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UNIVERSAL JOINT FOR GRINDING MILLS.

APPLICATION FILED MAY 4, 1912.

1,048,307. Patented Dec. 24, 1912.

Fig. 1.

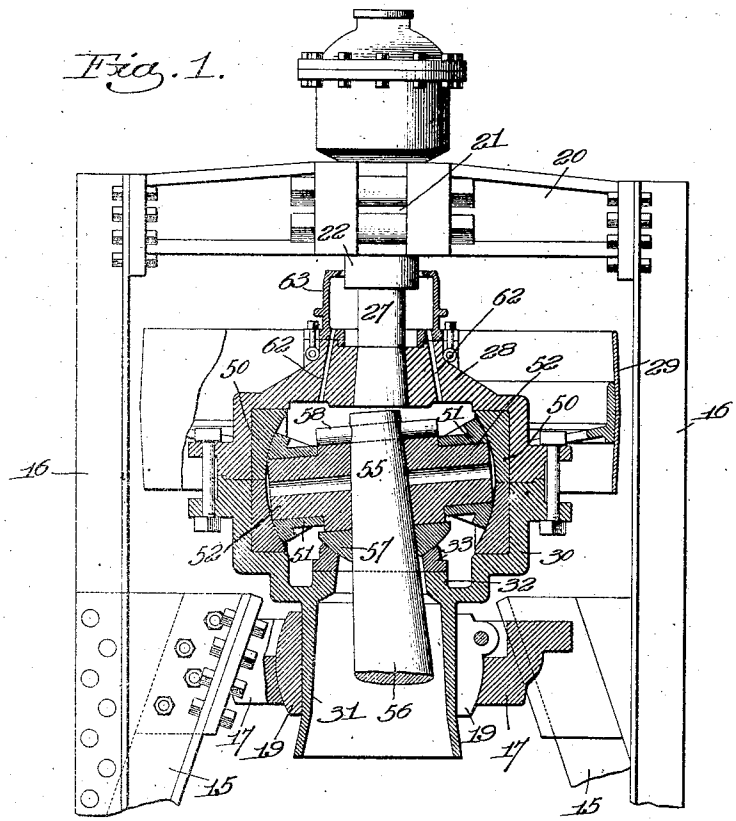

Fig. 3.

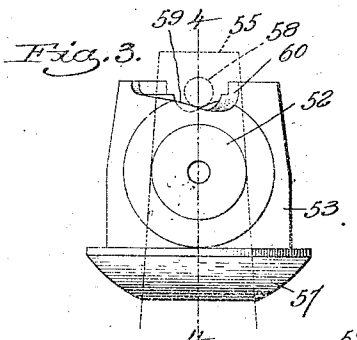

Fig. 4.

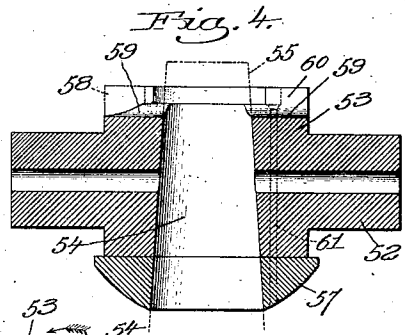

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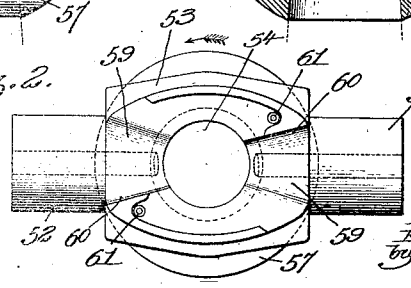
Fig. 2.



Witnesses:
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Harriet O'Neill

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by Edmunds, Howard & Smith. Attys

UNITED STATES PATENT OFFICE.

EDWIN C. GRIFFIN, DECEASED, LATE OF NEWTON, MASSACHUSETTS, BY LOVINA M. GRIFFIN, EXECUTRIX, OF ASHMONT, MASSACHUSETTS, ASSIGNOR TO BRADLEY PULVERIZER CO., OF BOSTON, MASSACHUSETTS, A CORPORATION OF MAINE.

UNIVERSAL JOINT FOR GRINDING-MILLS.

1,048,307. Specification of Letters Patent. **Patented Dec. 24, 1912.**

Application filed May 4, 1912. Serial No. 695,179.

To all whom it may concern:

Be it known that EDWIN C. GRIFFIN, deceased, late of Newton, county of Middlesex, State of Massachusetts, did invent an Improvement in Universal Joints for Grinding-Mills, of which the following description, in connection with the accompanying drawing, is a specification, like characters on the drawing representing like parts.

This invention relates more particularly to mills for pulverizing or grinding rock, ore, slag or other refractory material by the action of a suspended revoluble roll having a gyratory action with relation to the suspension means therefor and which coöperates with an annular die, a mill of this type being shown in United States Patent No. 1,020,092, dated March 12, 1912. In such mills the suspending means usually includes an overhead and suitably supported driving shaft having an attached pulley connected by belting with a proper source of power, the grinding roll shaft being connected with such overhead shaft by a substantially universal coupling, in such manner that the roll shaft is suspended and rotated positively without interference with the gyratory motion thereof when the mill is in operation. The coupling comprises essentially a rotating outer member and an inclosed coöperating rocking member which is rotated bodily and positively in unison with the outer member, the latter being fixedly attached to the driven shaft. This inner member is made as a cross-head having radial arms or trunnions extended laterally therefrom and carrying segments which have their bearings on concave seats in the outer member, as for instance in Patents No. 721,035 dated February 17, 1903, and No. 922,579 dated May 25, 1909. As shown therein the cross-head has a central tapered hole to receive the correspondingly tapered upper end of the roll shaft, which is held in the cross-head by a nut screwed onto the threaded extremity of the shaft projecting above the top of the cross-head. It has been found in practice that this construction is objectionable, for the jar and shock to which the parts are subjected by the operation of the mill tend to loosen the retaining nut, so that the roll shaft is not held as rigidly and tightly as it should be in the cross-head, and the retaining nut must be set up from time to time, a very laborious operation requiring dismantling of a portion of the apparatus for its accomplishment.

The present invention has for its main object the production of simple, strong and durable means for connecting the roll shaft with the cross-head, the construction and arrangement being such that the operation of the mill acts constantly and automatically to tighten the connection between the shaft and the cross-head. When it is necessary to separate such parts, however, it can be effected easily and rapidly with a minimum expenditure of time and labor.

The various novel features of the invention will be fully described in the subjoined specification and particularly pointed out in the following claims.

Figure 1 is a view in elevation and section of a sufficient portion of a grinding mill of the type referred to, with a practical form of the present invention embodied therein; Fig. 2 is an enlarged top plan view of the cross-head from which the roll shaft is suspended, showing the seats for the shaft-retaining member; Fig. 3 is a right hand side elevation of the cross-head, the tapered end of the roll shaft and the retaining member therefor being shown by dotted lines; Fig. 4 is a vertical section of the cross-head taken through the center thereof on the line 4—4, Fig. 3.

Referring to Fig. 1, the frames 15 carrying the annular member 17 which forms a concave seat for the bearing 19, the cross piece 20 supported by the frame 16, and sustaining the seat 21 for the bearing 22 of the depending shaft 27, having its ower end secured in the hub 28 of the driving pulley 29; the tubular portion 30 bolted to and depending from the pulley hub and terminating in a flared tubular extension 31 onto which the bearing 19 is clamped; the annular internal shoulder 32, and the concaved bearing ring 33, may be and are all substantially as in Patent No. 1,020,092. The hub 28 and attached depending portion 30 constitute an inclosed outer or socket member of the coupling which connects the suspending shaft 27 and the suspended roll shaft, to be referred to. Within the socket member

are diametrically disposed and upright concave seats 50, 50 each seat being conveniently made in two parts, as shown, and coöperating with the convex end faces of segments 51 centrally apertured to fit easily upon oppositely extended arms or trunnions 52 which project radially from a cross-head 53. The cross-head has a tapered axial hole 54 for the reception of the correspondingly tapered upper end 55 of the roll shaft 56, Fig. 1, it being understood that said shaft in practice carries at its lower end a suitable grinding roll, as in Patent No. 1,020,092.

The described structure provides a universal coupling between the shafts 27 and 56, as will be apparent, in a manner similar to the couplings shown in Patents Nos. 721,035 and 922,579, the weight of the roll shaft, roll and cross-head being sustained by the suspension member 57, made as a spherical segment and seated in the concaved bearing 33. As such segment is subjected to hard wear it is made of manganese steel or other suitable wear-resisting metal, and separate from the cross-head, so that it can be readily renewed when necessary, the segment being apertured centrally for the shaft, the bottom of the cross-head seating upon the flat upper face of the segment. Herein the retaining nut for the roll shaft, and the threading of the latter for the nut, are obviated altogether, and instead of such retaining means a steel pin 58 is driven through a transverse hole in the tapered part of the roll shaft, the projecting ends of the pin resting upon diametrically opposite cam seats 59 formed on the top of the cross-head. Said cam seats are oppositely inclined, as shown, and preferably are made as helical surfaces, the low portions of said seats being adjacent abutments 60, the abutments being parallel to each other and offset at opposite sides of a diameter through the axial center of the cross-head, as shown in Fig. 2.

When assembling the cross-head and roll shaft the tapered end 55 of the latter is inserted in the hole 54 of the cross-head and the retaining pin 58 is driven into position through the shaft, the ends of the pin resting on the cam seats at their low points, adjacent the abutments 60. The exact position of the pin on the seats depends upon the fit of the shaft in the hole 54, the farther in the shaft extends the higher upon the seats will the ends of the pin rest initially. Rotation of the cross-head is in the direction of the arrow, Fig. 2, that is, from the high toward the low parts of the cam seats, in consequence of which the projecting ends of the pin always tend to travel toward the high parts of the seats. This coöperation of the pin and the cam seats acts to pull the shaft upward into its tapered hole 54 in the cross-head, as will be manifest, so that the greater the resistance to rotation offered by the shaft the more securely and firmly will the described connection draw together the shaft and cross-head.

As the parts are all inclosed and have no relative movement, once the shaft and cross-head have been drawn together by the described cam action, it will be obvious that there is no wear, and the connection will last indefinitely.

It is impossible for the shaft to become loose in the cross-head when the mill is in operation, manifestly, owing to the self-tightening action of the connection between such parts, yet when it is necessary to separate the parts it can be easily effected by reversing the rotation of the cross-head, as thereby the ends of the retaining pin are caused to travel down the helical seats toward the abutments.

The trunnions are made hollow, as shown, for the reception of lubricant, and oil holes 61 are drilled through the cross-head and through the suspending segment 57, Fig. 4.

Oil ducts 62 lead through the pulley hub 28 to the interior thereof from a lubricating cup or chamber 63 bolted to the hub and surrounding the shaft 27, whereby the lubricant can be introduced to the interior of the inclosing or socket member of the shaft-coupling.

The particular construction of the shaft-coupling may be varied or re-arranged as may be convenient, and various other parts of the apparatus may be changed or modified without interfering or departing from the spirit and scope of the present invention as set forth in the claims hereunto annexed.

Having fully described the invention, what is claimed and desired to be secured by Letters Patent is:

1. In a grinding mill of the class described, a driving shaft, a suspended roll shaft having a tapered upper end, a universal coupling including an inclosing member attached to the driving shaft and an inclosed rocking member having a tapered hole for the upper end of the roll shaft, oppositely inclined cam seats on the top of the inclosed member adjacent the shaft hole, and a retaining pin extended through the projecting end of the shaft and having its opposite ends resting upon the seats, whereby rotation of the coupling in the direction of the lower portions of the cam seats causes the latter to coöperate with the retaining pin and draw the roll shaft and cross-head together.

2. The combination with a driving shaft, a suspended shaft to be driven, and a universal coupling between them and from which the driven shaft is suspended, the coupling including a member having a tapered hole for the correspondingly tapered upper end of the suspended shaft, of an automatically tightening connection between said shaft and coupling member comprising

oppositely inclined cam seats on the top of the coupling member and radial projections on the tapered end of the shaft resting upon and upheld by the cam seats.

3. The combination with a driving shaft, a suspended shaft to be driven, and a universal coupling between them and from which the driven shaft is suspended, the coupling including a member having a tapered hole for the correspondingly tapered upper end of the suspended shaft, of an automatically tightening connection between said shaft and coupling member, comprising seats on the top of the coupling member diametrically opposite each other and having oppositely inclined helical surfaces, and a pin extended through the projecting end of the shaft and resting upon the helical surfaces at opposite sides of the shaft.

4. In a grinding mill, an overhead driving shaft, a suspended gyratory roll shaft, a universal coupling between the shafts and from which the roll shaft is driven, the coupling including an inclosed rocking cross-head having an axial, tapered hole for the correspondingly tapered upper end of the roll shaft, oppositely inclined helical seats on the top of the cross-head at opposite sides of the shaft hole, and a coöperating pin passed through the shaft above the cross-head, the projecting ends of the pin resting upon and being supported by the seats, rotation of the coupling toward the low portions of the seats causing the pin to travel up said seats and thereby draw the shaft tightly into the cross-head.

5. In a grinding mill, an overhead driving shaft, a suspended gyratory roll shaft, a universal coupling between the shafts and from which the roll shaft is driven, the coupling comprising an outer member provided with an annular, coaxial bearing, and a cross-head mounted to rock in the outer member and having a tapered axial hole for the correspondingly tapered end of the roll shaft, a suspending member surrounding the shaft and interposed between the cross-head and said annular bearing, and an automatically tightening connection between the roll shaft and the cross-head, comprising oppositely inclined helical seats on the top of the latter and a transverse pin carried by the shaft and resting upon the seats, operative rotation of the coupling causing the pin to travel up the seats and thereby draw the roll shaft tightly into the cross-head.

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

LOVINA M. GRIFFIN,
Executrix of estate Edwin C. Griffin, deceased.

Witnesses:
J. E. GRIFFIN,
FRED M. MONTGOMERY.