

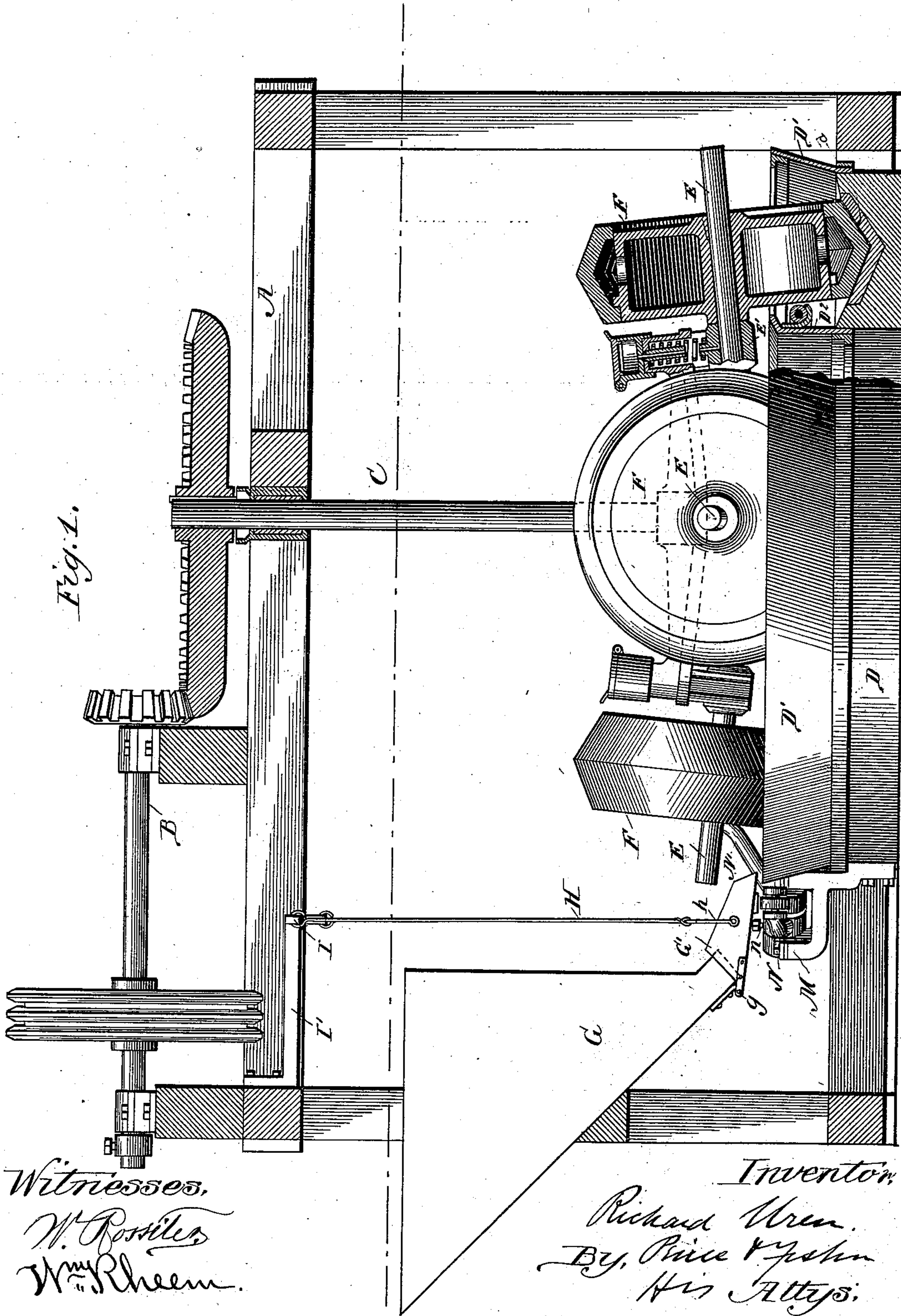
(No Model.)

2 Sheets—Sheet 1.

R. UREN.  
ORE CRUSHER.

No. 376,928.

Patented Jan. 24, 1888.



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Wm. Rheem

Inventor,  
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By, Price & Fisher  
His Attys;



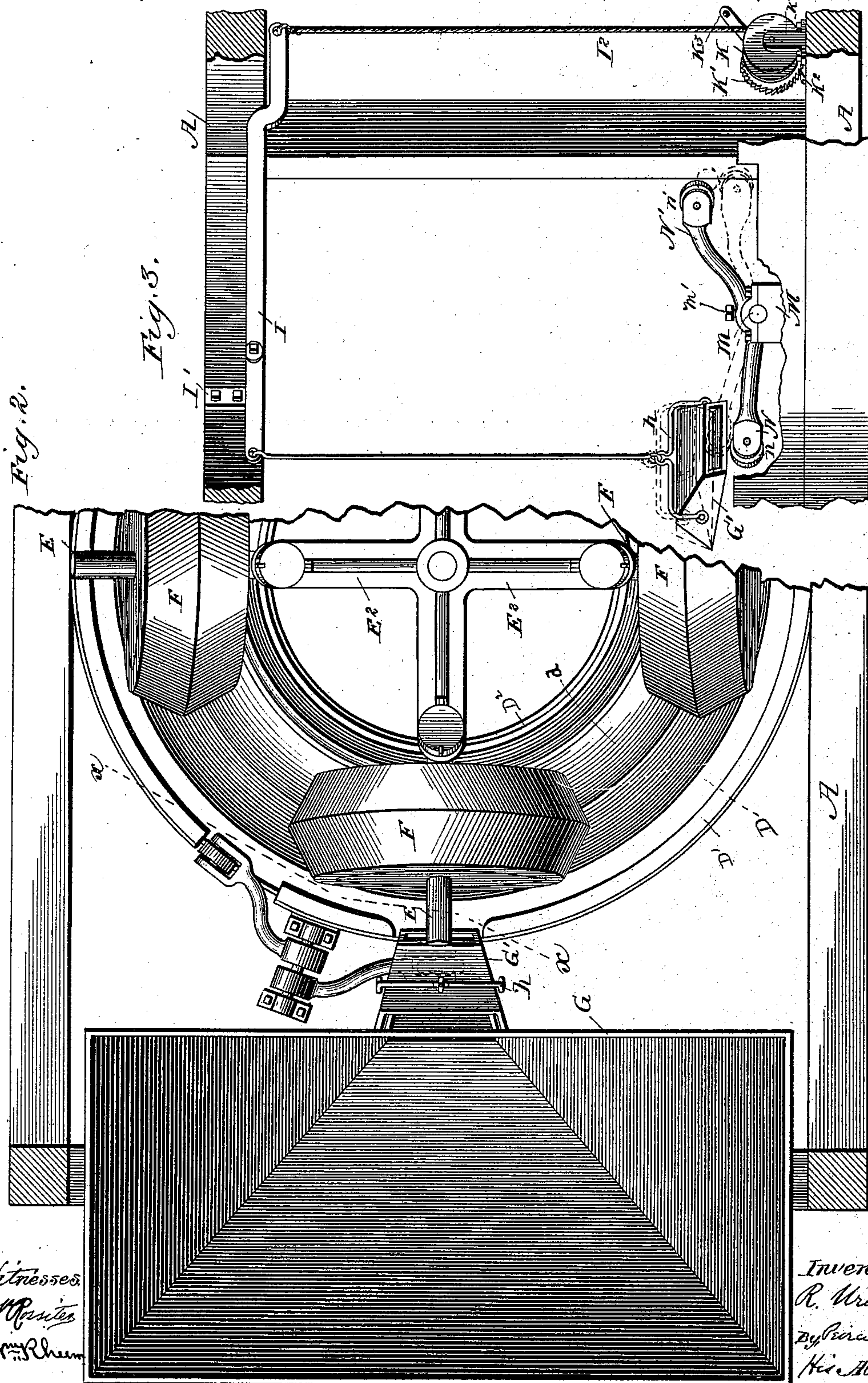
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# UNITED STATES PATENT OFFICE.

RICHARD UREN, OF HOUGHTON, MICHIGAN.

## ORE-CRUSHER.

SPECIFICATION forming part of Letters Patent No. 376,928, dated January 24, 1888.

Application filed August 20, 1886. Serial No. 211,367. (No model.)

*To all whom it may concern:*

Be it known that I, RICHARD UREN, a citizen of the United States, residing at Houghton, in the county of Houghton, in the State of Michigan, have invented certain new and useful Improvements in Ore-Crushers, of which I do declare the following to be a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My present invention has reference to that class of ore-crushers wherein the crushing of the ore is effected upon a horizontally-arranged bed by means of rolls which rotate upon shafts that project laterally from and are driven by a central vertical shaft. An objection heretofore encountered in the class of ore-crushers in which the crushing-rolls are carried by horizontally-arranged shafts is that the crushing-rolls, particularly when revolving at a high rate of speed, are impelled by their centrifugal force toward a movement in outward direction, and are thus caused to become unequally worn, and hence tend to cause an unequal wear upon the bed of the machine, which eventually impairs the uniform and perfect action of the machine.

Attempt has heretofore been made to overcome the centrifugal force of the crushing-rolls by forming the bottom of the crushing-bed upon an outward and upward incline, and by providing the rolls with flat peripheries corresponding with such inclined bottom or track of the bed. In this construction, however, the relative form of the crushing-bed and of the periphery of the rolls was such that the material to be crushed would work to the bottom of the single incline of the track, and would cause the entire wear to come upon one part of the flat rims of the crushing-rolls, rendering the other part practically inert, and lifting the rolls in such a manner as to overcome the advantage sought to be attained by arranging the track or bottom of the bed upon an incline. It has also been heretofore proposed to form the crushing-rolls with double-incline or V-shaped peripheries, and to form a correspondingly-shaped track in the bed of the machine. In this last construction, however, the rolls were carried by horizontally-

arranged shafts, and the machines so constructed were subject to the objections heretofore pointed out.

The object of my invention is to so improve the relative construction and arrangement of the crushing rolls and bed that the centrifugal force of the crushing-rolls will be neutralized, and at the same time a uniform action of the rolls will be secured.

To this end my invention consists in the combination, with a circular crushing-bed having a double-inclined track, of crushing-rolls having their peripheries provided with double inclines corresponding with the track, said rolls being mounted upon upwardly and outwardly inclined shafts.

My invention also consists in the construction and arrangement of feed mechanism hereinafter described, illustrated in the accompanying drawings, and particularly defined in the claims at the end of this specification.

Figure 1 is a view in side elevation, parts being shown in vertical section for the purpose of better illustration. Fig. 2 is a plan view of the feed-hopper and bin, the automatic feed-gage, and a portion of the crushing rolls and bed. Fig. 3 is an enlarged detail view upon line *xx* of Fig. 2.

A designates the main frame of the machine, within which will be journaled, in the usual or any suitable manner, the main drive-shaft B and the vertical shaft C, properly geared thereto, the lower end of this vertical shaft C being journaled at a central point within the circular bed D of the machine.

From the lower portion of the vertical shaft C project the lateral shafts E<sup>2</sup>, the inner ends of said shafts being journaled within suitable bearings upon a sleeve that is fastened to the shaft C, this sleeve and its adjuncts being of any suitable construction. The shafts E, as clearly shown in Fig. 1 of the drawings, are inclined upwardly in outward direction, and upon these shafts are keyed the crushing-rolls F, the outer peripheries of which are suitably conformed to fit the track *d* of the crushing-bed, and these shafts E are also journaled in suitable sleeves, E', which are sustained by the arms E<sup>2</sup>, projecting from the sleeve that encircles the vertical shaft. The crushing-bed



D will be provided with the inner and outer curbs, D' and D<sup>2</sup>, which serve to deliver the ore properly to the bed.

It will be observed that the track *d* of the crushing-bed is of double-inclined or V shape, thus corresponding to the shape of the peripheries of the crushing-rolls, and by employing this shape of crushing-rolls and track, in connection with the inclined shafts for sustaining the crushing-rolls, a uniform wear upon the surface of the rolls and beds is attained, and at the same time, by reason of the inclination of the shafts E, the centrifugal action of the rolls is overcome. It will also be noticed that the outer inclined portion of the track *d* is higher and steeper than the inner inclined portion of said track, since upon this outer portion the centrifugal force of the rolls will be exerted.

At the side and above the bed of the machine is located the ore-bin G, provided at its bottom with a shaking hopper, G', suitably hinged thereto, as shown at *g*, the inner end of this hopper G' projecting a slight distance beyond the outer curb, D', of the crushing-bed, so as to properly deliver the ore upon the bed. This hopper G' is preferably sustained by means of the rod H, connected to the hopper by the loops *h* and attached at its upper end to a lever, I, that is pivoted to a bracket, I', and is provided at its rear end with the cord I<sup>2</sup>, the lower portion of which is wound around the pulley K, journaled upon the standard *k*, bolted to the frame-work of the machine. The pulley K is provided with a ratchet-wheel, K', which engages with a suitable check-pawl, K<sup>2</sup>, and with a crank-handle, K<sup>3</sup>, by means of which the pulley and the ratchet-wheel will be turned. By turning the crank or handle K<sup>3</sup> the cord I<sup>2</sup> can be wound upon the pulley K, in order to fix the delivery-hopper G' at any desired elevation with respect to the curb D' of the crushing-bed, and consequently to vary the amount of ore to be delivered into the machine at each descent of the hopper. At the side of the crushing-bed, and journaled upon a shaft, *m*, sustained by a bracket, M, are placed the two arms or levers N and N', which constitute the feed-gage that serves to properly actuate the delivery-hopper G'. Each of these arms or levers is keyed to the shaft *m* by means of a suitable set-screw, *m'*, and the inner end of the arm or lever N extends beneath the bottom of the hopper G', and the inner end of the arm or lever N' extends above the edge of the outer curb of the crushing-bed D. The arms or levers N and N' are preferably provided at their free ends with the friction-rolls *n* and *n'*, the roll *n* bearing against the under side of the hopper G', and the roll *n'* projecting into the path of the extended ends of the shafts E of the crushing-rolls, which shafts, it will be observed, project beyond the outer faces of the crushing-rolls and to a point above the edge of the curb D'.

From the foregoing construction it will be seen that when motion has been imparted to the vertical shaft C, so as to cause a rotation of the crushing-rolls, the projecting ends of the shafts E will successively strike against the friction-roll *n'* on the end of the arm or lever N' and depress this arm, thereby causing it in turn to rock the shaft *m* and lift the arm or lever N, which in turn will lift the delivery-hopper G', and as the shaft E passes from above and releases the arm or lever N the hopper G' is permitted to instantly drop and to shake out a quantity of ore onto the crushing-bed. The ore thus continues to be discharged automatically from the hopper until a sufficient quantity has been delivered onto the crushing-bed to elevate the crushing-rolls such distance that the projecting ends of their shafts E rise above and do not strike the friction-roll *n'* of the lever N'. It is evident that as soon as a fresh supply of ore is needed upon the crushing-bed the descent of the crushing-rolls will occur, and the projecting ends of the shafts E will at once begin to automatically operate the feed-gage, and thus secure a uniform and constant supply of ore upon the bed of the machine. By means of the pulley K and its adjuncts the hopper G' can be raised or lowered, in order to determine the quantity of ore that shall be discharged therefrom at each stroke of the feed arm or lever N'. It will be readily understood that the details of construction above set out may be varied without departing from the scope of my invention.

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

1. In an ore-crusher, the combination of the roller-shafts, a lever operated by said shafts, an ore-supply bin having a movable hopper engaged by said lever, and suitable means for regulating the supply of material to the crusher, substantially as described.

2. In an ore-crusher, the combination, with the roller-shafts, of the ore-supply bin having a movable hopper, a rod supporting said hopper, a lever attached to the crusher, having one end engaging with said hopper and its opposite end engaged by said shafts, whereby the hopper is actuated so as to discharge the ore into the crusher, and suitable means for regulating the discharge of the material from the hopper into the crusher, substantially as described.

3. In an ore-crusher, the combination of the bed D, the track *d*, crushing-rolls F, shafts E, extending beyond said rolls, the ore-supply bin G, the vibrating hopper G', the levers N and N', arranged to come in contact with the ends of said shafts, and means for imparting motion to the rolls, substantially as described.

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Witnesses:

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