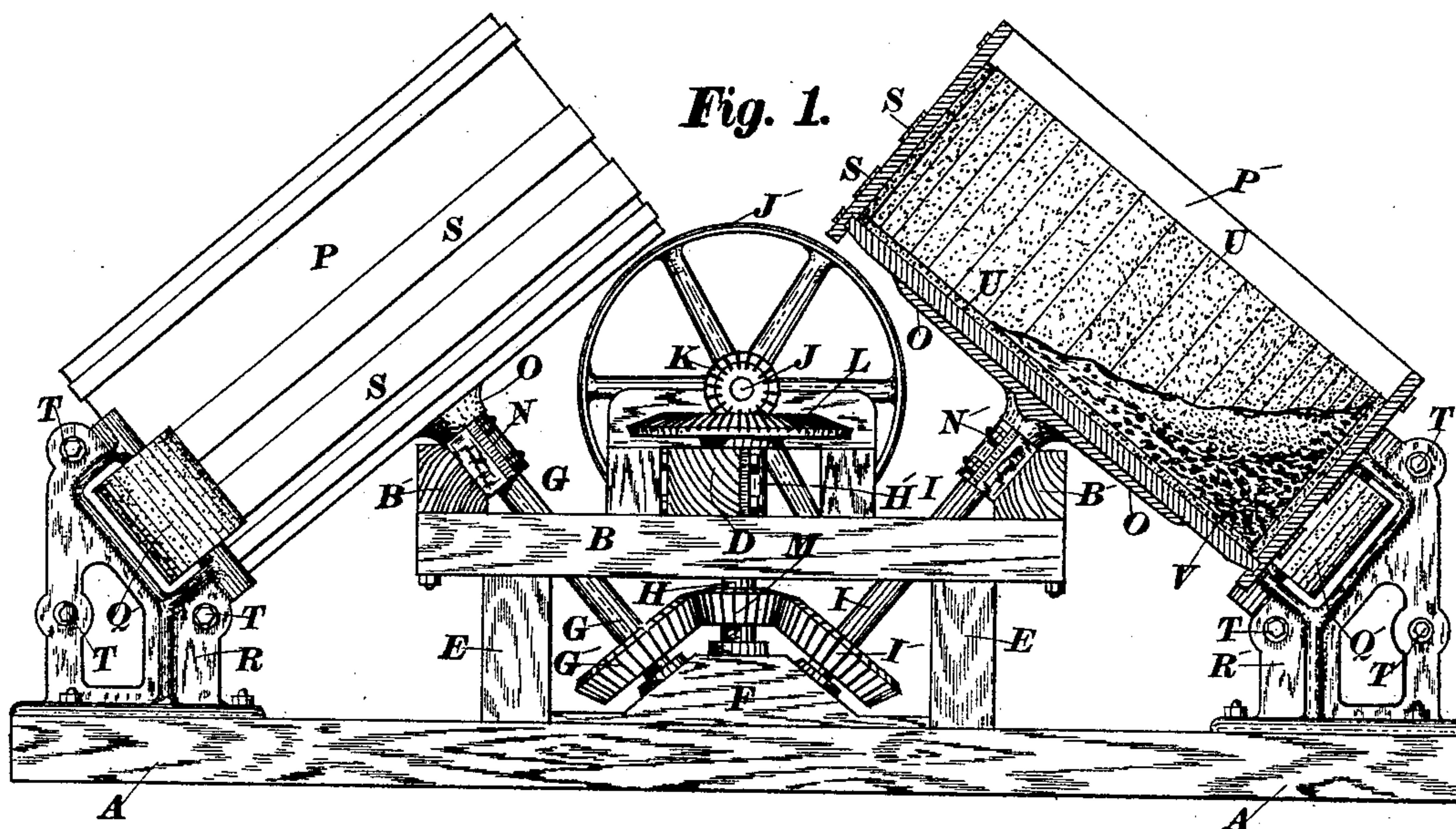


(No Model.)

G. H. SMITH.  
PULVERIZER.

No. 481,532.

Patented Aug. 23, 1892.



4 Witnesses  
Wm. Landmesser  
H. L. Brown.

Inventor  
George A. Smith,  
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# UNITED STATES PATENT OFFICE.

GEORGE H. SMITH, OF CHICAGO, ILLINOIS.

## PULVERIZER.

SPECIFICATION forming part of Letters Patent No. 481,532, dated August 23, 1892.

Application filed July 17, 1891. Serial No. 399,829. (No model.)

*To all whom it may concern:*

Be it known that I, GEORGE H. SMITH, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Pulverizer, of which the following is a specification.

My invention relates to means for pulverizing a great variety of materials, but is specially intended for reducing to an impalpable powder metals or ores which are to be used in the manufacture of paints of various kinds.

My object is to provide a machine which will reduce to a very fine condition such metals as lead, tin, and zinc, which have a high degree of ductility and which resist the ordinary means of grinding them to a powder, the machine being at the same time adapted to the reduction of friable materials, such as emery, corundum, and many kinds of metal-liferous ores. I attain these objects by the construction shown in the accompanying drawings, in which—

Figure 1 is a side view with several parts broken away on line *a b*, Fig. 2. Fig. 2 is a view of the right-hand end of Fig. 1 as the machine appears when in operation and charged with material to be pulverized.

Similar letters refer to like parts throughout the several views.

The frame is composed of heavy timbers. The sills *A* extend the whole length of the machine and are connected by cross-sills *A'*, Fig. 2. Mounted upon the top of the sills is a rectangular frame, which is composed of side pieces *B* and end pieces *B'*. There is also a cross-piece *D*, which connects the center of length of side pieces *B*. This rectangular frame is supported above the sills by heavy posts *E*. In the center of length and width of the base-frame formed by the sills is a heavy block *F*, which has three step-bearings to receive the lower ends of three shafts *G*, *H*, and *I*.

Journalled to the top rectangular frame is a horizontal shaft *J*, which has a driving-pulley *J'*, to which a belt is applied to furnish power to drive the machine. The shaft *J* has a position across the top frame in a transverse direction, and at its inner end is a bevel-pinion *K*, which gears with a large bevel-wheel *L*, which is secured to the top of vertical shaft

*H*, which shaft *H* is journalled in a box *H'*, which is secured to the side of cross-timber *D*, giving the shaft a central position in the top frame composed of sides *B* and ends *B'*. Near the lower end of vertical shaft *H* is firmly secured a pinion *M*, which gears with large bevel-wheels *G'* and *I'*, which are firmly attached, respectively, to inclined shafts *G* and *I*.

At the center of length of the end timbers *B'* at the inside upper corner are secured heavy boxes *N* and *N'*, in which, respectively, shafts *G* and *I* are journalled. At the top of each shaft *G* and *I* is a spider or broad flange *O*, firmly attached thereto, and to the top faces of these spiders are firmly attached by the bottoms the tubs *P* and *P'*. On account of the great weight of the tubs and their contents and the comparatively high speed which they must attain when in action rollers *Q Q'* have been provided, which are journalled to heavy brackets *R R'*, the brackets having a broad strong base, which is attached to the sills of the machine with bolts, as shown. Against the peripheries of these rollers *Q* and *Q'* the tubs rest, there being two heavy bands *S* around each tub to form a track, against which the rollers have bearing. These bands may be of metal and the rollers covered with some yielding material—such as rubber or leather—to prevent the roaring noise incident to the bands and rollers being both made entirely of metal.

The brackets *R* and *R'* by the pressure of the tubs against the rollers would have a tendency to spread apart; but this is provided against by long stay-bolts *T*, which connect the brackets and hold them firmly in position.

The inside lining *U* of the tubs is tile, porcelain, glass, stone, or any similar material not easily affected by liquid chemicals in case it is necessary to use them, and at the same time that will present a surface which is not quickly worn away by the continued attrition of the particles which are being reduced to a pulverulent state. The tubs are usually constructed of wood, and the lining in pieces is secured to the inside of the tubs by means of common wood-screws passing through holes in the lining and thence into the tubs. The lining, however, can be made of cement or some other similar substance and plastered



in in a soft state, or the tubs can be made all or a part of metal, as may be found necessary in practice.

This machine was devised for the special purpose of reducing metallic lead or zinc to a fine powder as a preliminary step in the manufacture of the carbonate of lead or zinc, and in describing the operation thereof I will confine myself to lead, which has been one of the most difficult metals to reduce to a fine and even state of comminution on account of its high degree of ductility.

In operation the tubs are partially filled, as shown at V, in section, Fig. 1, with lead pellets of various sizes, from about one-half-inch diameter down to the smallest that can be made, by the well-known process of dropping molten lead into a tank of water. After sufficient quantity of lead pellets are in the tub enough water is introduced to more than cover the lead pellets, when, power being applied to pulley J', it will be transmitted through the described train of cog-gearing and revolve the tub or tubs. In the revolutions of the tubs, standing at an inclination, as they do, Fig. 1, the pellets of lead and the water are carried by the frictional contact of the side and bottom of the lining of the tub above their normal level toward the side to which the tub is revolving; but the attraction of gravitation holds the pellets and water from rising above a limited amount, which depends upon the velocity of the revolution of the tub, and the pellets while in this position are rolled against the lining and themselves and gradually worn away, the abraded particles mixing with the water and undergoing a still further reduction in size until they are reduced to a very fine state and held in suspension in the water.

Revolving hemispherical or conical shaped vessels having their axis placed on an incline similar to the tubs, hereinbefore described, or cylindrically-shaped vessels having their axis placed horizontally, could be used; but

I have found that tubs after the form herein shown and described and their axis inclined to an angle of about forty-five degrees from a horizontal are preferable, since having the open top the interior is readily accessible either to supply or remove material, and there is no obstruction to making an inspection of the condition of the contents of the tub at any time when the machine is in operation with little danger to the attendant.

I claim as my invention—

1. In a pulverizer for reducing metals and minerals, a central motor, a multiple of vessels arranged around the motor and adapted to be operated thereby, each of said vessels having its plane of revolution at an angle to a horizontal and adapted to receive material to be operated upon and to carry it part way up the inclination formed by the sides and bottom of the vessel, substantially as set forth.

2. In a pulverizer for reducing metals and minerals, a base-frame, a rectangular frame mounted thereon, a support at each end of the base-frame, provided with rollers, two vessels mounted in the frames, each having its plane of revolution at an angle to a horizontal and adapted to bear against the rollers of the support at its respective end of the frame, and a central motor for operating said vessels, substantially as set forth.

3. In a pulverizer for reducing metals and minerals, a base-frame, a rectangular frame mounted thereon, a block at the center of the base-frame, provided with three step-bearings, a shaft journaled in each bearing and in bearings upon the rectangular frame, a motor for the central shaft, and a vessel upon the upper end of each of the other shafts, the plane of revolution of which is at an angle to a horizontal, and a support for each vessel, substantially as set forth.

GEORGE H. SMITH.

Witnesses:

W. R. ADAIT,

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