(No Model.) 3 Sheets—Sheet 1.

J. F. WISWELL.

ORE CRUSHER.

No. 421,151. Patented Feb. 11, 1890.

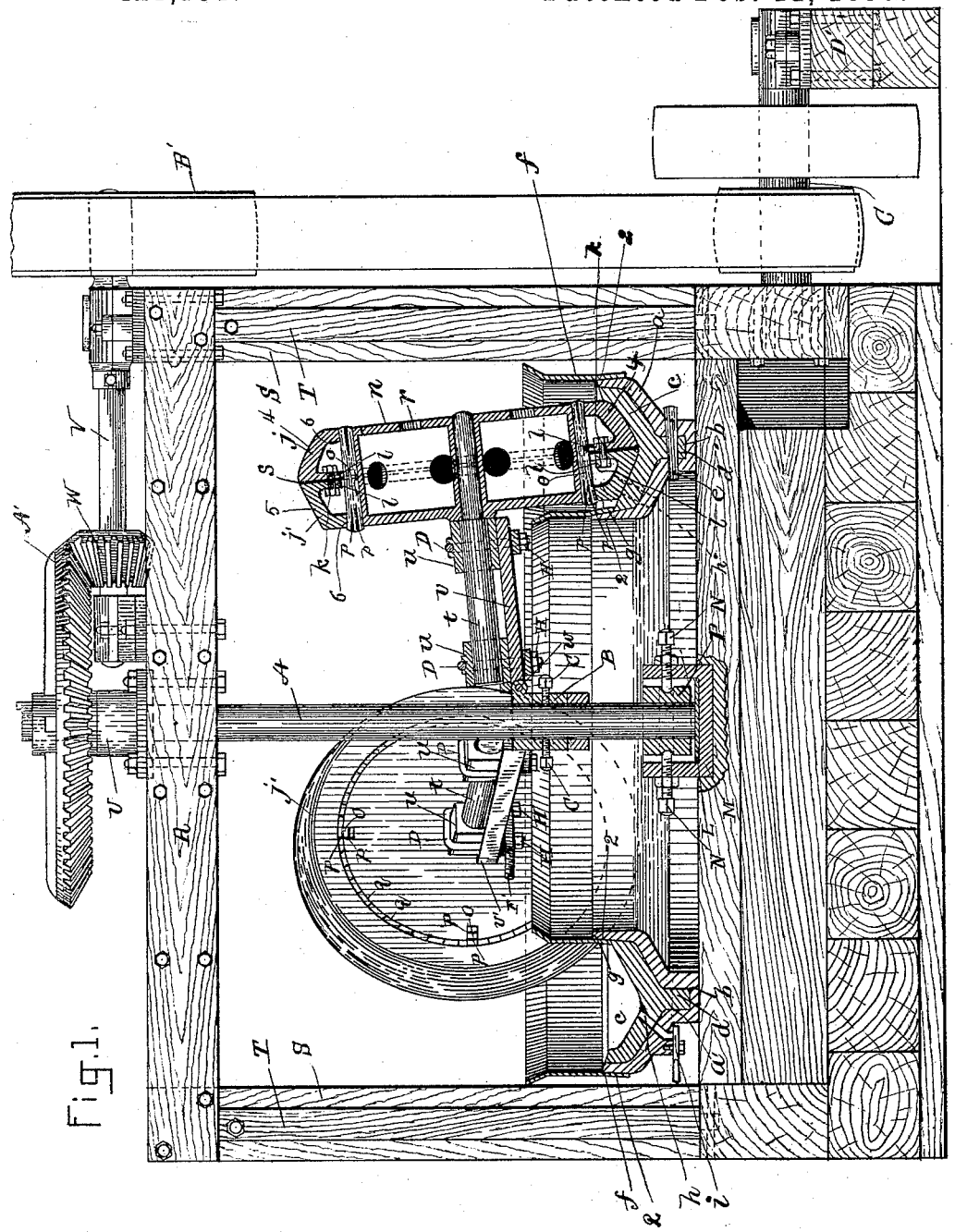

Fig. 1.

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J. F. WISWELL.

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No. 421,151. Patented Feb. 11, 1890.

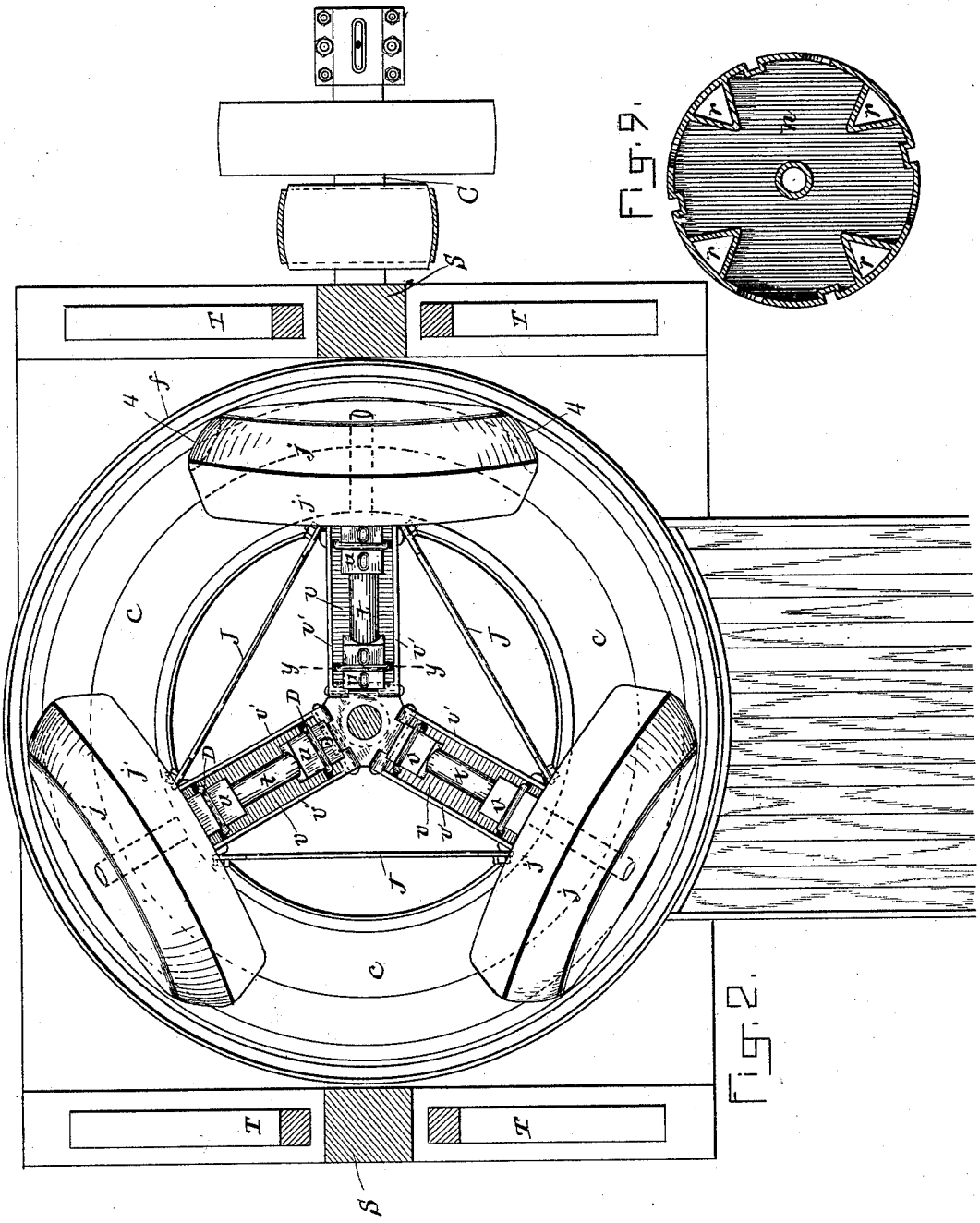

Fig. 2.

Fig. 9.

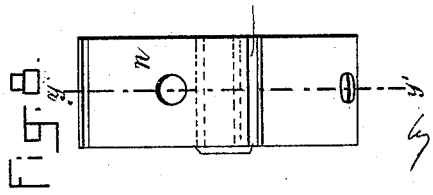

Fig. 8.

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(No Model.) 3 Sheets—Sheet 3.

J. F. WISWELL.

ORE CRUSHER.

No. 421,151. Patented Feb. 11, 1890.

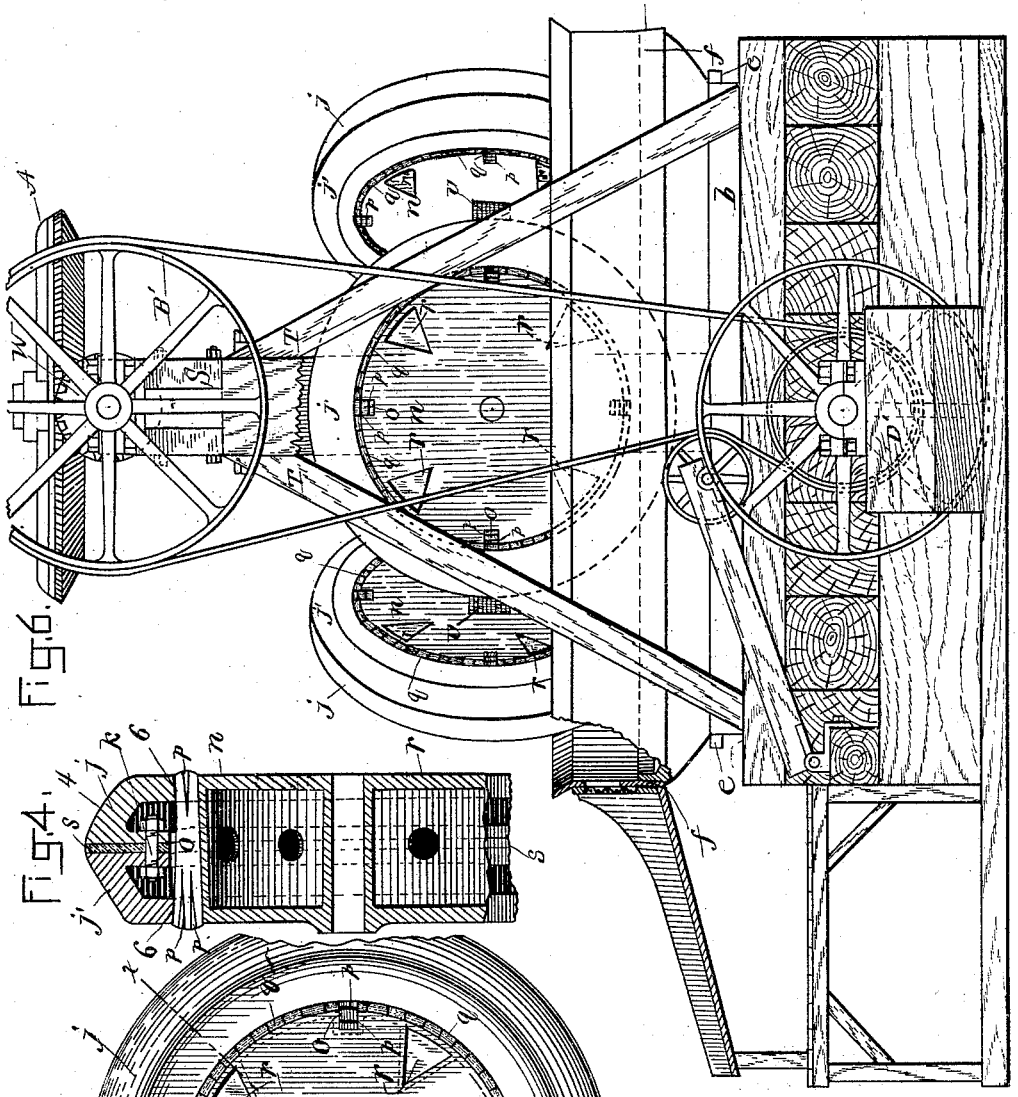

Fig. 6.

Fig. 4.

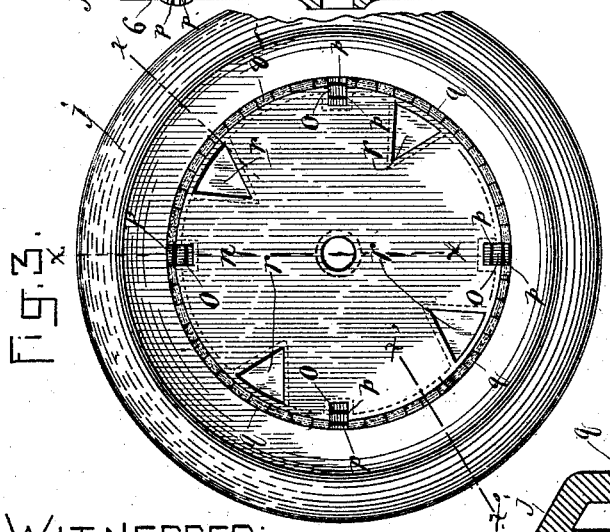

Fig. 3.

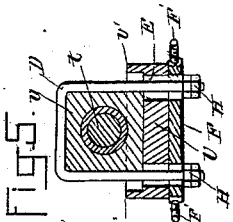

Fig. 5.

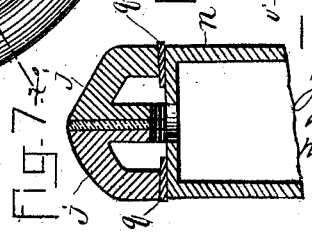

Fig. 7.

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UNITED STATES PATENT OFFICE.

JOHN FRANKLIN WISWELL, OF MEDFORD, MASSACHUSETTS, ASSIGNOR TO JACOB C. WISWELL, OF SAME PLACE.

ORE-CRUSHER.

SPECIFICATION forming part of Letters Patent No. 421,151, dated February 11, 1890.

Application filed February 18, 1888. Serial No. 264,486. (No model.)

To all whom it may concern:

Be it known that I, JOHN FRANKLIN WISWELL, of Medford, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Ore-Crushers, of which the following is a specification.

This invention relates to ore-crushers composed of a circular bed or trough and a series of crushing-rolls formed to fit said bed and mounted on axles attached to a power-driven shaft, whereby the rolls are carried around the bed and caused to crush the ore thereon.

The object of the invention is to provide certain improvements in the construction of the bed, the rolls, and the means for connecting the rolls to the driving-shaft, whereby the durability, ease of operation, and general effectiveness of the machine are increased.

The invention consists in the several improvements which I will now proceed to describe and claim.

In the accompanying drawings, forming a part of this specification, Figure 1 represents a side view of my improved ore-crusher, partly in elevation and partly in vertical section. Fig. 2 represents a top view of the same. Fig. 3 represents a side view of one of the rolls. Fig. 4 represents a section on line $x\ x$, Fig. 3. Fig. 5 represents a section on line $y\ y$, Fig. 2. Fig. 6 represents an end view with parts broken away. Fig. 7 is a sectional view of a portion of one of the crushing-rolls. Fig. 8 is an end view of one of the hubs of the rollers. Fig. 9 is a vertical sectional view thereof on the line $y'\ y'$, Fig. 8.

The same letters and figures of reference indicate the same parts in all the figures.

The bed of the machine is composed of a continuous circular holder a, formed with a central offset a', containing a groove b, and a series of segmental wearing-plates c, formed to fit said holder and provided on their under sides with ribs d, which fit the grooves in the holder a and are secured to the latter by keys e, driven through coinciding holes in the offset portion of said holder and in the ribs d. The tongues or ribs d give strength to the wearing-plates by largely increasing their thickness at the center, and also enable the plates to be securely fastened without bolts extending through their wearing-surfaces.

The upper edges of the holder a have slightly-beveled surfaces 2 2, so that the outside curb f and the inside curb g of the bed when driven onto said beveled portions will be slightly expanded at their lower edges by said beveled portions and will be held thereon by friction alone, no bolts or other fastening devices being employed. The inner edge of the holder is raised above the wearing-plates, to prevent the crushed ore from lodging at one side of the path of the rolls. An opening h is formed through one of the wearing-plates and through the holder, for the purpose of removing the contents of the bed or trough while the mill is in operation. Said opening, which extends downwardly from the lowest point in the bed, is closed at its outer end by a gate i.

The crushing-rolls, preferably three in number, are composed of hubs and tires detachably connected. The tires are each composed of two annular sections $j\ j'$, placed together and connected by bolts k, passing through ears or flanges $l\ l$ on said sections. The peripheries of said sections are oppositely inclined, so that the entire periphery of the roll is approximately V-shaped in cross-section. The periphery 4 of the outer section of the roll is, however, curved, so that it presents a half-ellipse in cross-section, while the cross-section of the periphery 5 of the inner section presents a straight bevel.

The wearing-plates c, on which the rolls travel, are formed to fit the above-described contour of the rolls, as shown. The described form of the rolls and bed is found to permit the rolls to rotate more easily and with less wear and abrasion than rolls as heretofore formed.

The rings or sections $j\ j'$ constitute a tire, which is secured to a cylindrical hollow hub n, the tire fitting upon the periphery of said hub and being secured thereto by wooden bars o, inserted in mortises formed in the periphery of the hub, and enlarged at their ends by wedges $p\ p$, driven into said bars. The ends of the bars are thus made wedge-shaped and are expanded against the sur-

faces of the hub and tire, firmly securing the latter to the former. The surfaces 6 6 of the tire on which the enlarged ends of the bar *o* bear are slightly beveled to correspond to the inclination given by the wedges *p* to the portions of the bar bearing on the tire, so that the tire cannot be displaced laterally. Wooden wedges *q* are driven into the crevices between the hub and tire at points between the bars *o o*. The wooden bars *o* and wedges *q*, interposed between the tire and hub, act as cushions to prevent the breakage of the tires when they become thin by wear.

The hub may have openings in its periphery, through which weights may be inserted to give the rolls any desired effective force. I prefer to provide one side of the hub with orifices, in which may be inserted metal plugs *r*, to serve as weights, compensating for wear of the tires. Before said weights become necessary, said holes may be stopped by wooden plugs.

Between the sections *j j'* of the tire is interposed a strip or gasket *s* of sheet-rubber, the edge of which forms a part of the periphery of the roll, and, coming in contact with the mercury in the bottom of the bed or trough, assists amalgamation. Said rubber also prevents the rolls from flattening the coarser particles of gold that are liberated from the ore and which fall to the bottom of the trough in milling.

The axles *t* of the rolls are journaled in boxes *u u*, which are secured to arms *v v*, radiating from the central driving-shaft A. Said arms are connected by hinges *w* with a collar or hub B, which is detachably secured to said shaft and made vertically adjustable thereon by means of set-screws C C. The hinged arms enable the rolls to rise and fall independently and constitute a desirable substitute in this respect for springs, which have been heretofore used for the same purpose. The vertical adjustability of the collar B enables the inner ends of the arms *v* to be raised or depressed, so that the axles *t* may be inclined from horizontal planes and the rolls may be correspondingly inclined from vertical planes.

I find that the mill can be operated to much better advantage if the rolls are inclined inwardly from their lower portions, as shown in Fig. 1, such inclination enabling the rolls to travel rapidly without the increase of resistance and friction which would be caused by centrifugal force if the rolls were not so inclined; hence the mill can be operated with less power. The inward inclination of the rolls also prevents them from throwing the contents of the trough outwardly.

The boxes *u u* are secured to the arms *v* by yokes or clamps D, the ends of which pass through transverse slots E in said arms and through cross-bars F under the arms *v*, and are secured by clamping-nuts H, screwed upon the threaded ends of the yokes and against the under sides of the cross-bars. The boxes *u* may be adjusted laterally upon the arms *v* by loosening the nuts H and moving the yoke D sidewise in the slots E. I am enabled by thus adjusting the boxes to make the axles of the rolls stand slightly tangential to the center of the driving-shaft, so that the forward portions of the rolls will be slightly nearer the center of said shaft than the rear portions. The rolls are thus caused to run more smoothly and with less resistance than they would if their axles were exactly radial.

The adjustability of the boxes enables the rolls to be adjusted for either direction of movement, so that the forward portions may in either direction be nearest the center.

The arms *v* have flanges *v' v'* to guide the surplus oil from the boxes, the downward inclination of the arms causing such oil to flow toward the driving-shaft, so that it cannot enter the trough to prevent amalgamation.

J J J represent braces, which extend from arm to arm and are provided with slots in their ends, which receive the reduced ends F' of the cross-bars F, to which the yokes or clamps D are secured. Said braces afford lateral support to the arms *v*, and prevent the entire lateral strain from being supported by the hinges.

The lower end of the vertical shaft A rests upon a plate of steel L, placed in the bottom of a square iron box M. Four steel set-screws N are inserted in the box, near the top of which a working-box P is fitted to the shaft, and held in position by means of the said set-screws N. A narrow groove is made which runs horizontally all around this box. In this groove the ends of the set-screws are seated. A truss composed of two parallel beams R, bolted together, is elevated upon two posts S S, firmly braced with four braces T. The upper end of the main shaft A passes between the beams R R and through a box U, secured thereto. The upper counter-shaft V, on which the pinion W, that intermeshes with the crown-gear A', is fixed, is also supported by the beams R R. It will be noticed that the bearing for the inner end of the counter-shaft is located at the extreme end of the shaft beyond the pinion, which prevents the shaft from springing when heavy strain is brought to bear upon it. On the opposite end of the shaft V the driving-pulley B' is fixed, which pulley is connected by means of a belt to the lower counter-shaft C', journaled in boxes secured one to the upright post in vertical line with the upper counter-shaft and the other end resting on a pillow-block D'.

The outside curb is provided with openings having wire screens for the escape of water and finely-pulverized ore, &c., onto an inclined bed or apron.

Some of the great advantages that are gained by the construction above described

may be set forth as follows: First, the pitch of the rolls can be adjusted to any given angle by lowering or raising the central collar or hub. This alone is of great importance in controlling the wear of both wearing-plates and tire; also, the speed of the mill may be increased or diminished by lowering or raising the ends of the axles and by setting the ends back or forward. It will also be observed that with this construction of carriage the use of springs over the rolls is obviated, the hinges permitting the free play of each separate roll up and down.

I claim—

1. In an ore-crusher, the crushing-rolls herein described, provided with central hubs and having the tires made of two annular sections, and a packing or filling between said sections, extending to the outer ends thereof, as and for the purpose set forth.

2. In an ore-crusher, the crushing-roll tires, each composed of two annular sections having oppositely-inclined peripheries placed side by side and bolted together, as described, and provided with a packing or filling of rubber placed between the adjacent sides of said sections, and the central hubs to which said tires are secured, as set forth.

3. In an ore-crusher, the crushing-rolls herein described, having their tires composed of annular sections bolted together internally and provided with beveled seats 6 on their inner edges, the hub provided with the mortises, the transverse bars or wedges driven through said mortises, and the continuous wooden wedges inserted between said hub and tire, substantially as set forth.

4. In an ore-crusher, the combination, with the circular bed or trough, of the crushing-rolls having openings or sockets to receive detachable weights to compensate for wear of the tires, as set forth.

5. In an ore-crusher, the combination of the wearing-plates formed to fit the periphery of the rolls and provided with the downwardly-projecting central ribs, and the bed formed to receive said wearing-plates and provided with a groove to receive the ribs thereof, as set forth.

6. In an ore-crusher, the combination of the bed having the central depression or offset and the groove formed in said offset, the wearing-plates having ribs formed to enter said groove, and transverse keys driven through said offset, groove, and ribs, as set forth.

7. The combination of the circular bed or trough, the crushing-rolls formed to fit the same, the central driving-shaft, and the axles for said rolls, adjustable vertically and laterally, substantially as and for the purpose set forth.

8. The combination of the circular bed or trough, the crushing-rolls formed to fit the same, the arms *v*, having slots formed therein, the boxes secured on said arms, and the clips passed over said boxes and having their ends extending through said slots, substantially as set forth, whereby the rolls may be adjusted to give their forward portions an inward inclination, as set forth.

9. The combination of the bed, the rolls, the arms *v*, and the laterally-adjustable boxes on said arms for the axles of the rolls, whereby the rolls may be adjusted to give their forward portions an inward inclination, as set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 25th day of January, A. D. 1888.

JOHN FRANKLIN WISWELL.

Witnesses:
C. F. BROWN,
A. D. HARRISON.