

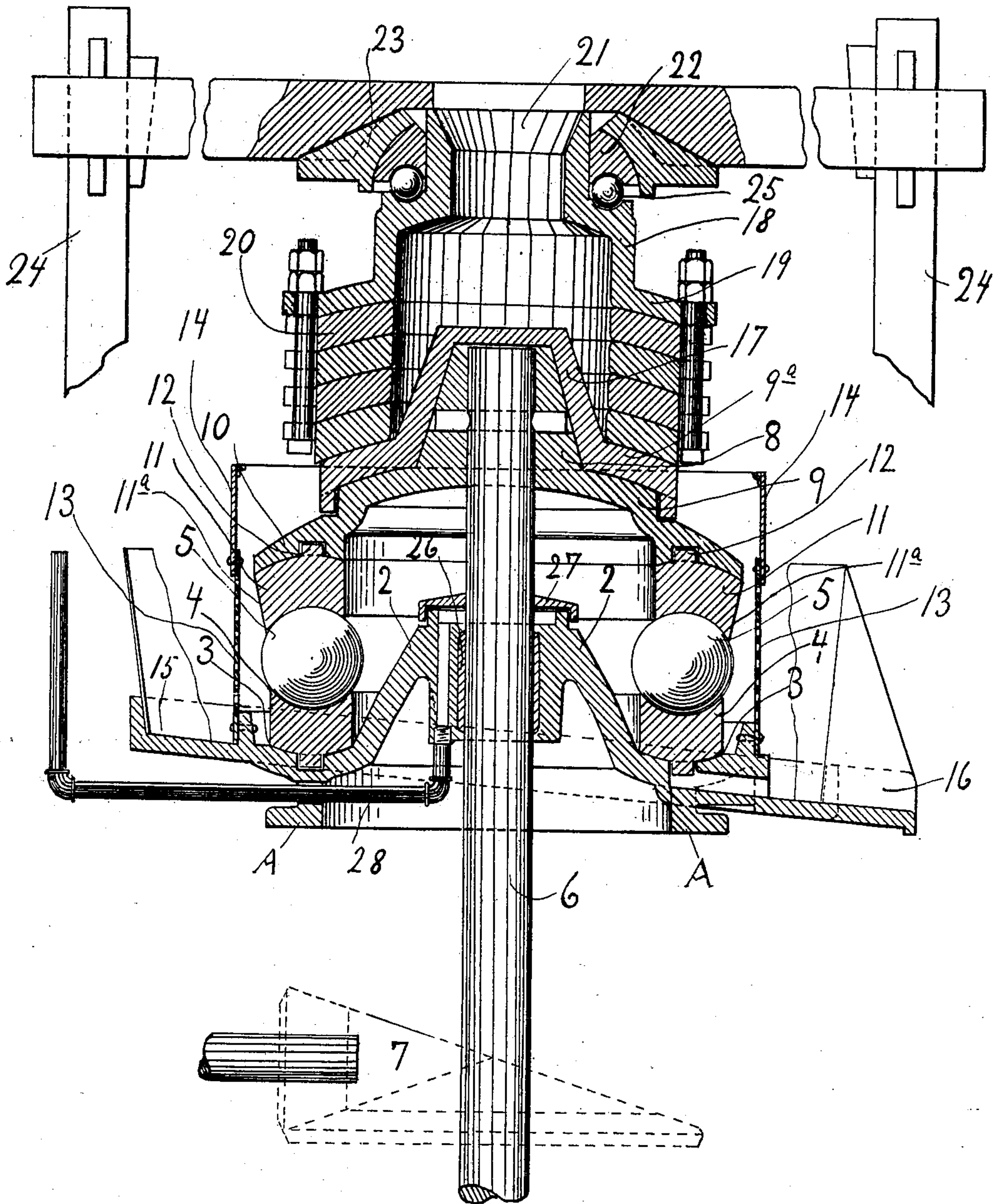
No. 762,580.

PATENTED JUNE 14, 1904.

J. M. DYER.
CRUSHING AND GRINDING MILL.

APPLICATION FILED DEC. 5, 1902.

NO MODEL.



WITNESSES:

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UNITED STATES PATENT OFFICE.

JAMES M. DYER, OF DOUGLAS CITY, CALIFORNIA.

CRUSHING AND GRINDING MILL.

SPECIFICATION forming part of Letters Patent No. 762,580, dated June 14, 1904.

Application filed December 5, 1902. Serial No. 133,942. (No model.)

To all whom it may concern:

Be it known that I, JAMES M. DYER, a citizen of the United States, residing at Douglas City, county of Trinity, State of California, have invented an Improvement in Crushing and Grinding Mills; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to an apparatus designed for crushing and pulverizing ore-bearing and other rock.

It consists of the parts and the constructions and combinations of parts which I will hereinafter describe and claim.

The figure is a vertical section of my apparatus.

The base A is supported upon any suitable foundation and has a central upwardly-projecting cone 2, with an annular channel 3 formed around its outer periphery. Within this channel are fixed dies 4, which may be made in as many segments as found desirable for convenience in handling and replacing. These dies have a concaved continuous channel formed in the upper surface, and within this channel the balls 5 are adapted to roll. Through the center of the cone 2 passes a vertical shaft 6, having beveled gear or other suitable driving devices, as at 7. To the upper end of this shaft is fixed a cone 8, having outwardly-divergent convex flanges, as at 9, and annular extensions 10, adapted to receive the dies 11, which are made similarly to the dies 4 and are locked, so as to revolve with the cone 8, by means of lugs, as 12, projecting into corresponding recesses. The dies 11 have their lower surfaces formed with a continuous concaved annular channel and are adapted to rest upon the balls 5, which, as before stated, are in turn supported in the dies 4, so that when the cone 8 is rotated by the driving-shaft 6 the dies 11 will be caused to travel upon the top of the balls 5, which in turn revolve in the dies 4, thus providing a pulverizing-surface for any material which may be delivered between the balls and the dies. In order to retain the balls and dies in proper relative position under considerable speed and centrifugal action, I have shown the upper dies

with the outer peripheries 11 extending lower upon the balls 5 than the inner peripheries, and any wear that takes place in the grooves or channels of the dies will be such that the outer peripheries of these channels will always stand lower than the inner ones.

Surrounding the channel 3, which holds the dies 4, is a screen 13 of any suitable or desired fineness, through which screen the material when sufficiently crushed will pass. Above this screen is a sheet-metal band or ring 14, extending high enough to receive and direct the material from the upper portion of the apparatus, to be hereinafter described, and to deliver it within the screen 13 and into the path of the balls 5. Surrounding the exterior of this screen and supported by or forming a part of the cone 2 is an annular channel 15, into which the pulp when delivered through the screen is received, and the bottom of this channel may have a sufficient inclination toward one side and connect at the lower side with a discharge spout or trough 16, so that the pulverized pulp after passing through the screen might be continually carried away to any suitable or desired point of deposit.

17 is a die fitting the upper part of the cone 8 and having a spherically-curved base-flange 9^a to fit the curvature of the base-flange of the cone. As it is the object of this invention to crush the ore and to pulverize it before it is delivered to the balls 5, I accomplish the desired purpose by employing the spherically-curved flange 9^a and imparting to the bottom of the cylinder or its shoes a curvature substantially corresponding to the spherical shape of said flange.

18 is a hollow cylindrical structure having flanges, as at 19, and 20 represents annular rings having the same general shape with the flanges 19, below which they are bolted and secured, as shown, thus forming a hollow cylindrical structure. The lower surfaces of the rings 20 are formed with a curvature corresponding with the surfaces of the flange 9^a, and the lowermost of the rings 20 rests upon the upper surface of the flange 9^a. The cylinders 18 and dies 20 have a larger interior diameter than the base of the cone, as shown

in my Patent No. 635,011, of October 17, 1899, and this portion of the structure is adapted to be moved out of line axially with the shaft 6 and cone 8, the lower surfaces of the shoes 20 being slidable upon the upper surface of the flange 9^a, so that there will be a wider space upon one side between the shoes 20 and the cone 17 than upon the other side. The upper portion of the cylinder 18 is extended and has a central opening, as at 21, which serves to receive the material to be crushed and to direct it down between the cone 17 and the shoes 20, so that under the previously-named conditions the frictional contact of the rock carried between the revolving cone 17 and the shoes 20 and the cylinder will also cause the latter to revolve, and thus carry the rock around from the wider space to the narrower space and continually reduce it until it is fine enough to pass out between the upper surface of the die 9^a and the lower surface of the contiguous shoe 20. The material thus discharged passes down over the outer inclined surface of the annular extension 10 of the cone 8, and being directed by the surrounding inclosing rim 14 falls down into the space within the screen 13 and around the dies 4 and 11 and the balls 5, and as these latter are continually traveling and rolling upon the die-surfaces the material will be passed between these surfaces, and thus triturated until it is sufficiently fine to be discharged through the screens 13. The adjustment of the upper part of the cylinder may be effected in various ways. I have here shown the upper portion 21 as having a surrounding annulus 22, the outer periphery of which is made convex, and this convex surface fits within the corresponding concavity of a transverse plate 23. This plate is connected by arms or extensions with suitable exterior posts or supports 24, and by means of wedge-shaped keys or equivalent adjusting devices this socket-piece 23 can be moved to one side or the other for the purpose of tilting the cylinder 18 and shoes 20 to stand out of line with the shaft 6, as previously described. The lower surface of the annulus 22 is concaved, and the upper shoulder of the cylinder 18, surrounding the smaller portion 21, is correspondingly concaved, and in these concaved channels are the balls 25, which thus forms an antifrictional support and contact between these parts, so that as the cylinder 18 is revolved in unison with the employment of the cone 17 by the

frictional contact of the ore passing between the two it will turn easily upon the balls 25.

The shaft 6 is turnable in a suitably-lined bearing within the cone 2, as shown at 26. 27 is a cap fixed upon the shaft above this bearing and having an annular downwardly-projecting peripheral flange, which forms a joint with the upper end of the cone 2 to prevent ingress of sand or pulp which might wear the bearing. This journal is easily lubricated by oil conducted thereto by a pipe, as shown at 28, leading thereto from the exterior of the machine.

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

1. The combination in an ore crushing and grinding apparatus, of a cone carried by a vertically-turnable shaft and having a spherically-curved base-flange; a cylinder supported thereon and having a base, concaved to fit the cone-flange; a tubular extension of the upper part of the cylinder with a surrounding grooved raceway; balls fitting said raceway; a ring surrounding the cylinder extension, said ring having a raceway in its lower surface resting upon the balls and an upper convex surface; a concave plate fitting and movable upon the convex surface of the ring; and means for moving the plate in a horizontal plane to tilt the cylinder with relation to the cone.

2. The combination in an ore crushing and pulverizing apparatus, of a cone revoluble upon a vertical axis and having a spherically-curved base-flange; a cylinder of larger interior diameter than the cone and having a spherically-curved base to fit the curvature of the cone-flange; an annulus surrounding the top of the cylinder, said cylinder and annulus having their adjacent faces provided with a raceway containing balls, said annulus having an outer curved surface; a plate concaved to fit the annulus and movable in a horizontal plane to tilt the upper end of the cylinder; a splash wall and screen surrounding the lower end of the cylinder; and an annular trough surrounding the screen.

In witness whereof I have hereunto set my hand.

JAMES M. DYER.

Witnesses:

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