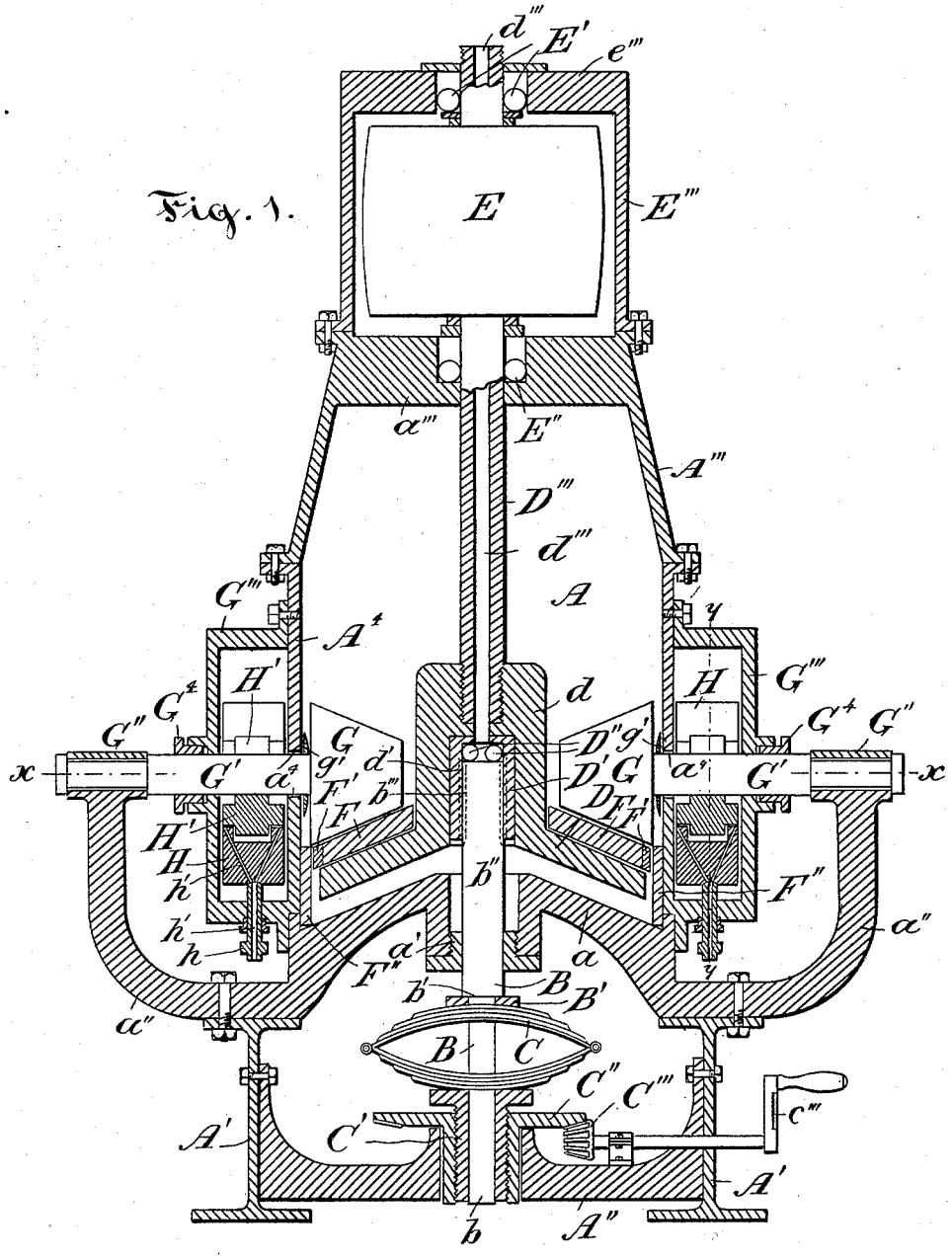
(No Model.) 5 Sheets—Sheet 1.

J. R. GORDON.

ORE CRUSHER.

No. 522,982. Patented July 17, 1894.

Fig. 1.



Witnesses:
Chas. Raley.
W. E. H. Noffke.

Jas. R. Gordon
Inventor
by A. Harvey
his Attorney

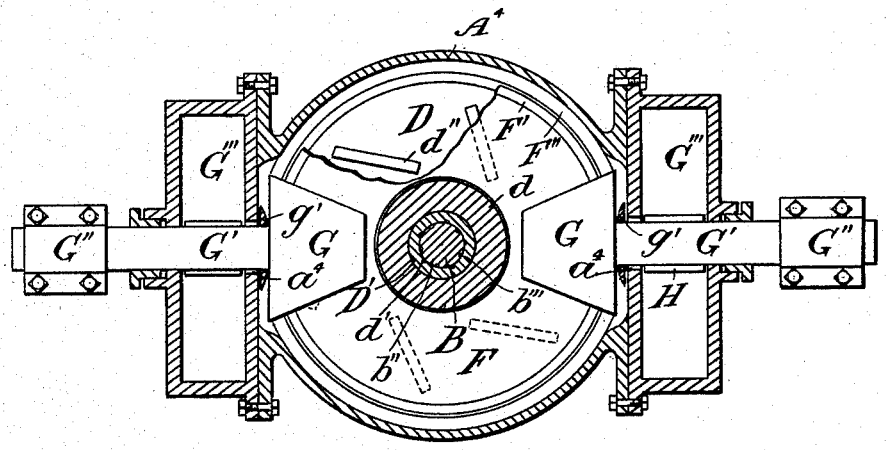
(No Model.) 5 Sheets—Sheet 2.

J. R. GORDON.

ORE CRUSHER.

No. 522,982. Patented July 17, 1894.

Fig. 2.



Witnesses:
Chas. Raley.
W. E. H. Caffree.

Jas. R. Gordon
Inventor
by A. Harvey
his Attorney

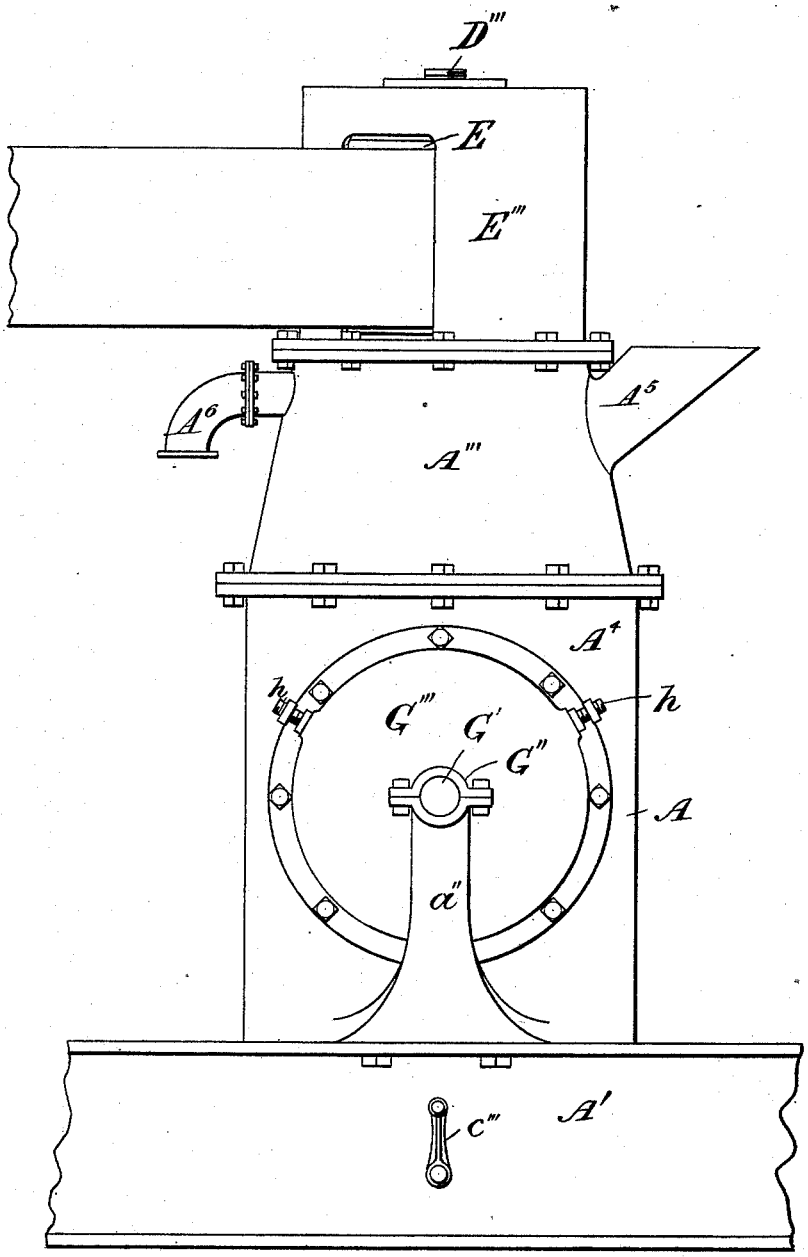
(No Model.) 5 Sheets—Sheet 3.

J. R. GORDON.

ORE CRUSHER.

No. 522,982. Patented July 17, 1894.

Fig. 3.



Witnesses:
Chas. Caley.
W. E. H. Noffke.

Jas. R. Gordon
Inventor
by A. Harvey
his Attorney

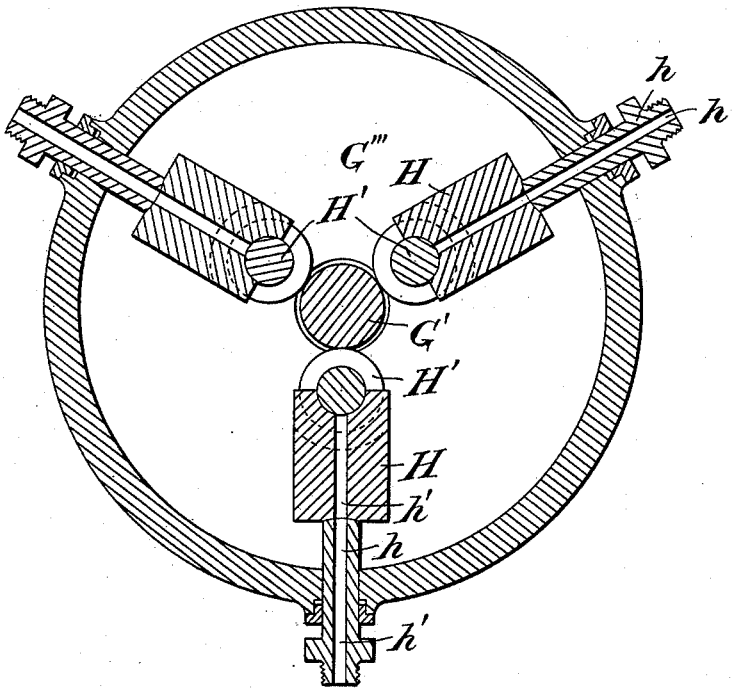
(No Model.) 5 Sheets—Sheet 4.

J. R. GORDON.

ORE CRUSHER.

No. 522,982. Patented July 17, 1894.

Fig. 4.



Witnesses:
Chas. Raley.
W. E. H. Noffke.

Jas. R. Gordon
Inventor
by A. Harvey
his Attorney

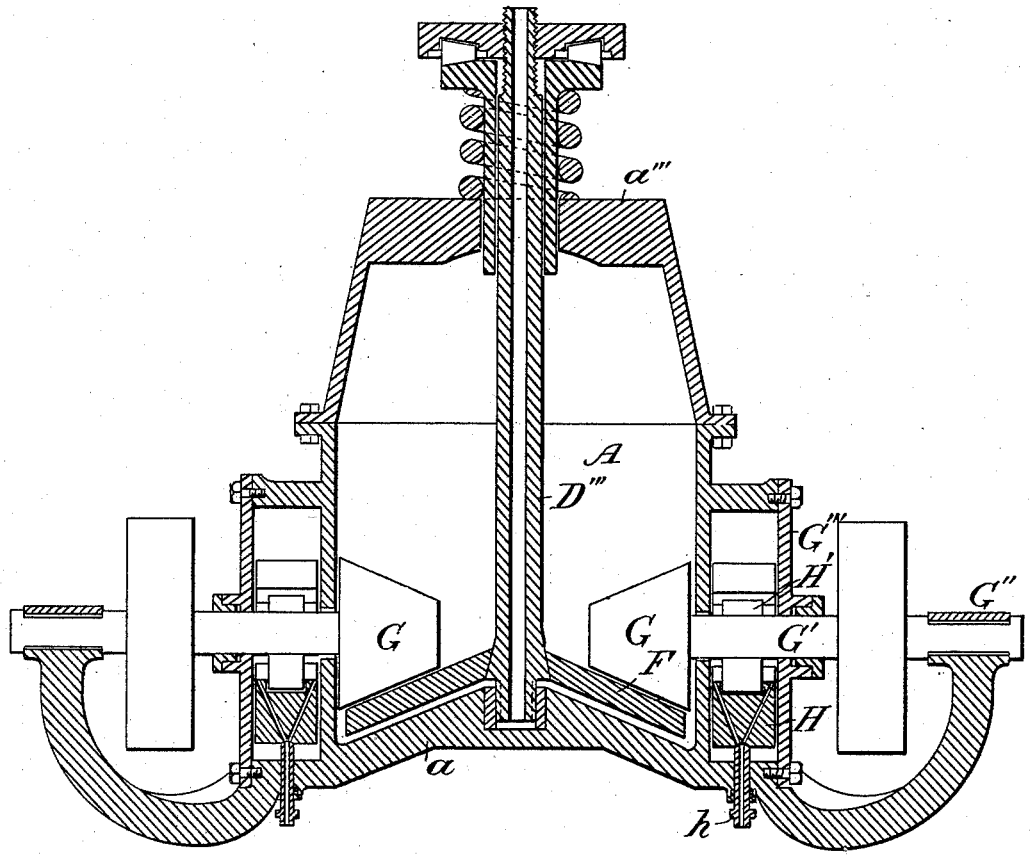
(No Model.) 5 Sheets—Sheet 5.

J. R. GORDON.

ORE CRUSHER.

No. 522,982. Patented July 17, 1894.

Fig. 5.



Witnesses:
Chas. Raley.
W. E. H. Noffke.

Jas. R. Gordon
Inventor
by A. Harvey
his Attorney.

UNITED STATES PATENT OFFICE.

JAMES R. GORDON, OF SUDBURY, ASSIGNOR OF ONE-HALF TO ANGUS WILLIAM FRASER, OF OTTAWA, CANADA.

ORE-CRUSHER.

SPECIFICATION forming part of Letters Patent No. 522,982, dated July 17, 1894.

Application filed February 26, 1894. Serial No. 501,506. (No model.)

To all whom it may concern:

Be it known that I, JAMES R. GORDON, of Sudbury, in the district of Nipissing and Province of Ontario, in the Dominion of Canada, have invented certain new and useful Improvements in Ore-Crushers; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part hereof.

My invention, which will be hereinafter fully set forth and claimed, relates to machines for mills for crushing, grinding or disintegrating and washing or concentrating and amalgamating ores.

The object of my invention is a machine the working parts of which shall be less subject to the destructive influence of the sand and grit that necessarily abound in the working of ores, that shall be better able to withstand such destructive wear and having such parts as are unavoidably subject to rapid wear readily exchangeable and a machine that consequently requires less driving power.

Figure 1 is a transverse section of my improved machine taken through the axis of the grinding rollers. Fig. 2 is a horizontal section of the same on line *x x* Fig. 1. Fig. 3 is an elevation of the same. Fig. 4 is a transverse section of the roller bearings on line *y y*. Fig. 5 shows a modification of the same.

Through a stuffing box *a'*, in the apex of the conical bottom *a* of a completely inclosed pan A, passes a stationary vertical axle B, yieldingly supported below by a spring, C, which is adjustably carried by a cross piece A'' on the girders A' upon which said pan is placed. The adjusting device may consist, as shown, of a bevel pinion C''', operated by a hand crank *c'''* and gearing into a bevel wheel C'' which is journaled in the cross piece A'' and has its eye threaded carrying therein a threaded and flanged bushing or thimble C', the eye of which receives the lower end *b* of the axle and upon the flanged upper end of which the spring C rests, the lower end *b* of the axle which passes through said spring, being reduced in diameter, a shoulder *b'* being thus formed which, by means of an interposed washer B', rests upon the upper part of the spring. Said axle projects a short distance above the apex of the pan bottom and the upper part, *b''*, has journaled upon it the hub *d* of a conical disk D, which it supports upon its flat end, lined with a flat ended steel bushing D'; balls D'' being inserted between the two flat ends, which are steel faced. To the upper end of the hub is firmly secured a shaft D''', the upper end of which carries the driving pulley E, ball bearings E' and E'' being provided immediately above and below in the transverse part *a'''* of the casing top A''' and the top *e'''* of the pulley casing E'''. A water passage, *d'''*, is provided through the shaft D''', hub *d* and end of the bush D' and grooves *d'* and *b'''*, coextensive with each other, are formed in the said bush and journal *b''* to provide an exit for the water after passing the balls D'' and the surface upon which they bear.

The hubbed conical disk D is carried high enough to leave a considerable clear space above the latter; its upper surface being formed with upwardly projecting oblique ribs or ridges *d''* (Fig. 2). These form a clear space between the upper surface of said disk and the lower surface of the conical disk which it supports, which the mercury may readily enter, and the obliquity of the ribs *d'* prevents the latter from rising too high toward the center. Upon the top of these ridges rests a chilled conical disk F which has a central opening into which the hub *d* fits loosely and which has shrunk upon its edge a steel ring F', bearing against a removable cylindrical lining F'' of the pan casing A of similar material. Upon the disk F, which forms the false rotary bottom of the pan, bear the two chilled conical rolls G G, one at each side, each secured upon a horizontal shaft or axle G', which projects outwardly through an opening a^4 in the casing A^4. A disk or washer *g'*, of leather or rubber, is placed upon the shaft G' between the roll G and casing A^4, covering said opening, fitting the shaft tight and having the edges next to the roll beveled, and acting as a check valve. Each of these shafts runs in two bearings, the outer one, G'', being an ordinary journal bearing carried by an arm or bracket *a''*, which may conveniently be formed integrally with the pan bottom *a*,

and the other, inner one, being a roller bearing, the box or casing, G‴, of which is secured to the pan casing and provided with a stuffing box G^4 at the outside, in which the axle G′ runs, the opening a^4 in the casing A, through which the axle runs, being larger than the axle. Each box G‴ contains three, (or more) brass blocks, H, disposed radially around the shaft or axle, in each of which is journaled a steel roller H′, bearing on the shaft and each provided with a stem h projecting through the rim of the box. Both stem and block are provided with a water passage h', that in the latter being split up or forked and directed to terminate in the bearings of the pintles of the rollers. The stems h are provided with means to make them adjustable in the rim of the box so that the blocks H may be set and any wear taken up and also with means of making a watertight joint with the said rim.

The operation of the machine is as follows: The ore is introduced through a feed hopper A^5 in the upper part of the casing top A‴ and motion is given to the disk D by a belt on the pulley E. With the disk D rotates the disk F, and this again rotates the conical rolls G. Between the disk F and the rolls G the ore is crushed. If larger pieces come between the rollers and disk than can at once be reduced, the false bottom F D yields by depressing, through the axle B, the spring C upon which it is supported, the tension of said spring being regulated by raising or lowering the bushing C′ by turning the crank C‴. As water is copiously used to wash away the débris, reduced to sand by the rolls, the difficulty hitherto experienced has been with the bearings on account of the sand and grit. These have been cut up and destroyed so rapidly as to throw the machine out of repair after a few hours' work, thus making it almost useless. This difficulty it is endeavored to overcome in this improved machine by forcing in the water, which is necessary to carry away the sand and grit, from behind the bearings, thus causing the current to be in the opposite direction to that of the sand on its way to the bearings. Thus, water passes through the shaft D‴ into the bushing D′ on the top of the axle B around the balls D″ and out through the channels d' and b''' to the bottom a of the pan, keeping the bearing both cool and clean, sand being prevented to get in, or carried back whence it came. Water also passes through all the stems h and blocks H into the boxes G‴ and thence through the openings a^4 around the shafts G′ into the pan A, thus cooling and washing the bearings of the rollers H and flowing in a current opposite to that in which sand and grit could get to the stuffing boxes G^4. The water thus continuously flowing into the pan A washes the ore and floats away the light particles to which the contents of the pan are continuously being reduced, openings for the overflow such as A^6 being provided near the top of the pan. The gold or other precious metal settles and is retained by mercury placed upon the pan bottom a.

Instead of the disk D being supported by a vertical axle carried by a spring below, the shaft D‴ may be hung upon a spring supported roller bearing at the top, lateral motion of the disk being provided against by a journal below the disk, as shown in Fig. 5.

I claim as my invention—

1. In an ore crusher, the combination of an inclosed pan with conical bottom, a vertical non-rotative axle passing through a gland in said bottom and through a guide and spring below upon which latter it is supported, a conical disk supported upon the upper flat end of said axle by a ball bearing within the hub of said disk, a vertical hollow shaft secured to said hub extending upwardly and run in ball bearings at its upper end, a conical disk supported on the disk aforementioned, conical rolls bearing on the last mentioned disk each mounted on a horizontal shaft, a journal bearing at the free end of each shaft supported on a bracket held by the pan and a roller bearing near each conical roll in a casing secured to the pan and provided with a stuffing box and with adjustably carried blocks in which the rollers are journaled and through which a water supply passes to said journals, substantially as set forth.

2. In a water flushed roller bearing for ore crushers, the combination of a box or casing having a free opening on one side for the shaft, a stuffing box opposite adapted to hold a shaft passing through said opening, necked rollers disposed around and adapted to bear on a shaft passing through said box as aforementioned, blocks each having a cavity in which one of said rollers is journaled provided with water passages ending in said journals, and a hollow stem holding each block adjustably in the rim of the casing, substantially as set forth.

3. In an ore crusher, the combination with the pan casing, of a horizontal shaft or axle passing through an opening in the same and carrying a conical roll at the end and a flexible disk between said roll and said opening, a box or casing around said opening provided at the opposite side with a stuffing box through which said shaft passes, rollers in said box bearing on said shaft, blocks carrying said rollers and having water passages terminating in the journal bearings of said rollers and carried by hollow stems passing adjustably through the rim of said casing and an outside journal bearing for the free end of said shaft carried by an arm or bracket held by the pan casing, substantially as set forth.

4. In an ore crusher, the combination with the conical bottom of the pan, of a gland adapted to hold a vertical axle slidingly, a cross piece below said bottom rigidly connected with the same and having the necked and internally threaded hub of a bevel wheel journaled therein, a threaded thimble in said

hub, a spring supported on said thimble, a vertical axle having a shouldered lower part passing through said spring and resting thereon by its shoulder and held slidingly in said thimble its upper part passing through said gland and projecting above the same and an axle with crank and carrying a bevel pinion gearing in said bevel wheel, substantially as set forth.

5. In an ore crusher, the combination of a pan casing having a conical bottom, a vertical axle passing through a gland in said bottom and yieldingly supported below and flat ended at the upper end, a hubbed conical disk with upwardly extending vertical hollow shaft journaled in ball bearings at its upper end, a cupped bushing in the lower part of the hub having its top perforated to form a continuation of the water passage in the shaft, balls between the upper end of the axle and the top of the bushing, and escape passages in said bushing and journal of the axle, substantially as set forth.

6. In an ore crusher, the combination of a pan casing having a conical bottom, a removable cylindrical lining in the lower part of the pan, a conical disk with obliquely ribbed surface supported upon a vertical non-rotative axle yieldingly supported and passing through a gland in the bottom of the pan, a conical disk supported on the upper ribbed surface of the disk aforementioned and a removable rim or hoop upon the edge of said last mentioned disk, substantially as set forth.

7. In an ore crusher, the combination of an inclosed pan having a vertical driving shaft journaled in its upper part and carrying a conical disk with obliquely ribbed surface yieldingly supported and through which and said shaft a water supply is allowed to enter said pan, a conical disk resting on said ribs, conical rolls on horizontal shafts bearing on said disk, a roller bearing for each shaft inclosed in a casing covering the opening in the pan through which the roll shaft passes and provided with a stuffing box on the outside and a water supply introduced into said casing and entering the pan through the opening through which the roll shaft passes, substantially as set forth.

8. In an ore crusher, the combination of a conical disk with hollow vertical shaft extending upward and carried by a spring support in a water flushed bearing, a conical disk supported by the disk aforementioned, conical rolls bearing on said last mentioned disk, each mounted on a horizontal shaft having its free end journaled in a bearing then passing through a stuffing box and being supported near said roll upon rollers in a water flushed box communicating through a space around said shaft with the inclosure in which said rolls rotate, an inclosure or pan casing with conical bottom corresponding to said disks provided with ball bearings for the vertical shaft at its upper part and with means for supporting the same vertically and with arms or brackets carrying the outer bearings of the conical rolls, roller bearing boxes for the conical roll shafts attached to said pan casing, each provided with a stuffing box, rollers upon which said shaft is carried, blocks formed with water passages and in which said rollers are journaled and which are provided with stems formed with water passages and projecting adjustably through the casing, substantially as set forth.

In testimony whereof I have signed in the presence of the undersigned witnesses.

JAMES R. GORDON.

Witnesses:
D. BAIKIE,
W. H. HOVEY.