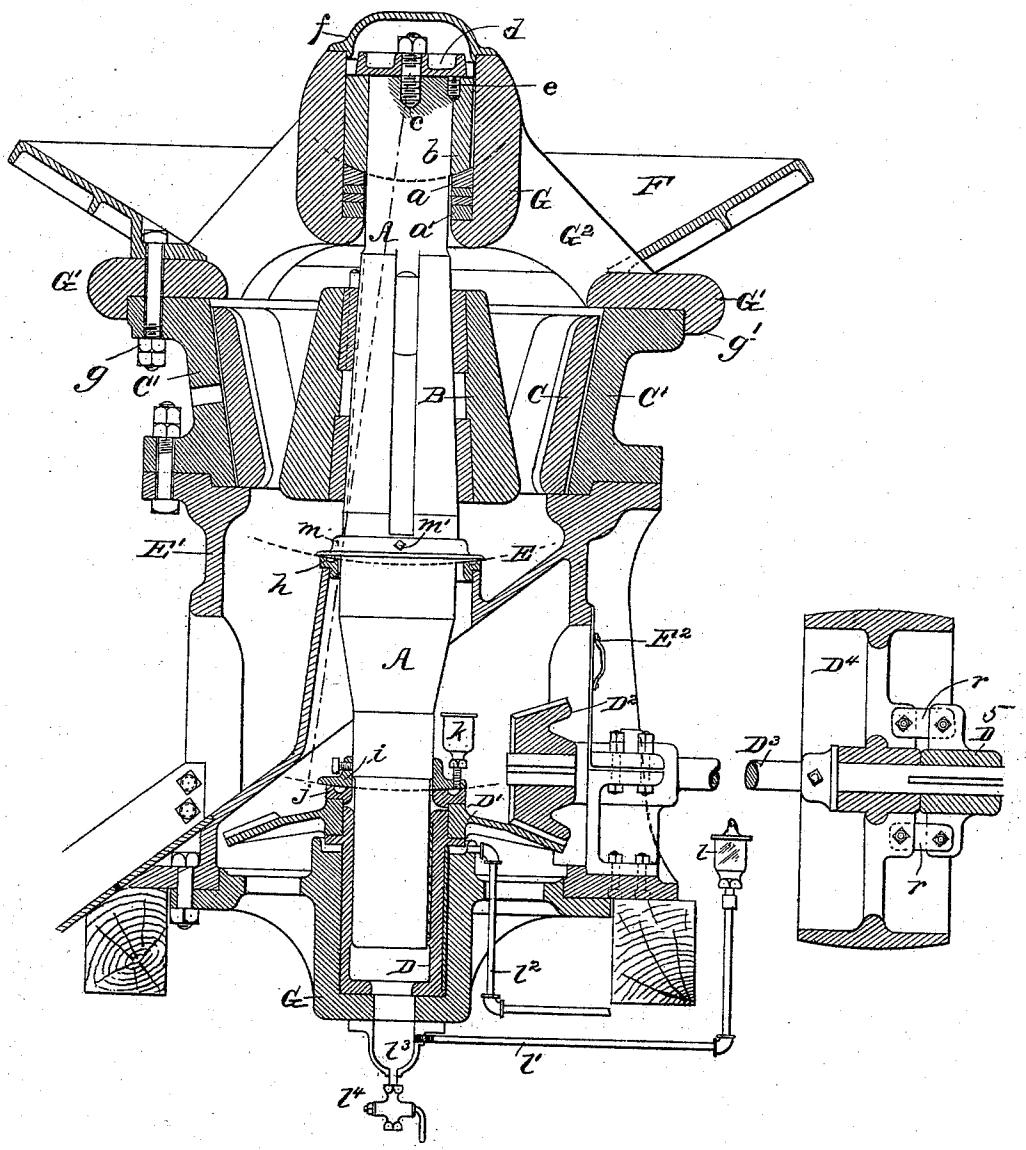
(No Model.)

S. C. McLANAHAN.

GYRATORY ROCK CRUSHER.

No. 535,716. Patented Mar. 12, 1895.



WITNESSES:

Fred G. Dieterich

Edw. E. Byrn.

INVENTOR

S. C. McLanahan.

BY Munn & Co

ATTORNEYS.

UNITED STATES PATENT OFFICE.

SAMUEL C. McLANAHAN, OF HOLLIDAYSBURG, PENNSYLVANIA.

GYRATORY ROCK-CRUSHER.

SPECIFICATION forming part of Letters Patent No. 535,716, dated March 12, 1895.

Application filed December 24, 1894. Serial No. 532,798. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL C. McLANAHAN, of Hollidaysburg, in the county of Blair and State of Pennsylvania, have invented a new and useful Improvement in Gyratory Rock-Crushers, of which the following is a specification.

My invention relates to gyratory rock crushers of that form in which a vertical shaft is suspended from a bearing at the top, and has below it a conical crushing hub operating in a crusher chamber, while at its lower end it is held in an eccentric bearing that is rotated by a bevel gear to give a gyratory motion to the lower end of the shaft and a corresponding motion of less degree to the conical hub in the crusher chamber above.

My invention comprises improved means for suspending the shaft, means for bracing and strengthening the crushing chamber at its upper edge, and means for closing the joints between the shaft and the stationary parts of the machine, as will be hereinafter more fully described with reference to the drawing, in which the figure is a vertical central section of the machine.

A represents the vertical shaft having special suspending devices at its upper end, and having just below its upper end a rigidly attached conical hub B working with a gyratory motion within the crusher chamber C C'. This shaft has its gyratory motion imparted to it at its lower end by having its lower end swiveled in an eccentric sleeve D to whose upper edge is rigidly attached a bevel gear wheel D' in mesh with and receiving motion from the bevel pinion D^2 on a horizontal shaft D^3 driven by a pulley D^4, so that when sleeve D is rotated by its driving gear the lower end of the shaft is carried around in a circle whose size depends upon the eccentricity of the sleeve D. As the lower end of the shaft has this gyratory motion, the conical crushing hub B above partakes of the same motion, only in a less degree, and its motion within the crusher chamber C causes it to crush the rock or ore which is fed into this chamber from the hopper F above, and after being crushed it slides down the inclined floor E formed in the middle section E' of the casing to a suitable point of deposit.

As so far described the machine does not differ materially from gyratory rock crushers heretofore constructed.

Above the crushing chamber there is an elevated frame carrying the bearing upon which is hung the upper end of the shaft. This frame is composed of a hub G having radial arms G^2, and flanged ring G' at their lower and outer extremities, all cast in one piece. This ring G' is secured by bolts *g* to the outer section C' of the crusher case and said ring has an overhanging flange *g'* that extends down outside of the upper edge of the crusher case C', which flange is intended to reinforce the upper edge of the crusher chamber against outward strain from the crushing of rock within, for it will be seen that this flange *g'* of ring G' makes a solid backing all around the upper edge of the crusher chamber that causes it to be reinforced by the full strength of the frame G G' G^2, instead of relying upon the bolts *g*. This makes a very strong and durable construction for the crusher chamber, and enables it to resist a much stronger breaking strain.

For supporting the upper end of the shaft A the hub G is bored out from its upper end with a cylindrical hole of uniform size extending nearly to the bottom, the opening from this point below being a smaller diameter to merely give passage to the shaft A and allow a slight lateral play. In the bottom of the larger diameter of the hub is placed a series of filling rings or washers *a'* to regulate the shaft as to vertical adjustment, and on top of them is placed an annular bearing *a* whose upper surface is the curve of a circle struck by a radius from the center of the upper end of the shaft. To the upper end of this shaft is rigidly and strongly secured a collar *b* whose lower edge conforms to the curve of the upper face of bearing *a* and rests thereupon. This collar is prevented from turning on the end of the shaft by a key or screw *e* fitting one half in the shaft, and one half in the collar, while a cap *d* is connected to the end of the shaft by a center screw bolt *c* and overlaps the upper edge of the said collar. The collar is by this means made detachable from the shaft, but is rigidly attached to it and its lower curved end forms the suspending bearing surface for the shaft. This collar is made tapering on its sides with its smallest

diameter below and its largest diameter at the top, and its upper diameter fits snugly with the bore of the hub G. In distinguishing this feature of my invention from other suspensory bearings for the shaft, I would state that heretofore this bearing has been placed at the center of oscillation of the shaft or else above it, and the portion of the shaft that projected above the bearing was tapered upwardly to a diminishing diameter above the bearing. In my construction, the center of oscillation is not at the bearing, but at the extreme upper end of the shaft, and the bearing is placed some distance below the center of oscillation, and the lower curved face of the collar *b* has a well defined sliding motion on the upper curved face of bearing *a*, which is permitted by the reduced diameter of the lower end of the collar, while the upper end of the shaft remains concentric and practically stationary.

In my crusher with the bearing below the center of oscillation, the movement of the top of cone crushing-hub is greater for the same movement of bottom of cone, than when the center of oscillation and top of cone are closer together. This is an advantage, as it will cause the rock to feed faster.

The upper side of the cap *d* is hollowed out to form an oil box, and from this oil is constantly fed through a wick by gravity and capillary attraction over the edge of the collar *b* and down into the bearing formed by the curved and abutting surfaces *a* and *b*.

To cover over the whole of the end of the shaft an outside cap *f* is placed upon the hub G, and a flange on said cap depends within the opening in the hub G to hold it in place. This cap protects the end of the shaft and its bearings from dust, dirt, and the weather.

Where the shaft passes through the inclined floor E there is usually a collar loosely held upon the shaft and sliding on a circular flange rising from the inclined floor to exclude the dust and dirt of the crushing chamber from the gears below. In my construction I fix a collar *m* to the shaft rigidly by means of set screws *m'*, and the lower surface of this collar is faced or ground to the curve of a circle struck by a radius from the top of the shaft as a center, and fitting beneath the rigid collar is a detachable annular bearing *h* having a flange fitting either inside or outside the flange rising from the inclined floor E. This detachable bearing *h* has its upper surface ground or faced to the same curve as the lower face of *m* and is also provided with an annular oil trough in its upper face in which oil is placed with a suitable packing of wick to make at the same time a dust tight joint and an oil receptacle to lubricate the bearing. This bearing it will be seen grinds with the radial swing of the shaft, and while its parts are fixed or rigid a tight joint is always maintained with a free movement between the parts. At a lower point on the shaft is another rigid collar *i* fixed to the shaft by a set screw and working on a subjacent detachable annular bearing *j* fixed to the top of the gear wheel D' and having an annular oil trough in its upper surface. The joint formed between these parts *i* and *j* is faced or ground to the curve of a circle struck by a radius from the top of the shaft as a center, so that the collar *i* moves in the gyratory motion of the shaft rigidly with said shaft over the subjacent bearing *j* and always preserves a tight joint. To preserve the lubrication of this joint an oil cup *k* is located in the collar *i* and gradually feeds oil to the joint, the oil feeding finally to bearing end of shaft.

The sleeve D, which carries the lower end of the shaft, is constantly lubricated from an oil cup *l*, the oil flowing in through a pipe *l'*, and filling the interior of the step bearing G, and overflowing through pipe l^2. A trap l^3 and cock l^4 permit the removal of sediment when necessary.

D^5 is a hub rigidly keyed to the shaft D^3 and connected to the driving pulley D^4 by break bars *r* so that any undue strain in the crusher will result in the breakage of the bars *r* without damaging the machine.

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

1. In a crushing machine provided with a shaft having a gyratory crushing movement inside a crushing chamber or hopper, a sleeve or collar attached to the upper end of said shaft and having a convexed lower end and tapered outwardly and upwardly from said lower end, a suitable seat for the lower end of said sleeve or collar, and a hub-support bored to receive said seat and sleeve, the inner walls of said hub-support above the seat cooperating with the larger upper end of said sleeve to constitute a fulcrum for said shaft, substantially as described.

2. In a crushing machine provided with a shaft having a gyratory crushing movement inside a crushing chamber or hopper, a sleeve or collar attached to the upper end of said shaft and having a convexed lower end and made of larger diameter at its upper end than it is at its lower end, and a hub-support with seat for the lower end of the said collar, said hub-support inclosing the collar and fitting snugly the upper end of the same to form a fulcrum for the shaft, substantially as and for the purposes described.

3. In a crushing machine provided with a shaft having a gyratory crushing movement inside a crushing chamber or hopper, a sleeve or collar attached to the upper end of said shaft and having a convexed lower end and made of larger diameter at its upper end than it is at its lower end, and a hub-support with seat for the lower end of the said collar, said hub-support inclosing the collar and fitting snugly the upper end of the same to form a

fulcrum for the shaft, a locking device to prevent the collar from turning, and a cap securedly fastened to and covering the upper end of the shaft and hollowed out to form an oil cup and overlapping the collar to prevent it from slipping off, substantially as and for the purposes described.

4. In a gyratory rock crusher, the combination with the upper supporting frame, a crushing chamber with inclined floor, and an eccentric sleeve with driving gear; of a vertical shaft having its supporting bearing at its upper end, and its lower end in the eccentric sleeve a rigid dust collar above the inclined floor, and a rigid dust collar above the driving gear, all formed with curved joints for their bearings described by a radius from the top of the shaft as a center, substantially as and for the purpose described.

5. The combination with the inclined floor E; of an annular bearing carried thereby having a curved upper face, and the vertical shaft passing therethrough and provided with a rigid collar *m* having a lower surface curved to correspond to the radius of the oscillation and grinding or sliding upon said bearing substantially as and for the purpose described.

6. The combination with the inclined floor E, having a circular upward projecting flange; of a detachable annular bearing *h* having a curved upper surface with trough-shaped annular oil chamber in the same, and the shaft having rigid collar *m* with a curved lower bearing surface fitting upon the bearing *h* substantially as and for the purpose described.

7. The combination with the gyratory shaft having an eccentric sleeve embracing its lower end, and a gear wheel rigidly attached to said sleeve at its upper end; of an annular bearing *j* resting concentrically upon its gear wheel and having a curved upper surface, and a collar *i* rigidly attached to the shaft and having a curved lower bearing surface resting upon the bearing *j* substantially as and for the purpose described.

SAMUEL C. McLANAHAN.

Witnesses:
FRANK J. OVER,
VIRGINIA McLANAHAN.