L. C. TRENT.

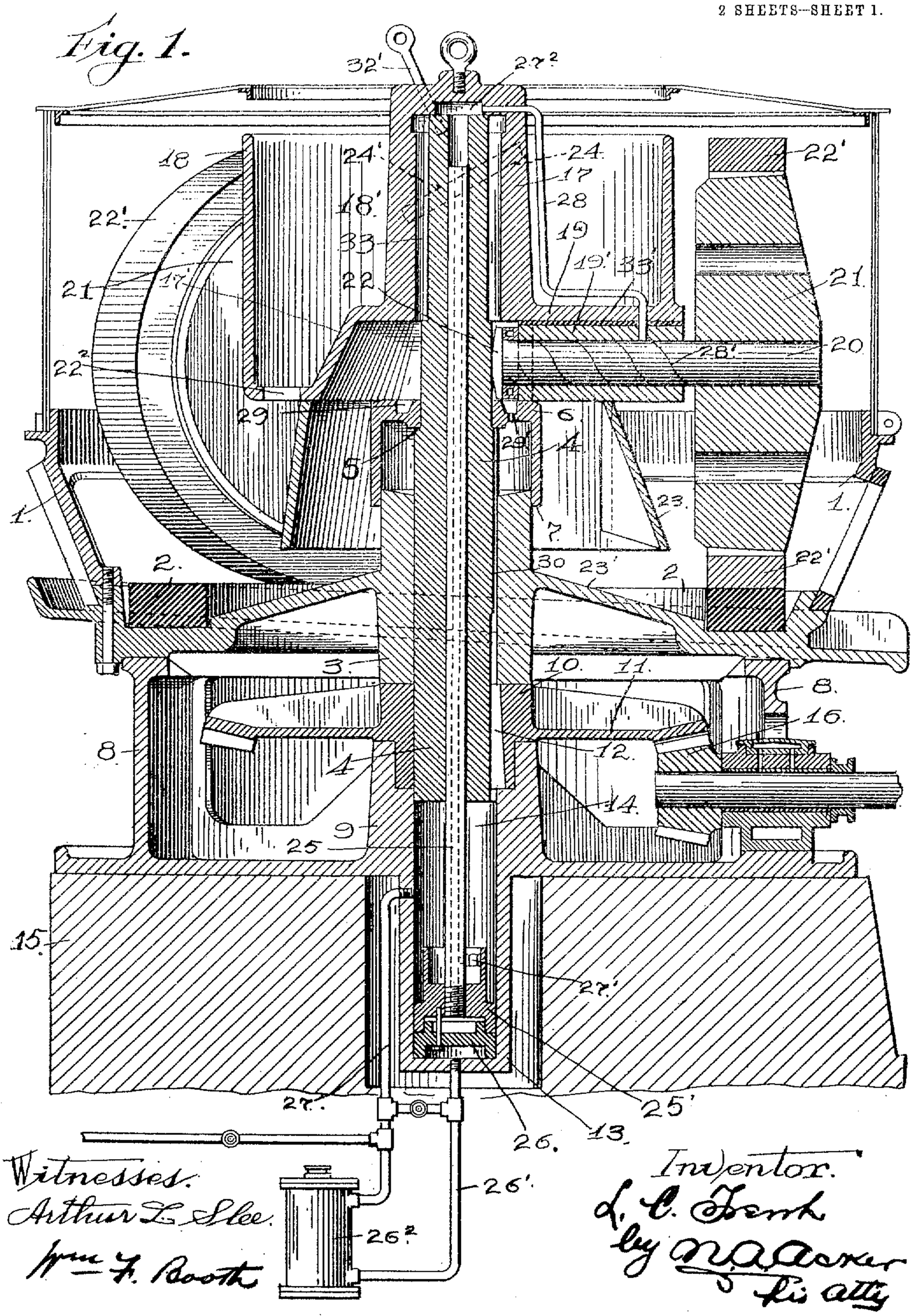
ROLLER ORE CRUSHER.

APPLICATION FILED OCT. 25, 1909.

986,608. **Patented Mar. 14, 1911.**

2 SHEETS—SHEET 1.

Fig. 1.



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2 SHEETS—SHEET 2.

Fig. 2.

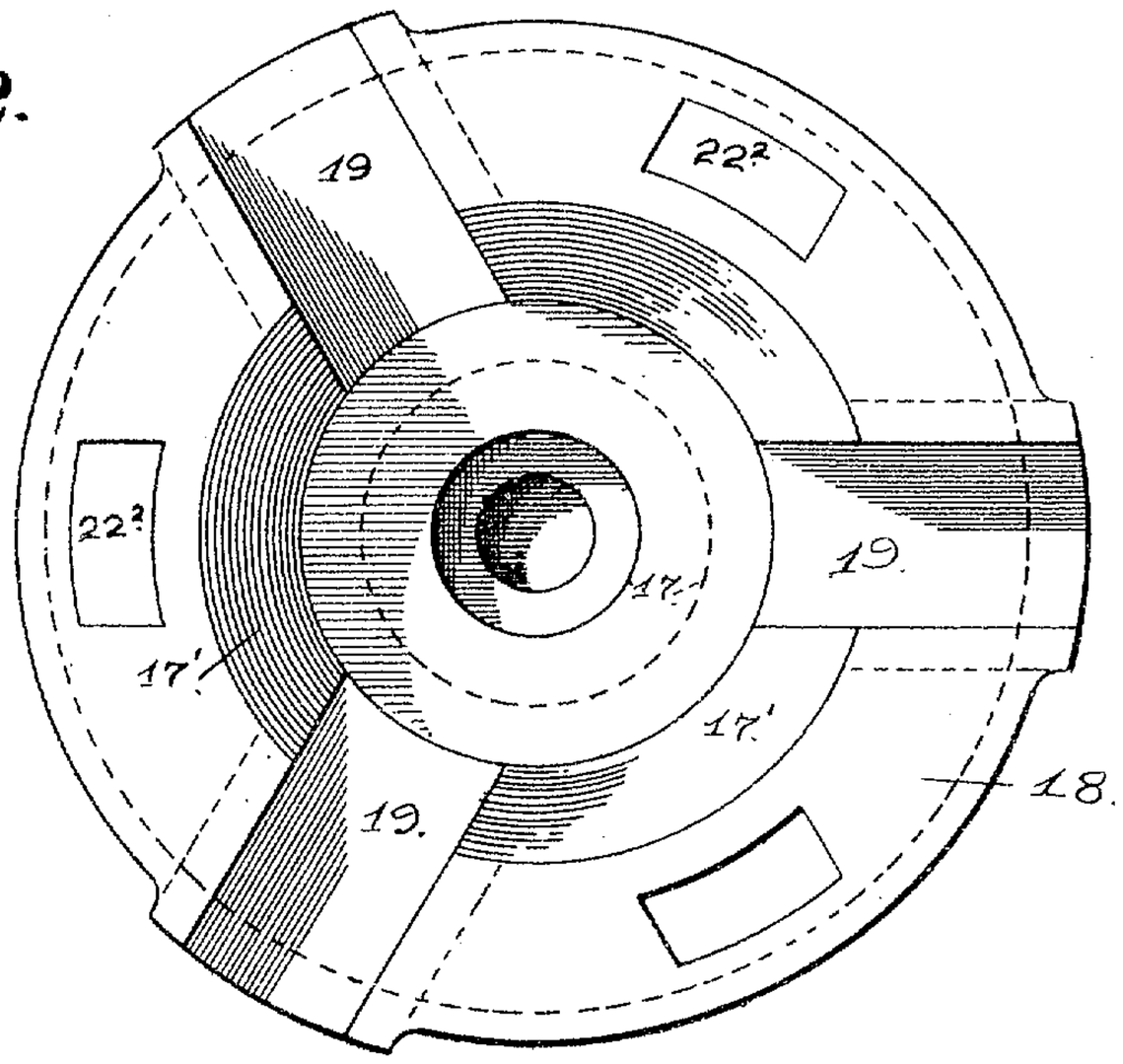
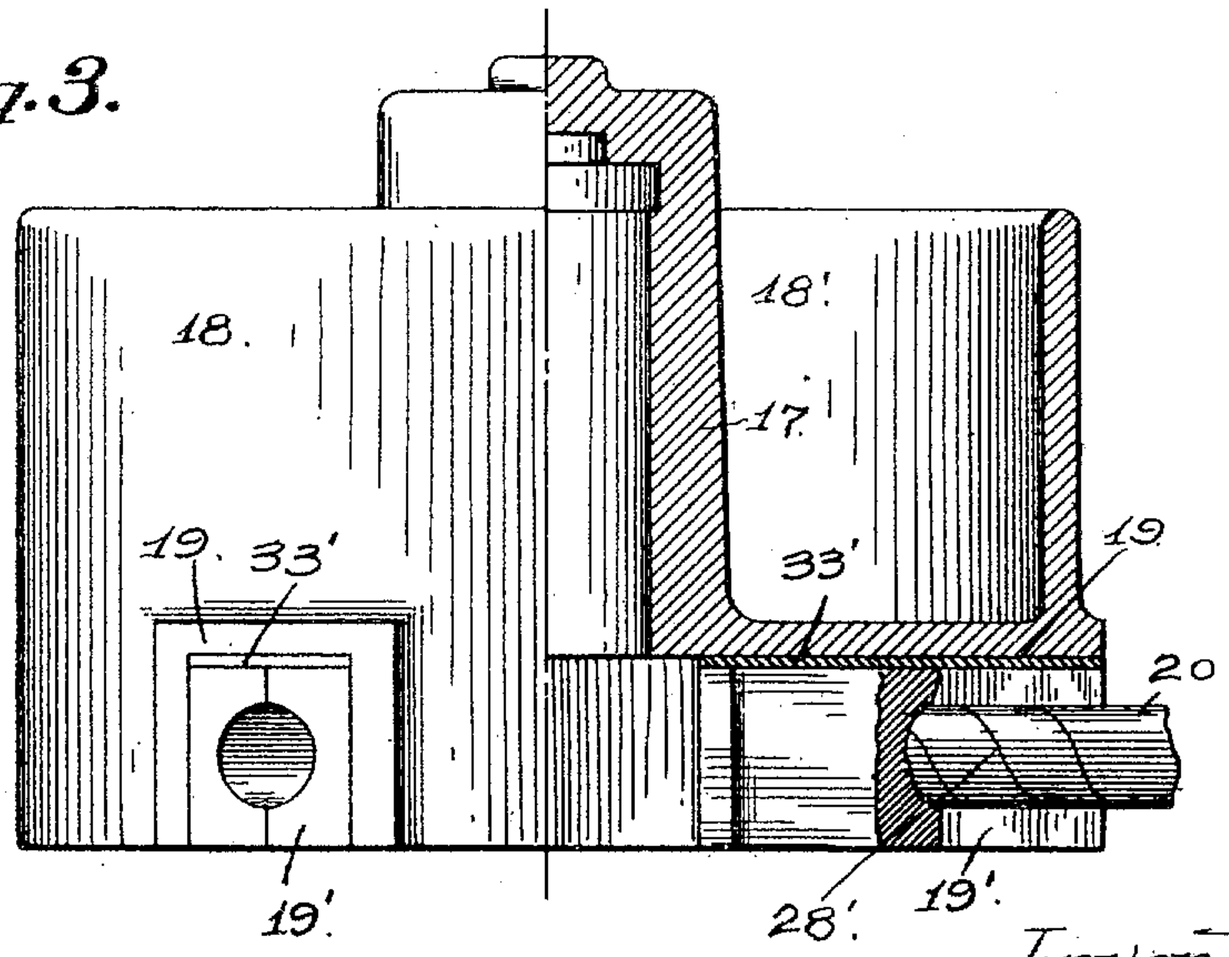


Fig. 3.



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UNITED STATES PATENT OFFICE.

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ROLLER ORE-CRUSHER.

986,608. Specification of Letters Patent. Patented Mar. 14, 1911.

Application filed October 25, 1909. Serial No. 524,572.

To all whom it may concern:

Be it known that I, LAMARTINE C. TRENT, a citizen of the United States, residing at Reno, in the county of Storey and State of Nevada, have invented certain new and useful Improvements in Roller Ore-Crushers, of which the following is a specification.

The hereinafter described invention relates to roller ore crushers of that type known as edge runner, commonly termed "Chilian" mills, for crushing or pulverizing ore and stone, and the improvements reside principally in the manner of mounting the rollers so as to maintain the face of the wearing rim thereof parallel to the surface of the die ring throughout the crushing action of the rollers, in the drive-head, for imparting rotary travel to the crushing rollers, in the means for actuating the drive head, and the mechanism for disconnecting the drive head from engagement with the journal boxes of the crushing rollers; although the invention additionally comprises certain details in construction which shall hereinafter be specifically referred to.

The objects to be attained by the invention are to increase the efficiency and working capacity of roller ore crushers, to simplify the construction thereof, to reduce the working parts to a minimum, to increase the crushing force of the rollers by placing thereon the added weight of the driving mechanism, to maintain the crushing face of the rollers and the die ring in parallelism during the crushing action of the rollers so as to provide against angular wear of the parts, and to dispense with the trunnion connection usually employed between the roller axles and the driving means.

To comprehend the invention, reference should be had to the accompanying sheets of drawings wherein—

Figure 1 is a vertical sectional view of the roller crusher, disclosing the drive shaft locked to the drive head. Fig. 2 is a bottom plan view of the drive head, with the scraper blades removed. Fig. 3 is a broken detail view in elevation of the drive head, illustrating one of the journal boxes for the roller axles mounted within its seat in the drive head.

In the present case the roller crusher is illustrated in connection with what is known as under drive mechanism, but it is immaterial whether an over-head or under-head drive be utilized, preference only being given to the under-drive by reason of the compactness which is thereby afforded the machine.

In the drawings, the numeral 1 is used to designate the mortar for the crushing mechanism, the same being provided with the usual die ring 2, and said mortar is formed with a central guide bearing hub 3. Through this guide bearing hub extends and works the drive-shaft 4, which, a slight distance above the guide bearing hub, is formed with a circular shoulder 5, on which rests and is supported a bearing collar 6, the said bearing collar being shrunk tight onto the drive shaft 4. This bearing collar 6 is formed with a downwardly extended circular wall 7, which fits over and incloses the upper end portion of the guide bearing hub 3, and serves as a guard to prevent the grit or splash from within the mortar entering between the guide bearing hub and the drive shaft, which would doubtless occur in case the upper end of the guide bearing hub be left exposed.

The mortar 1 rests on any suitable supporting frame or base 8, which is provided with a central guide bearing 9 for the lower end portion of the drive shaft 4, which shaft extends through and is slidably connected to the hub 10 of the drive gear 11 by means of a feather or key 12, the said hub 10 being seated for rotation within a step bearing in the upper end portion of the guide bearing 9. This guide bearing 9 terminates in a downwardly extended tubular extension or section 13, which forms a well or chamber 14, the purpose of which will be hereinafter described. The said tubular extension or section 13 is illustrated seated within a sub-base 15.

The drive-gear 11 is held to its seat by means of the bearing guide 3, which rests thereon, and rotation is imparted to the said gear for rotating the drive-shaft 4 by means of an intermeshing pinion 16, driven in any suitable manner.

Onto the upper end portion of the drive-shaft 4 is feathered the drive-head or turret 17, the base plate 17′ of which head terminates in an outer upwardly extended circular wall 18, so as to provide an ore receiving chamber or hopper 18′. This drive head or turret is provided on its under face with a series of open saddle seats 19, into which,

when the said head is in position, loosely fit the journal boxes 19′ for the axles 20 of the crushing rollers 21, the axles being prevented from moving outwardly from within the said journal boxes 19′ by means of the enlarged flange 22 secured to the inner end thereof.

The inner end of the journal boxes 19′ rest or bear on the collar 6 and are held thereon by the weight of the drive head 17 and its associated parts, which act to hold the crushing rollers 21 against upward movement, so as to place onto the ore to be crushed not only the weight of the said rollers, but additionally the weight of the drive head and its associated parts, including the weight of the ore within the hopper 18′. In fact, the crusher rollers, inasmuch as the axles thereof are not secured to the journal boxes by means of a trunnioned connection, are held against a swinging action, so that the wear rim 22′ of each roller is maintained in horizontal alinement with the crushing face of the die ring 2, thus providing against the angular wear which usually occurs on the die ring and wear rim 22′ of the crushing rollers and lessens materially the life and usefulness of such parts. Under the described connection between the crushing rollers and the drive means, the same being a flexible or loose one, as either of the rollers tend to swing or give while passing over material too hard to be crushed by the weight thereof, the strain produced is brought or thrown by means of its journal box 19′ onto the collar 6, with the result that a vertical or lifting strain is placed onto the drive head, causing the same to lift slightly with the upward movement of the crushing roller, the drive head thus giving to the strains placed thereon and the crushing roller and drive head rising vertically. The crushing rollers, are thus held under compression, and before giving to the resistance offered by the material to be crushed, it is necessary that the material be of such a character as to overcome the combined weight of the crushing roller and the drive head and associated parts, which added weight will serve to break and pulverize material which could not successfully be broken by the mere weight of the crushing roller, more especially of a roller which is permitted a swinging action to give under the influence of the ore or material acted on.

The ore hopper 18′, formed by the circular wall 18 of the drive head 17, is formed with one or more outlets 22^2 for the discharge of the ore into the mortar 1, which ore falls onto the inclined outwardly curved deflector plates 23, carried by the drive head. These plates not only serve the purpose of guiding the falling ore toward the periphery of the crushing rollers, but likewise as scrapers for sweeping the material accumulating on the inclined bottom 23′ of the mortar onto the die ring 2, to place the same within the path of the traveling crushing rollers 19′.

The drive shaft 4 is suspended from the drive head 17, so as to add thereto the weight of the said shaft, by means of the securing pin or key-bolt 24, which is inserted through the drive-head and an incline opening 24′ in the shaft 4. Inasmuch as the drive shaft is suspended from the drive-head, not only is the weight of the said drive-head placed onto and distributed between the crushing rollers, but likewise that of the drive shaft, thus materially augmenting the crushing weight of the rollers. It will be noticed that the drive shaft is supported by the drive-head, which head in turn is supported by the crushing rollers, through the medium of the journal boxes for the axles thereof.

The drive shaft 4 is bored throughout the entire length thereof to receive a small tubular rod 25, connected to a trunk piston 25′, seated on a piston ram 26, which normally rests on the bottom of the chamber 14, of the bearing extension 13. The object of this inner rod 25 is to raise the drive head 17 so as to clear the journal boxes 19′ of the crushing rollers, to release the same for repair purposes. This rod 25 is raised by fluid forced into the well or chamber 14 below the piston ram 26, the fluid or oil being forced therein through the pipe connection 26′, by means of a small hand pump 26^2.

Oil or fluid is admitted into the well or chamber 14 above the trunk piston 25′, through the valved connection 27, which oil serves as a lubricant for the working parts of the crushing apparatus. Throughout the entire working of the machine there is a continuous vibration imparted to the drive-shaft 4, which acting onto the body of oil within the well 14, displaces a small quantity thereof by forcing the same through the valved opening 27′ in the lower end of the rod 25, the pumping action so produced causing the displaced oil to gradually work upwardly through the tubular rod 25 into the oil reservoir 27^2 within the drive-head 17, from whence it flows through the small distributing pipes 28 and is delivered thereby to and into the outer end of the journal boxes 19′, and falls into the spiral groove 28′ cut in the roller shafts 20. The oil thus admitted for the lubrication of the roller shafts is conveyed by the spiral groove 28′ back to a groove 29 in the face of the collar 6, and flows therefrom through an outlet opening 29′ onto the inwardly inclined face of the upper end of the guide bearing hub 3, which directs the oil into the vertical channel 30, cut in the outer face of the drive shaft 4. By means of this channel or oil passage 30 in the drive shaft, the displaced oil used for lubricating the roller axles and the bearing of the drive shaft is returned to

the well or chamber 14. The oil is thus employed for automatically lubricating the bearings of the described rotating members, and waste of the same being provided against by the continuous circulation maintained.

When it is desired to raise the drive-head to release the crushing rollers for any given purpose, oil is forced into the well or chamber 14 beneath the piston ram 26, the oil being preferably withdrawn from within the chamber above the trunk piston at such time, which may be done by any suitable form of valved controlled pipe connection, the flow of oil being regulated by the hand pump 26^2, which forces the oil as withdrawn from above the trunk piston into the well or chamber 14 beneath the piston ram 26, causing the same to move upwardly therein and raising the tubular rod 26 within the drive shaft 6. The said shaft having been previously disconnected from the drive-head by the withdrawal of the locking pin or bolt 24, it is obvious that as the upper end of the rod 15 strikes against the end of the drive-head 9, the rod continuing its upward movement, the said drive head is raised so as to lift the same from engagement with the journal boxes of the crushing rollers, thus freeing the said boxes and the crushing rollers. To lower the drive head, a reverse circulation is given to the fluid within the well or chamber 14, transposing the same from beneath the piston ram to above the trunk piston, which causes the downward movement of the rod 25 and the drive head 17, until the same is seated onto the journal boxes of the crushing rollers, when the drive shaft is connected or locked to the drive head by the insertion of the locking pin or bolt 24.

During the upward lifting of the drive-head to free the crushing rollers or rather the journal boxes thereof, it is required that the drive shaft be held against downward movement or slippage, and for this purpose, prior to the removal of the lock pin or bolt 24 to disconnect the drive-shaft from the drive-head, an eye-bolt 32′ is inserted through the top end of the drive-head and screwed into a threaded socket in the upper end of the drive-shaft, the said eye-bolt being of sufficient length to permit of the required upward movement of the drive-head. This eye-bolt is connected by a chain or cable to a suitable overhead structure, and with the drive-shaft thus supported the lock pin or bolt 24 is withdrawn to disengage the drive-head.

While fluid pressure is utilized for operating the lifting rod 25 to raise the drive-head 17, it is obvious that various devices may be employed for this purpose; hence it is not the intention to limit the actuation of the lift rod by fluid under pressure, although preference is given thereto.

So far as relates to the transmitting of rotation from the drive shaft to the drive head, the feather 33 is the locking connection between the said parts and receives the strains incident thereto, the pin or bolt 24 being merely for the purpose of holding the parts locked against vertical or end movement.

With the described roller or crusher, the weight of all the working parts, likewise the weight of the ore is brought to bear onto the crushing roller to increase the crushing force thereof, and the form of connection between the crushing rollers and the drive means is such that the wear on the rim of the rollers and the die ring is evenly distributed throughout the width thereof, and as a result the angle of the crushing faces do not change, which eliminates the necessity of adjustment for the crushing rollers to compensate for uneven or angular wear. This results from the fact that swinging movement of the crushing rollers is provided against, and the weight of all working elements are placed thereon to hold the wear face or rim thereof in horizontal position relative to the face of the die ring. Inasmuch as the angle of the crushing faces do not change, no adjusting of such faces relative to each other is necessary or required, with the result that the rollers may be run without adjustment until the wear rim thereof and the die ring become worn out. As the wear rim of the rollers and the die ring wear away, the rotating drive mechanism will gradually lower to compensate therefor; so that at no time will the rollers be thrown from their adjusted position.

To eliminate as far as possible the disastrous effect of the sudden and severe shocks which necessarily fall onto the drive head by the irregular strains of the crushing rollers, there is secured within each journal seat of the drive head an elastic cushion 33′, preferably of rubber, which first receives and gives to the shocks placed thereon and thereby relieves the drive head of the same to a great extent. Again, these cushions compensate for any irregularities in the casting and insures an even joint being made between the journal boxes and the journal sockets or seats in the drive head. The said elastic cushions are secured within the journal box seats in any well known manner.

By throwing the weight of the drive-head and its associated rotating parts, including the weight of the suspended drive-shaft onto the crushing rollers and holding the same against swinging movement, the gain in crushing force for the rollers is evident. It is obvious that where the rollers are held to the driving means by a trunnioned connection, that neither roller is capable of

crushing material which will not give under the influence of the initial weight thereof, for in such cases the rollers will simply lift over such obstructing material and this rising movement of the rollers does not increase the weight or crushing force thereof. However, by holding the crushing rollers against a swinging movement relative to their joint connections, the weight of the rollers in acting against said material is increased by the weight of the rotating drive means and associated parts, thus allowing of the apparatus acting successfully on material which the rollers cannot crush by their own weight.

Having thus described the invention what is claimed as new and desired to be protected by Letters Patent is—

1. In a roller ore crusher, the combination with the crushing rollers, of journal boxes for the axles thereof, a vertically movable drive head loosely seated on said boxes for throwing the weight thereof onto the crushing rollers, a drive-shaft on which the drive head is slidably mounted, means for actuating the drive shaft for imparting rotation to the drive-head and the rollers held thereby, and a bearing seat carried by the drive-shaft for the inner ends of the journal boxes.

2. In a roller ore crusher, the combination with the drive shaft of the crushing rollers, of journal boxes for the axles thereof, a vertically adjustable drive head provided in its under face with a series of open seats within which the journal boxes are loosely fitted, means on the drive shaft for sustaining the inner ends of the journal boxes so that the weight of the drive-head is distributed between the crushing rollers, and means for imparting rotation to the drive-head.

3. In a roller ore crusher, the combination with the drive shaft, of the crushing rollers held against swinging movement, a vertically movable drive-head slidably mounted on the drive shaft and loosely connected to the journals of the crushing rollers to distribute the weight thereof between the said rollers, a circular wall carried by the drive-head to form an ore hopper, ore outlets in the bottom wall of the drive-head, deflecting plates depending from the drive-head, and means for imparting rotation to the drive shaft to actuate the said drive-head for driving the crushing rollers.

4. In a roller ore crusher, the combination with the crushing rollers, of journal boxes for the axles thereof, an adjustable drive-head bearing directly onto the journal boxes and provided with a series of open or saddle seats in its under face in which said journal boxes are loosely held, a drive-shaft to which the drive head is slidably connected, means for imparting rotation to the said shaft to drive the crushing rollers through the medium of the drive-head, and a bearing for the inner end of the loosely held journal boxes.

5. In a roller ore crusher the combination with an adjustable drive shaft, of a drive head slidably mounted thereon for distributing its weight thereof between the crushing rollers, the same being provided on its under face with a series of open or saddle seats for loosely embracing the journal boxes of the crushing rollers, the said drive-head resting on the upper face of the journal boxes, and means for imparting rotation to the drive shaft.

6. In a roller ore crusher the combination with the drive shaft, of the crushing rollers, a vertically movable drive-head slidably mounted on the drive shaft and bearing onto the axles of the crushing rollers to distribute the weight thereof between the said crushing rollers, the said drive-head carrying a circular outer wall to form an ore hopper for the ore to be crushed, and in its bottom wall a series of open or saddle seats for loosely embracing the journal boxes of the crushing rollers.

7. In a roller ore crusher, the combination with the crushing rollers, of journal boxes for the axles thereof, a vertically movable drive-head provided on its under face with a series of open or saddle seats for loosely embracing the journal boxes on which the drive-head rests to throw the weight thereof onto the crushing rollers, a drive-shaft feathered to the drive-head, mechanism for imparting rotation to the said shaft to drive the crushing rollers through the medium of the drive-head, and means for adjusting said drive-head independent of the drive-shaft.

8. In a roller ore crusher, the combination with the crushing rollers, of journal boxes for the axles thereof, a drive shaft, a drive head slidably mounted thereon, a series of saddle seats in the under face of the drive head which loosely embrace the journal boxes of the crushing rollers, an elastic cushion interposed between the upper wall of each seat and the journal boxes, and means for imparting rotation to the drive shaft for operating the said drive-head to actuate the crushing rollers.

9. In a roller ore crusher, the combination with the crushing rollers, a fixed axle for each roller, journal boxes in which said axles are mounted, a spiral groove in each axle to receive a lubricant, a vertically movable drive-head provided with a series of saddle seats which loosely embrace the journal boxes, a drive-shaft feathered to the drive-head, an oil well into which extends the drive-shaft, a tubular adjusting rod for the drive-head extended through a central bore in the drive-shaft and serving as a conduit

for conveying oil into a reservoir formed in the drive-head, a bearing for the inner end of the journal boxes, means for conveying oil from the reservoir of the drive-head to the groove of the roller axles, and an oil passage-way in the drive-shaft for returning the oil passed through the journal boxes to the oil well.

10. In a roller ore crusher, the combination with the crushing rollers, of journal boxes for the axles thereof, a drive head mounted to distribute its weight between the crushing rollers, a series of saddle seats in the drive-head which loosely embrace the journal boxes, a drive-shaft feathered to the drive-head, mechanism for rotating the drive-shaft to operate the crushing rollers through the medium of the drive-head, an adjusting rod extended through a central bore in the drive-shaft for raising and lowering the drive-head, and means for imparting vertical movement to the said rod.

11. In a roller ore crusher, the combination with the crushing rollers, of a mortar provided with a die ring on which the rollers travel, journal boxes for the axles of the crushing rollers, a central bearing in the mortar through which extends a drive-shaft a drive-head feathered to the said drive-shaft, a series of saddle seats in the under face of the drive-head which loosely embrace the journal boxes of the crushing rollers, a bearing collar on the drive-shaft for the inner end of the journal boxes, a circular wall depending from said bearing collar to inclose the end of the bearing hub of the mortar, and means for imparting rotation to the drive-shaft and its associated parts.

12. In a crushing mill, a circular track, an upright floating driving shaft located centrally thereof, a drive head connected to said shaft and supporting the weight thereof, and rolls rotatably carried by said driving head.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

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Witnesses:

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