

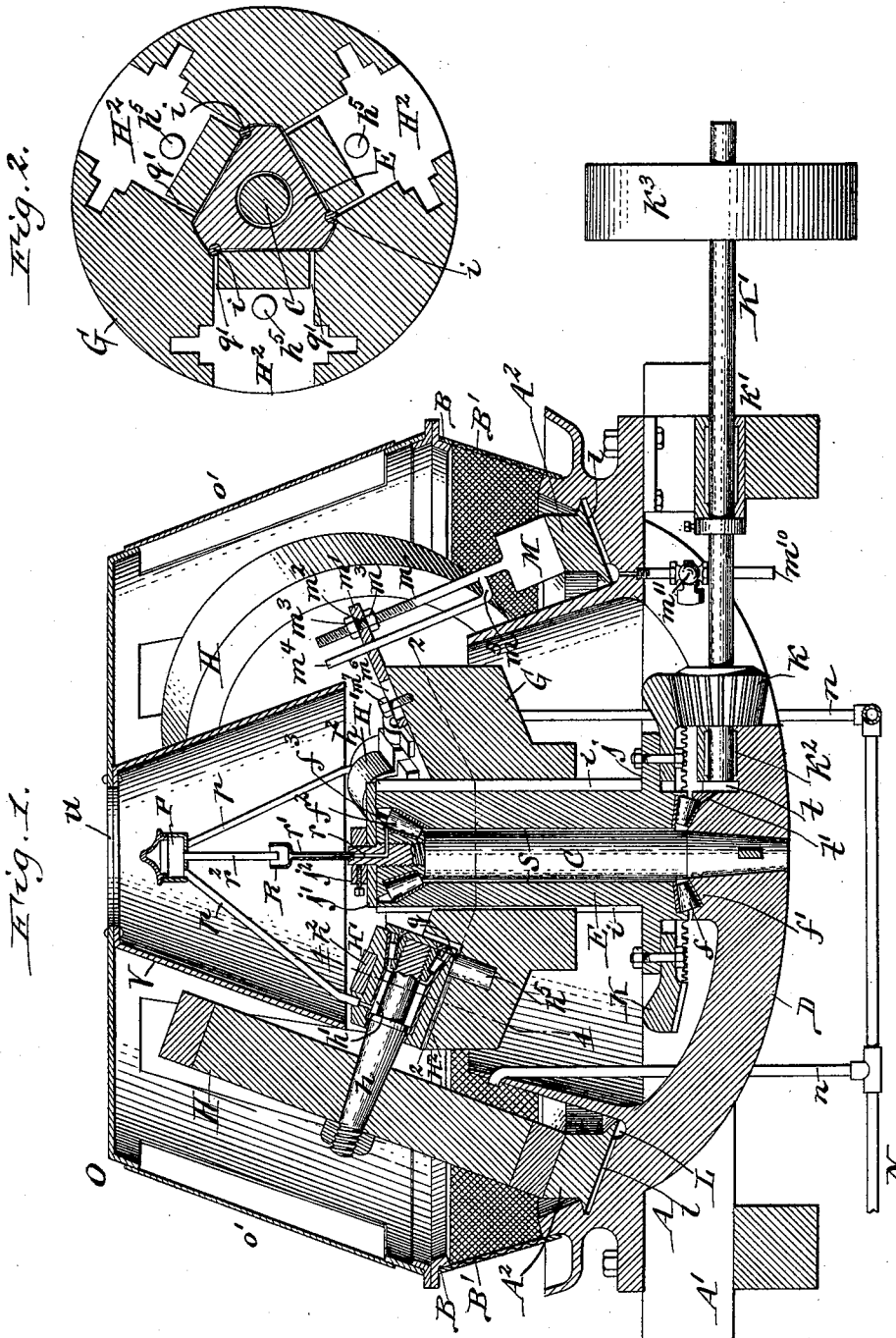
(No Model.)

3 Sheets—Sheet 1.

J. P. HANSON.
ORE CRUSHER.

No. 583,619.

Patented June 1, 1897.



Witnesses:
Emest P. Palsford.
Theo. L. Popp.

John P. Hanson Inventor
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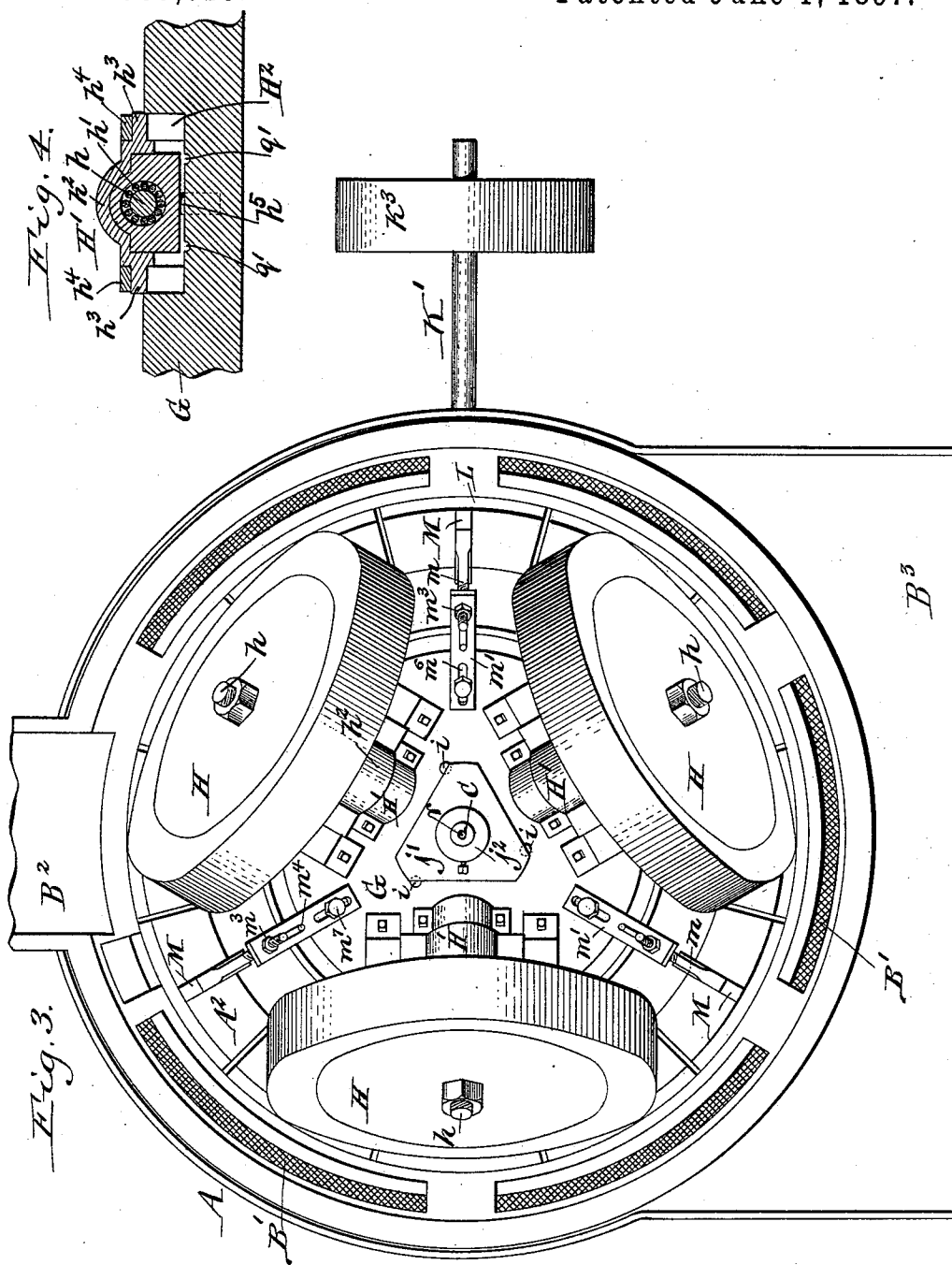
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3 Sheets—Sheet 2.

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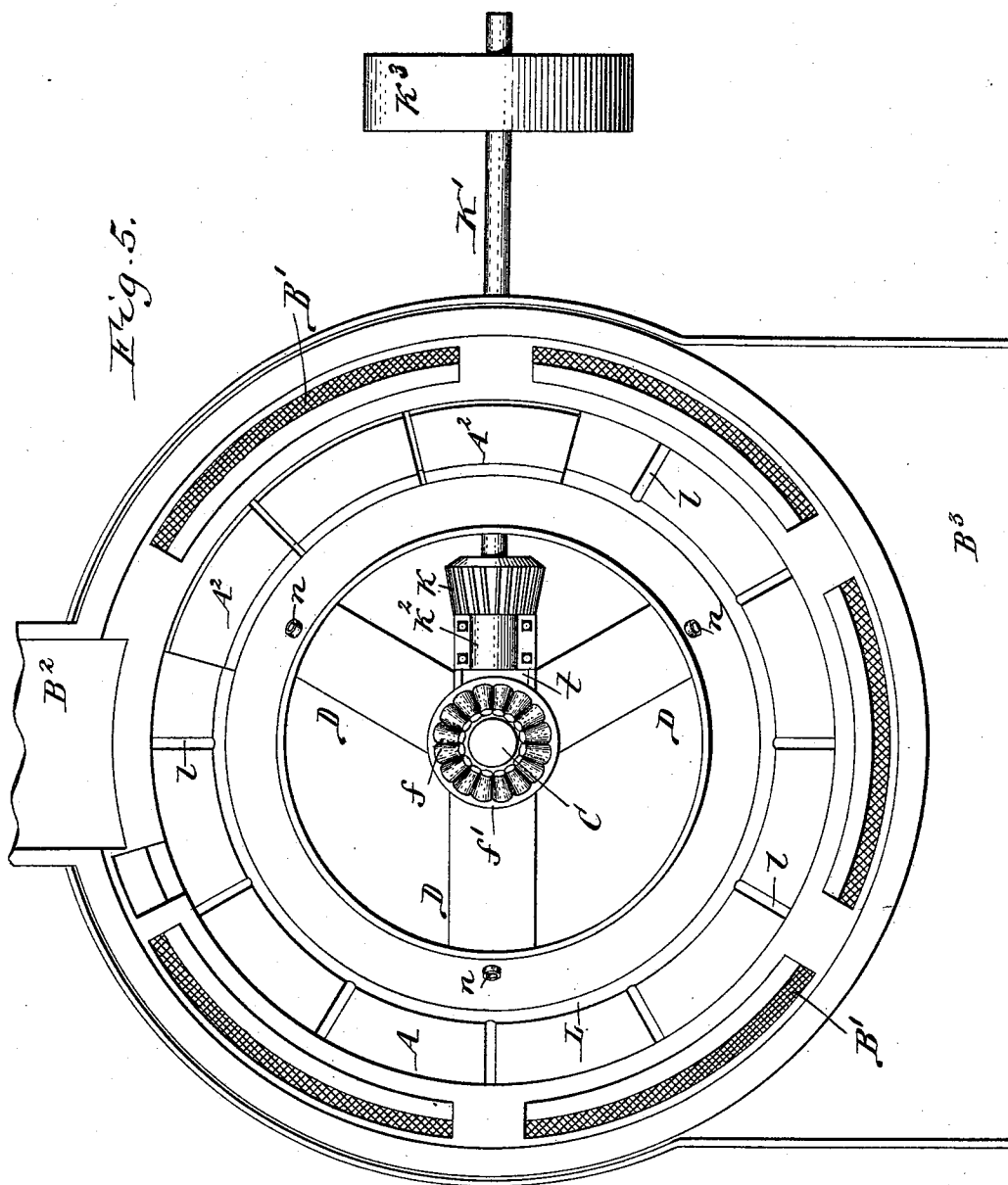
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3 Sheets—Sheet 3.

J. P. HANSON.
ORE CRUSHER.

No. 583,619.

Patented June 1, 1897.



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UNITED STATES PATENT OFFICE.

JOHN P. HANSON, OF BUTTE, MONTANA, ASSIGNOR OF ONE-HALF TO ABRAM T. KERR, OF BUFFALO, NEW YORK, AND JAMES H. KERR, OF HELENA, MONTANA.

ORE-CRUSHER.

SPECIFICATION forming part of Letters Patent No. 583,619, dated June 1, 1897.

Application filed July 27, 1896. Serial No. 600,618. (No model.)

To all whom it may concern:

Be it known that I, JOHN P. HANSON, a subject of the King of Sweden and Norway, residing at Butte, in the county of Silver Bow and State of Montana, have invented a new and useful Improvement in Ore-Crushers, of which the following is a specification.

This invention relates to the general class of ore-crushers commonly known as "Chilian mills," and more particularly to a combined ore crusher and amalgamator which is especially adapted to free milling and the reduction of semirefractory ores. The invention has more especial reference to mills of this class in which the rollers are arranged in an inclined position and run upon a bed sloping toward the axis of the machine, so that the pressure resulting from centrifugal force is utilized in addition to that exerted by the weight of the rollers.

My invention has for its objects to increase the strength of the head or driver which carries the crushing-rollers and to relieve the same from the wear resulting from its vertical movement; to render each crushing-roller vertically movable independently of the other rollers, so that it can yield to unusually hard substances without affecting the remaining rollers, and at the same time to hold the rollers in contact with the dies or annular bed of the frame, so as to prevent bounding of the rollers in passing over such obstructions, and also to so construct the dies and so support the crushing-rollers that the contiguous surfaces of the dies and rollers are worn at a uniform angle.

Another object of my invention is to provide the machine with means whereby the mercury employed for gathering or amalgamating the liberated metal is prevented from entering between the crushing-rollers and the dies, so as to avoid "flouring" of the amalgam and the objections resulting therefrom.

Additional objects of the invention are to improve the construction of the scrapers which distribute and discharge the material, and to provide the machine with efficient lubricating means whereby oil is conveniently supplied to the various bearings, but at the same time excluded from the ore in the pan.

In the accompanying drawings, consisting

of three sheets, Figure 1 is a sectional elevation of my improved ore-crusher. Fig. 2 is a horizontal section thereof in line 2 2, Fig. 1. Fig. 3 is a top plan view of the same with the casing and a portion of the lubricating devices removed. Fig. 4 is a transverse section of the bearing of one of the crushing-rollers in line 4 4, Fig. 1. Fig. 5 is a top plan view of the machine with the casing, the crushing-rollers, the driving-head, and a number of the dies removed to expose the mercury-grooves of the pan.

Like letters of reference refer to like parts in the several figures.

A is the pan or trough of the machine, supported upon timbers A'; A², the hardened dies or sectional steel bed forming the bottom of the pan; B, the usual annular rim or screen-frame surrounding the pan, and B' the screens arranged in said frame in a well-known manner.

B² is the usual feed-spout, arranged on one side of the machine, and B³ the discharge-spout, arranged on the opposite side thereof, as shown in Figs. 3 and 5.

C is a stationary vertical shaft or arbor arranged axially in the machine and secured at its lower end to a spider or bridge-tree D, preferably cast in one piece with the pan.

E is an upright rotary hub surrounding the arbor C and preferably provided with tapering roller-bearings to reduce friction. In the construction shown in the drawings a lower annular row of tapering rollers *f* is interposed between the lower end of the hub and the opposing upper end of a cylindrical boss *f'* of the spider D, and an upper row of tapering rollers *f*² is arranged in a conical recess in the upper end of the hub between the wall of said recess and a grooved conical collar *f*³, applied to the reduced upper end of the arbor C.

G is a head or driver which is mounted on the rotary hub E, so as to turn therewith, and which carries the crushing-rollers H, so as to cause the latter to revolve about the arbor C and traverse the pan. This driver, while compelled to rotate with the hub E, is free to slide vertically thereon to permit the rollers to descend as they become worn. For this purpose the driver is preferably made

three-sided and connected with the hub by means of removable upright pins or keys i , each of which is arranged partly in a recess formed in the bore of the driver and partly in a recess formed in the surface of the hub, as shown in Figs. 1 and 2. These pins rest at their lower ends upon a flange j , formed at the lower end of the hub, and are confined in place by a cap or plate j' , applied to the contracted upper end of the arbor C and overlapping the upper ends of the pins. The cap j' is secured in place by a collar j^2 , having a set-screw. The pins or keys i receive the wear due to the driving strain between the rotary hub E and the driver G and when worn out can be renewed at small cost, thereby relieving the hub and driver from such wear and avoiding the necessity of renewing these parts, which would involve considerable expense. The pins are readily withdrawn upon removing the collar j^2 and cap j' . This cap is as small as or smaller than the upper end of the hub, so that the driver may be lifted off the hub for cleaning the mill or for other purposes without removing the cap.

K is a gear-rim secured to or formed integrally with the flange j of the hub, and K' is the main driving-shaft of the machine, arranged horizontally underneath the pan and having a pinion k , which meshes with the gear-rim K. The driving-shaft K' is supported in bearings k' k^2 and is provided with a driving-pulley k^3 . By mounting the driver G upon a separate rotary hub, instead of securing the same directly to an upright driving-shaft, a stronger construction is obtained, which effectually withstands the great strains to which it is subjected.

Each of the crushing-rollers is rigidly secured to a shaft or axle h , preferably inclined toward the arbor C and journaled in a bearing-box H', carried by the rotary driver G, rollers h' being preferably arranged between the shaft of the roller and the bearing-box, as shown, to reduce friction to a minimum. In order to allow the crushing-rollers to oscillate vertically on the driver to enable them to rise and ride over unusually hard obstructions, the bearing of each roller is embraced by a transverse yoke h^2 , having horizontal trunnions h^3 , which turn in bearings h^4 , secured to the upper side of the driver on opposite sides of the main bearing-box H', as shown in Figs. 3 and 4. These main bearing-boxes are seated in recesses H², formed in the driver, as shown in Fig. 4.

Under each bearing-box H' and on the inner side of its trunnions h^3 is arranged a spring h^5 , preferably consisting of a rubber block, which projects above the bottom of the recess in which the box is seated and which constantly tends to swing the inner end of the box upwardly, thereby depressing its front portion and the roller-shaft mounted therein and at all times holding the roller in yielding contact with the pan-dies or the ore lying upon the dies. The springs h^5 , while

allowing the crushing-rollers to rise independently of one another, always tend to force the same downward, thereby preventing the rollers from bounding or leaving the dies and avoiding the consequent loss in the crushing capacity of the machine.

The upper or working surface of the dies A² is inclined inwardly or toward the axis of the machine, and the periphery of the crushing-rollers is parallel with their axis and as wide as the dies and so that the inclined rollers run squarely upon the inclined face of the dies. The inner and outer edges of the dies are perpendicular or parallel with the vertical arbor C of the machine, as shown in Fig. 1. This construction of the dies, in conjunction with the vertically-sliding capacity of the driver G and the oscillatory feature of the crushing-rollers, causes the contiguous faces of the rollers and dies to wear at a uniform angle and without forming recesses or flanges on the parts, this uniform wear being due to the above-described construction of the dies and the fact that the vertically-sliding driver and the vertically-swinging rollers maintain the same relative positions at all elevations of the rollers.

L is a groove or gutter arranged in the bottom of the pan or trough A, preferably at the inner edge of the annular steel bed formed by the dies A², and extending entirely around the pan. This annular groove is adapted to contain mercury and to receive the particles of gold or other metal which are liberated from the ore. The pan is preferably provided in its bottom, underneath the dies, with radial grooves or conduits l , which lead from the outer wall of the pan to the mercury-groove L and conduct any metal falling over the outer edges of the dies into the mercury-groove. From this groove the amalgamated metal is drawn from time to time by a drain-pipe m^{10} , having a valve m^{11} .

M represents the scrapers and conveyers which traverse the dies A² for distributing the material over the same and discharging it therefrom. Each of these scrapers consists of a blade or shovel having an upwardly-extending shank or screw-stem m , which is carried by an arm m' , secured to the driver G and overhanging the pan. The screw-stem of the scraper passes through a smooth or unthreaded opening m^2 of the carrying-arm m' and is firmly secured against vertical displacement therein by clamping-nuts m^3 , applied to said screw-stem and bearing against opposite sides of the arm, as shown in Fig. 1. The stem of each scraper is provided on one side thereof with a stop-rod m^4 , arranged parallel therewith and passing loosely through an opening formed in the carrying-arm m' , the stop-rod being connected at its lower end with the scraper-stem by an angular portion m^5 . This stop-rod prevents the scraper from twisting on the carrying-arm, and at the same time permits the stem of the scraper to be adjusted vertically in the arm for raising or low-

ering the scraper in accordance with the position of the crushing-rollers. This adjustment is effected by screwing one of the nuts m^3 upward and the other downward, according to the direction in which the scraper is to be adjusted.

In order to permit the scraper to be adjusted at a greater or less angle, as well as inwardly and outwardly, the carrying-arm is provided with a longitudinal slot m^6 , through which a set-screw m^7 passes. Upon loosening this set-screw the arm can be adjusted at any angle to the radial lines of the pan or shifted inward or outward, as may be desired. By attaching the scraper to its support in the above-described manner the same is not liable to loosen and descend in such close contact with the dies as to be broken off by striking the meeting edges thereof.

N represents the main water-supply pipe, and n the usual branches leading from said pipe to the pan or trough A .

O represents the usual casing surmounting the screen-frame B and preferably provided with doors o .

P is an oil-reservoir from which the various moving parts of the machine are supplied and which is supported centrally in the casing directly over the arbor C by downwardly-diverging oil-pipes p , leading from the bottom of the oil-reservoir to the bearing-boxes H' of the three crushing-rollers, respectively. These pipes enter the upper sides of the inclined bearing-boxes at their outer elevated ends, so that the incoming oil flows from the outer toward the inner end of each bearing, and thus traverses all parts thereof. Each of these boxes is provided at its inner end on its lower side with outlet-passages q , through which the oil escapes into the recess H^2 , in which the box is seated.

q' represents descending oil-passages which extend radially from the inner corners of the recess H^2 to the bore of the driver G , as shown in Figs. 1 and 2, and through which the oil flows from said recess into the space between the driver and the hub E and into the recesses in which the pins or keys i are seated, thereby lubricating the vertically-sliding driver. The oil then flows down the surface of the hub and drips upon the ground or into a suitable receptacle.

r is an oil-passage leading downwardly from the upper end of the arbor C and thence laterally to the periphery thereof, whereby the oil introduced into said passage is conducted to the upper roller-bearing of the hub E . The passage r is supplied by an upright pipe r' from a stationary oil-cup R , which latter is in turn supplied from the main oil-reservoir P by a depending pipe r^2 . The oil-cup R is supported at the upper end of the pipe r' .

The hub E is separated from the arbor C by an intervening annular space s , which forms a descending oil-passage through which the oil flows from the upper to the lower roller-bearing of the hub.

t is an oil bath or chamber arranged at the inner end of the inner bearing k^2 of the main driving-shaft K' , the inner end of the latter being submerged in this bath, so as to lubricate the adjacent bearing. Oil is supplied to this bath or chamber by a descending passage t' , leading from the outer end of the lower hub-bearing to said chamber.

By supporting the main oil-reservoir axially in the upper portion of the machine, the same, although rotated with the driver through its supporting-pipes, does not revolve in the casing, but simply rotates on its own axis, thus always remaining in the center of the machine, where it can be readily supplied through an opening u in the top of the casing O without requiring the machine to be stopped for this purpose.

V is an open-ended conical hood depending from the head of the casing O and inclosing the space above the driver G and inside of the crushing-rollers. This hood forms a guard which prevents a careless attendant from dropping oil into the pan or upon the rollers and incurring the loss of metal which results from the presence of oil in the pan, and it also prevents the pulp adhering to the periphery of the crushing-rollers from spattering the bearing-boxes of the rollers.

I claim as my invention—

1. The combination with the pan, of an upright stationary shaft or arbor secured centrally to the pan, a hub capable of turning on said arbor, but held against vertical movement thereon, means for rotating said hub, a driving-head capable of sliding vertically on said hub but held against turning thereon, and crushing-rollers running in said pan and journaled on said head, substantially as set forth.

2. In an ore-crusher having an annular pan and crushing-rollers running in said pan, the combination with an upright shaft supported centrally on the pan, a non-tapering hub journaled on said shaft, a roller-carrying head capable of sliding vertically on said hub and having a corresponding bore, and non-tapering pins or keys interposed between said hub and said head and interlocking with both of said parts, substantially as set forth.

3. In an ore-crusher having an annular pan and crushing-rollers running in said pan, the combination with an upright shaft supported centrally on the pan, a non-tapering hub journaled on said shaft, a roller-carrying head capable of sliding vertically on said hub and having a corresponding bore, non-tapering pins or keys interposed between said hub and said head and interlocking with both of said parts, a retaining-cap applied to the upper portion of said shaft and overlapping the upper ends of said pins or keys but constructed of smaller dimensions than the bore of said driving-head whereby the head can be removed from said hub without disturbing said cap and keys, substantially as set forth.

4. The combination with the pan having a

bed or annular series of dies provided with vertical inner and outer edges and an inclined upper surface which slopes toward the axis of the pan and extends from the outer to the inner edge of the dies, of a rotary driving head or carrier capable of moving freely up and down, crushing-rollers having their periphery arranged parallel with their axis and running upon the sloping faces of said dies, and shafts carrying said rollers and capable of oscillating vertically on said head or carrier, substantially as set forth.

5. The combination with the pan and the crushing-rollers, of an upright rotary hub, a driving-head arranged to slide vertically on said hub and carrying bearing-boxes in which the shafts of the crushing-rollers are journaled, each of said bearing-boxes being provided at its outer end with an oil-inlet and at its inner end with an oil-outlet and oil-passages arranged in said driving-head and leading from said oil-outlets to the bore of said driving-head, substantially as set forth.

6. The combination with the pan and the crushing-rollers of an upright stationary shaft or arbor supported centrally on the pan and a hub surrounding said arbor, having bearings at its upper and lower ends and sepa-

rated from the arbor by an intervening oil-passage which connects said upper and lower bearings, said arbor having an oil-passage leading from the upper end thereof to said upper bearing, substantially as set forth.

7. The combination with the pan and the crushing-rollers, of an upright stationary shaft or arbor supported centrally on the pan, a hub surrounding said arbor, having bearings at its upper and lower ends and separated from the arbor by an intervening oil-passage which connects said upper and lower bearings, a stationary oil-cup connected with said upper bearing, a driving-head mounted on said hub and carrying bearing-boxes in which the shafts of said crushing-rollers are journaled, and an oil-reservoir arranged axially above said arbor and supported by oil-pipes leading to the several bearing-boxes and having a discharge-pipe leading to said stationary oil-cup, substantially as set forth.

Witness my hand this 16th day of July, 1896.

JOHN P. HANSON.

Witnesses:

CARL F. GEYER,
KATHRYN ELMORE.