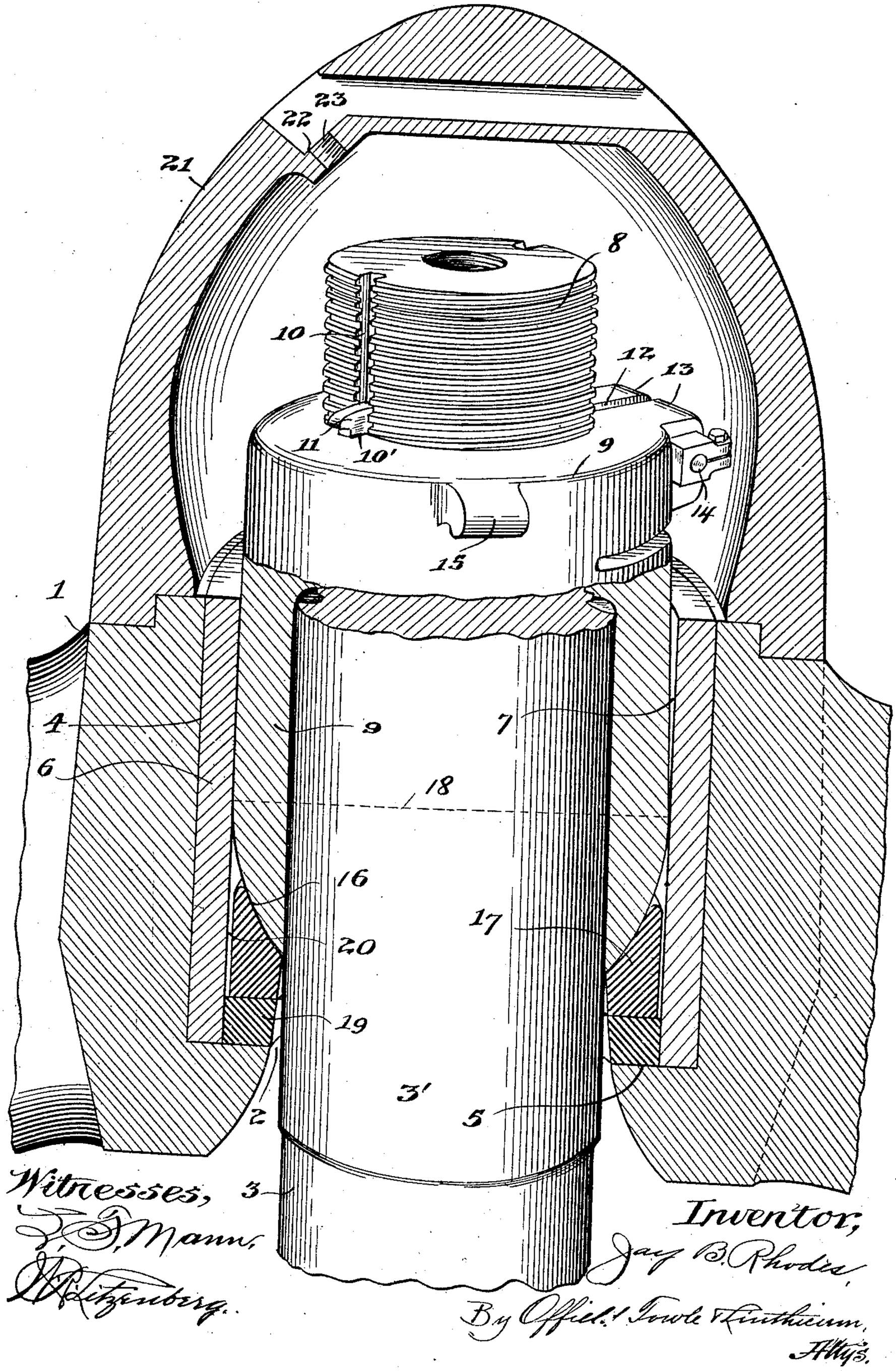
No. 839,891. PATENTED JAN. 1, 1907.

J. B. RHODES.

GYRATORY CRUSHER.

APPLICATION FILED MAR. 11, 1905.



Witnesses,
J. D. Mann.
D. Kitzenberg.

Inventor,
Jay B. Rhodes,
By Offield, Towle & Linthicum,
Attys.

UNITED STATES PATENT OFFICE.

JAY B. RHODES, OF CHICAGO, ILLINOIS, ASSIGNOR TO AUSTIN MANUFACTURING COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

GYRATORY CRUSHER.

No. 839,891. Specification of Letters Patent. Patented Jan. 1, 1907.

Application filed March 11, 1905. Serial No. 249,652.

To all whom it may concern:

Be it known that I, JAY B. RHODES, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Gyratory Crushers, of which the following is a specification.

This invention relates to improvements in gyratory crushers, and refers more specifically to an improved construction in suspension-bearings for the main gyratory shaft of such crushers.

The salient object of the present invention is to provide a construction in which the main shaft is supported in such manner that its weight is carried upon annular supporting-shoulders having bearing-surfaces formed concentrically with the axis of gyration and oscillation of the main shaft and located as near the center of such oscillation as the external diameter of the main shaft will permit, whereby the relative movement of one bearing member upon another is reduced to a minimum, and the bearing-surfaces are at all times in full-face contact with each other.

Subordinate objects of the invention are to provide a construction which enables the main shaft to be bodily adjusted up or down without disturbing the bearings and without changing the area of bearing-contact; to provide a construction which enables those members which take the direct wear to be independently constructed in the form of relatively small parts capable of being readily formed from the material best suited; to provide a construction which may be applied with slight modification to most of the gyratory crushers now in common use without necessitating great or expensive changes in the latter; to provide a construction which affords absolute freedom of movement of the gyratory shaft without bringing upon the bearings undue stresses; to provide a construction which may be readily kept in thoroughly well lubricated condition, and in general to provide a simple and improved construction of the character referred to.

To the above ends the invention consists in the matters hereinafter described, and more particularly pointed out in the appended claims.

The invention will be readily understood from the following description, reference being had to the accompanying drawing, in which the single figure illustrates, chiefly in axial section, but partly in perspective, the hub portion of a spider-head, fragmentary portions of the spider-arms, the upper end portion of the main gyratory shaft, and my improved suspension-bearing applied to said parts.

Referring to the drawing, 1 designates as a whole the spider, which is provided with an axial bore 2 to accommodate the upper end of the main gyratory shaft 3 and is counterbored, as indicated at 4, to form a cylindric recess, terminating at its lower end in an inwardly-projecting angular supporting-ledge or shoulder 5. Within the recess referred to is fitted and seated a cylindric bushing 6, the lower end of which rests upon the supporting-ledge 5 and the inner surface 7 of which forms the bearing or journal surface which takes the lateral thrust of the main shaft.

The upper end portion of the main shaft is threaded, as indicated at 8, throughout a considerable distance, and upon said threaded portion is fitted a wearing-sleeve 9, the interior of which fits accurately upon the upper cylindric portion 3′ of the main shaft, but is capable nevertheless of adjustment up and down upon the latter by means of its screw-threaded engagement with the part 8. In order that the wearing-sleeve 9 may be locked in adjusted position, a keyway is formed partly within the threaded portion 8 of the shaft and partly within the wearing-sleeve, as indicated at 10 and 10′, respectively, and within this keyway is seated a key 11. In order to lock the wearing-sleeve with absolute rigidity upon the main shaft, that portion of the sleeve which is internally threaded is divided at one side, as indicated at 12, provided with clamping-ears 13 13′, and a clamping-bolt 14 inserted therethrough. The sleeve is also provided with one or more spanner-lugs 15, whereby it may be rotated after being released.

It will be understood from the foregoing description that the wearing-sleeve constitutes a member which is rigid with the main shaft in operation and the exterior of which constitutes the bearing-surface which coöperates with the interior of the bushing 6, but which nevertheless permits the main shaft to

be raised and lowered therethrough. As an important feature of the present invention I provide the lower end of this sleeve with bearing-surfaces which are utilized to support the weight of the main shaft, and these bearing-surfaces are formed concentrically with the center of gyration of said main shaft and are located as near this center as practicable. The main body portion of the wearing-sleeve above these lower bearing-surfaces is slightly conical or tapered, its walls being slightly upwardly convergent, as shown. In constructing the wearing-sleeve I form the lower end thereof convex, forming the same upon the arc of a radius from the center of gyration in the main shaft to a point of maximum diameter of the wearing-sleeve, and the convex end 16 thus formed is arranged to rest upon and engage a supporting member 17, having a correspondingly concavely curved surface.

18 indicates a dotted line assumed to intersect the axis of the main shaft at right angles in the transverse plane of maximum diameter of the wearing-sleeve, in which line the center of gyration falls.

Theoretically it is possible to so construct the wearing-sleeve upon the main shaft, the internally-cylindric bushing which confines the shaft against lateral movement, and the parti-spherical lower end bearing in such manner that movement of the concave member 17 is unnecessary, or, in other words, this part might theoretically be made integral with the spider head or bushing 6, rigidly mounted in the spider-head. Practically, however, it is impossible to provide mathematically-tight bearings, and it follows that if the slightly-conical exterior of the wearing-sleeve 9 is at all times to have a full line bearing against the interior of the bushing 6 without necessitating any riding-up motion on the part of the main shaft then the bearing member 17 must be made capable of a very slight lateral movement or a movement with the gyrating shaft. Accordingly I make said bearing member 17 as an independent ring, the lower surface of which is substantially perpendicular to the axis of the main shaft and accurately fits and rests upon a fixed wearing-ring 19. The wearing-ring 17 is of sufficiently smaller external diameter than the interior of the bushing 6 to afford such lateral movement, such clearance being indicated at 20. The object of providing the independent ring 19 is simply to facilitate the construction of a proper seat or support for the ring 17, made of suitable metal, from which it will be understood that it is not necessarily constructed independently of the bushing or spider-head.

With the parts constructed as described it will be obvious that a perfect face-to-face or full-surface contact bearing is at all times afforded between the sleeve member 9 and the bearing-ring 17, while at the same time the main shaft is free to move under the crushing stress into a full-line bearing with the interior of the bushing. It will be further noted that these relations are unaffected by the raising or lowering of the main shaft and also that the fit between the convex portion of the wearing-sleeve and the wearing-ring 17 and the fit between the latter and the rigid ring 19 are such that, in effect, a well sealed at its lower end is formed between the interior of the bushing 6 and the parts moving with the main shaft, and accordingly this unoccupied space may be filled with oil, and the oil will be confined against leaking out except in so far as it works through between the bearing-surfaces. This latter feature is a feature of great importance, because it enables the mechanism to be kept perfectly lubricated as to those parts which take the heaviest wearing stress with the use of a minimum amount of oil and without employing any means for circulating the oil. In order that the parts may be thus kept lubricated and at the same time protected against ingressive dirt, the upper end of the spider-hub is inclosed in a removable cap 21, which is provided with an oil-inlet 22, normally closed by a plug 23.

The operation of the mechanism has been fully set forth in connection with the description of the construction of the parts and need not, therefore, be repeated. It is to be noted, however, that some of the details of construction and arrangement may be modified without in any sense departing from the invention or the spirit thereof, and accordingly I do not limit myself to the exact details shown and described, except to the extent that they are made the subject of specific claims.

I claim as my invention—

1. In a gyratory crusher, the combination of a spider-head bored to accommodate the upper end portion of the main gyratory shaft, a supporting ledge or shoulder upon the interior of said spider-head, a main gyratory shaft, a wearing-sleeve mounted upon the upper end portion of said main shaft and extending both above and below the center of gyration of said shaft, the lower end of said sleeve being formed with a convex upper surface projected from a center substantially coincident with the center of gyration and supported by the said ledge or shoulder of the spider-head.

2. In a gyratory crusher, the combination of a spider-head bored to accommodate the upper end portion of the main gyratory shaft, a supporting ledge or shoulder upon the interior of said spider-head, a main gyratory shaft, a wearing-sleeve mounted upon the upper end portion of said main shaft and extending both above and below the center of gyration of said shaft, the lower end of said sleeve being formed with a convex bearing-surface projected from a center substantially coincident with the center of gyration, and a

bearing member interposed between said wearing-sleeve and supporting ledge or shoulder.

3. In a gyratory crusher, the combination of a spider-head bored to accommodate the upper end portion of the main gyratory shaft, a supporting ledge or shoulder upon the interior of said spider-head, a main gyratory shaft, a wearing-sleeve adjustably mounted upon the upper end portion of said main shaft and extending above and below the center of gyration of said shaft, the lower end of said sleeve being formed with a convex bearing-surface projected from a center substantially coincident with the center of gyration, and a bearing member interposed between said wearing-sleeve and said supporting ledge or shoulder.

4. In a gyratory crusher, the combination with a main frame-support bored to accommodate the upper end portion of a gyratory shaft, a supporting ledge or shoulder upon the interior of said frame, a main gyratory shaft, a bearing-sleeve adjustably mounted upon the upper end portion of said main shaft and extending both above and below the center of gyration of the shaft, the lower end of said sleeve being formed with a convex bearing-surface projected from a center substantially coincident with the center or gyration, and a bearing-ring provided with a concave upper surface conformed to the lower end surface of the wearing-sleeve interposed between said wearing-sleeve and said supporting ledge or shoulder and free to move laterally.

5. In a gyratory crusher, the combination of a spider-head bored to accommodate the upper end portion of a main gyratory shaft, a supporting ledge or shoulder upon the interior of said spider-head, a main gyratory shaft, a conical wearing-sleeve adjustably mounted upon the upper end portion of said main shaft and extending both above and below the center of gyration of said shaft, the said sleeve being provided with a downwardly-convex bearing-surface projected from a center substantially coincident with the center of gyration and formed upon a radius from the said center to a point on the bearing-surface of the sleeve in the transverse plane of its maximum diameter, and a bearing-ring interposed between the convex surface of said wearing-sleeve and said supporting ledge or shoulder.

6. In a gyratory crusher, the combination of a spider-head bored to accommodate the upper end portion of a main gyratory shaft, a supporting ledge or shoulder upon the interior of said spider-head, a bearing member carried upon the upper end portion of said main shaft having an external approximately cylindric but slightly conical upper portion and a parti-spherical downwardly-convex lower portion, and a bearing-ring interposed between said parti-spherical portion and the supporting ledge or shoulder carried by the spider.

7. In a gyratory crusher, the combination of a spider-head bored to accommodate the upper end portion of a main gyratory shaft, a supporting ledge or shoulder upon the interior of said spider-head and located below the center of gyration of the main shaft, and ball-and-socket-like fittings between said supporting-ledge and the main shaft whereby the unoccupied space between the main shaft and interior of the spider above said fittings constitutes a well substantially sealed against the escape of oil by gravity flow.

JAY B. RHODES.

Witnesses:
ALBERT H. GRAVES,
FREDERICK C. GOODWIN.