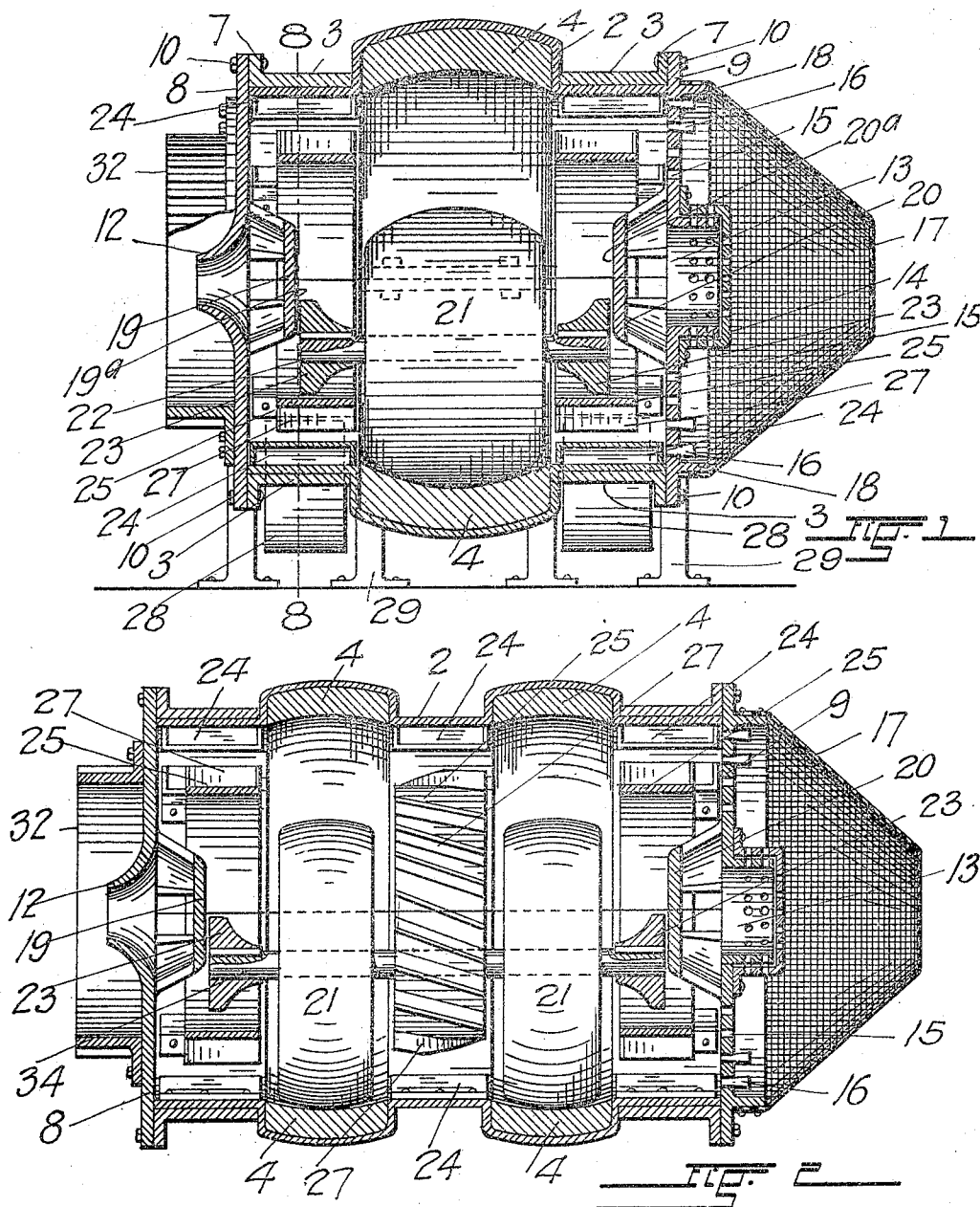


J. S. BARTLEY.
CRUSHING MILL.
APPLICATION FILED FEB. 11, 1911.

1,064,680.

Patented June 10, 1913.

3 SHEETS-SHEET 1.

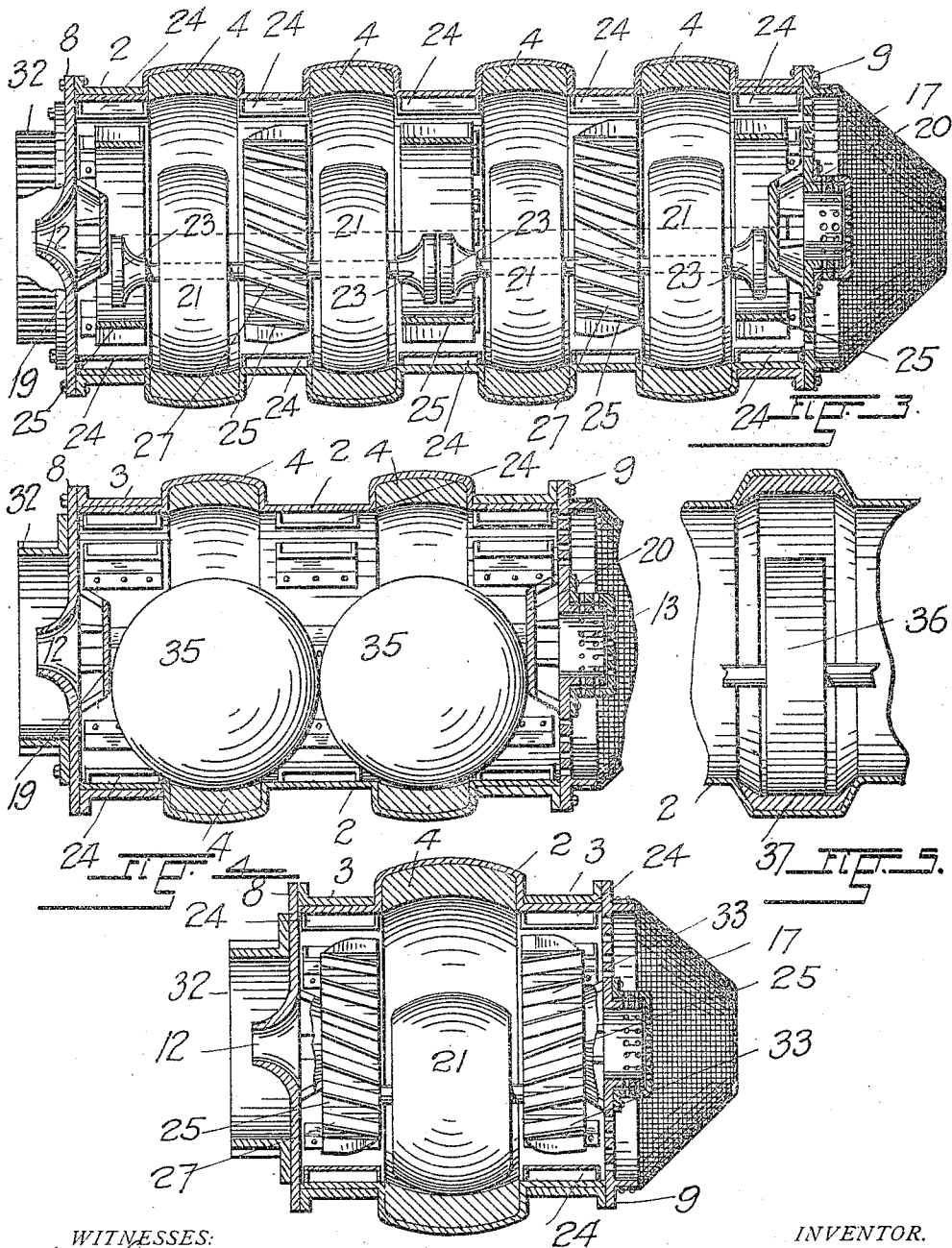


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1,064,680.

3 SHEETS—SHEET 2.



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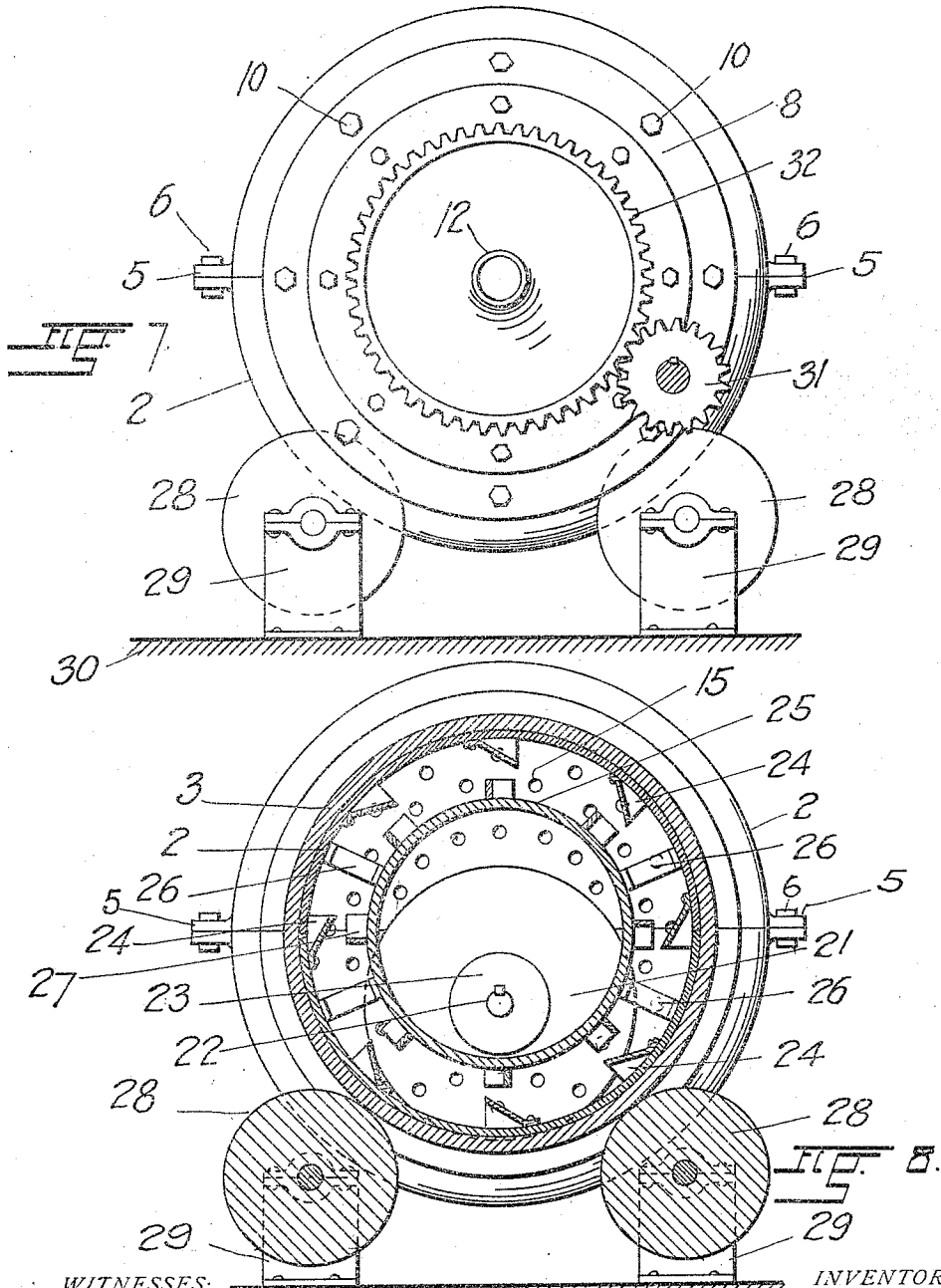
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JOSEPH S. BARTLEY, OF DENVER, COLORADO.

CRUSHING-MILL.

1,064,680.

Specification of Letters Patent.

Patented June 10, 1913.

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To all whom it may concern:

Be it known that I, JOSEPH S. BARTLEY, a citizen of the United States of America, residing at Denver, in the county of Denver and State of Colorado, have invented certain new and useful Improvements in Crushing-Mills, of which the following is a specification.

My invention relates to crushing-mills of the class employed to comminute ore, rock, cement and other similar substances and its principal object resides in the provision of a mill in which one or more mullers are loosely supported in circular mortars which are mounted to rotate about a horizontal axis.

Other minor objects of the invention will fully appear in the following description, reference being had to the accompanying drawings in the various views of which like parts are similarly designated and in which—

Figure 1, represents a longitudinal vertical section of my improved crusher in its simplest form, Fig. 2, a vertical longitudinal section of the revolving element comprised in the invention, in which two mortars are provided for the support of duplex mullers. Fig. 3, a section similar to Fig. 2, showing the method of assembling a larger number of mullers in one mill, Fig. 4, a similar section of the revolving element of a mill in which the mullers are spherical, Fig. 5, a fragmentary sectional view of a mortar and the therein supported muller, the contacting circular surfaces of which are flat, Fig. 6, a longitudinal section of the revolving element of the mill shown in Fig. 1, provided with means for returning a portion of the material discharged from the mortar, into the same for further treatment, Fig. 7, an end view of the mill and Fig. 8, a transverse section taken along the line 8—8 Fig. 1.

Referring to Figs. 1, 7 and 8 of the drawings, the reference character 2 designates a cylindrical shell, longitudinally divided into two halves which are held together by means of tires 3 fitted around opposite ends thereof. The portion of the shell intermediate these tires is expanded to form an internal recess for the reception of the circular mortar 4, and the two halves of the shell are at this point provided with flanges 5 which are connected by means of bolts 6. The

tires 3 have at their outer edges, circumferential flanges 7 to which the heads 8 and 9 which close the ends of the shell 2, are fastened by means of bolts 10. The head 8 at the feed end of the shell has a central inlet-opening formed by an outwardly projecting neck 12 which, in practice, communicates with a chute or other appliance through which the material to be crushed, is conducted to the mill, and the opposite head 9 at the discharge end of the mill, has a central, outwardly projecting nozzle 13 which normally is closed by means of a cap 14. The head 9 is furthermore provided with a plurality of apertures 15 which, if so desired may be closed by means of plugs 16, and the nozzle 13 as well as the cap 14, are likewise formed with perforations through which the material discharged from the mortar may pass into a conical receiver 17 which is fastened at its edge around a circular flange 18 which projects concentrically outwardly from the head 9. The receiver 17 is preferably composed of wire screen or other foraminous substance, for the purpose of discharging the comminuted matter, while the mill is in operation.

The central openings of the two heads 8 and 9 communicate respectively with the interiors of inwardly projecting hollow bosses 19 and 20 formed integral with the said heads to provide at their extreme ends, guiding surfaces 19^a and 20^a which in the operation, serve to maintain the muller supported in the mortar, against lateral displacement, as will hereinafter be described and the circumferential walls of these bosses 19 and 20 are formed with openings through which the material may pass into and out of the shell.

The inner surface of the mortar 4 which occupies the recess formed by the expanded portion of the shell, is concave and its edges are either in alinement with or slightly below the interior surfaces of the end portions of the shell.

A muller 21 whose circumferential surface is convex to conform with the interior surface of the mortar, is loosely supported in the latter and it carries an axially disposed shaft 22 which, extending at opposite sides thereof is provided, at its extremities, with blocks 23, the outer surfaces of which extend contiguous to the guiding faces 19^a and 20^a at the inner ends of the hollow bosses

19 and 20, for the purpose of maintaining the muller against lateral displacement while the mill is in operation.

The end portions of the shell 2, at opposite sides of the mortar 4, are provided with a series of buckets 24 which are arranged consecutively along the interior surfaces of the said portions, to convey the material fed thereinto, to points above the axis of the shell, where it is discharged upon the exterior surface of an annular plate 25 which is secured concentrically in spaced relation to the said end portions by means of struts 26 and each of which has upon its outer surface a series of consecutively arranged, oblique riffles 27 which guide the material toward the discharge end of the mill.

The material fed into the mill through the central neck 12 and the circumferential ports in the boss 19, is thus conveyed by means of the adjacent series of buckets 24 to a point above the muller 21, and is through the instrumentality of the riffles 27 on the corresponding annulus 25, discharged into the mortar in front of the muller, and the comminuted matter discharged from the mortar is in the same manner conveyed toward the apertured head 9 through which it passes into the receiver 17.

The shell 2 is supported to revolve about a horizontal axis coincident with its longitudinal axis, upon rollers 28 which engage the circumferential surfaces of the tires 3, and are rotatably supported in pairs, in bearing boxes 29 upon a suitable base 30, and the said movement is imparted to the shell by means of a pinion 31 which connects with a conveniently located motor and which meshes with an annular gear-wheel 32 concentrically secured upon the outer surface of the head 8 at the feed-end of the shell.

Instead of directing the oblique riffles upon the annular plate 25, toward the discharge end of the shell, they may be arranged in the opposite direction, as shown at 33 in Fig. 6, for the purpose of returning the larger constituents of the comminuted matter discharged from the mortar into the same to be again subjected to the crushing action of the muller 21.

When the mill is constructed with two mortars, as is shown in Fig. 2, the respective mullers are connected to move in unison by means of a shaft 34 which, projecting beyond opposite sides thereof, carries at its extremities, the blocks 23 which engage the guiding faces of the bosses 19 and 20 on the heads 8 and 9.

In the form illustrated in Fig. 3, the shell carries four consecutively arranged mortars, and the mullers supported therein are connected in pairs in the manner shown in Fig. 2, the outermost blocks 23 engaging the guiding surfaces of the respective bosses 19 and 20 while those at the inner ends of the

shafts 34 engage each other. The portions of the shell which separate the several mortars are each provided with a series of buckets 24 and a riffled plate 25 as hereinbefore described, so that the material fed into the shell through the neck 12, is moved consecutively from one mortar into the next succeeding one, until it has reached the end portion of the shell whence it is discharged through the apertured head 9 into the receiver 17.

In the form shown in Fig. 4 the spherical mullers 35 engage each other and the guiding surfaces of the bosses 19 and 20 circumferentially and thus obviate the use of the blocks 23, while in Fig. 5, the circular surfaces of the mortar 36 and the muller 37, are flat instead of concave and convex as are those hereinbefore described.

As the operation of the mill has been referred to at intervals in the course of the description, it will only be necessary to outline it briefly at this point.

The material to be crushed is together with a suitable quantity of water fed through the neck 12 into the revolving shell 2 and is by means of the buckets 24 and the riffles upon the corresponding ring 25, carried into the mortar at a point in front of the muller which rotates by reason of its contact with the mortar and which by its weight as well as its rotary movement, crushes the material into minute particles which flow into the end portion of the shell adjacent the apertured head 9. The fineness of the material to be discharged into the receiver 17 is determined by closing one or more of the outer series of openings in the head 9 by means of the plugs 16 for it will be observed, that, inasmuch as the shell is continuously provided with water, the particles of the comminuted ore will be classified according to their size and weight, the smaller and lighter particles being held in suspension near the surface of the fluid contained in the shell while the heavier matter sinks to the bottom thereof. By arranging the riffles at the discharge end of the shell, in the manner shown in Fig. 6, these heavier particles are returned to the mortar while the lighter matter, nearer the axis of rotation, is discharged through the apertures in the plate 9.

In the treatment of very hard substances, the numbers of mullers may be increased to a practically unlimited extent, as shown in the forms represented in Figs. 2 and 3, and the shape of the contacting surfaces of the mortars and the mullers, and the size of the latter may be varied to render the mill suitable for the treatment of materials of different characters.

The removable cap 14 upon the nozzle 13 affords a convenient means of access to the interior of the shell and the blocks at op-

posite sides of the muller, in coöperation with the bosses 19 and 20 on the heads 8 and 9 maintain the muller in position in the circular mortar while the latter revolves about its horizontal axis.

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

1. A crushing mill comprising a cylindrical shell mounted to rotate about a horizontal axis, heads closing the ends of the said shell, and provided with central, guiding faces transverse to its axis of rotation, an annular mortar having its inner surface within the said shell, and a circular muller loosely supported upon the said surface and having the opposite ends of its axle contiguous to the said faces.

2. A crushing mill comprising a cylindrical shell mounted to rotate about a horizontal axis, heads closing the ends of the said shell and provided with inwardly projecting hollow, circumferentially apertured bosses having guiding faces transverse to the axis of rotation, an annular mortar having its inner surface within the said shell, and a circular muller loosely supported upon the said surface and having parts contiguous to the said faces, the said heads having openings communicating with the interiors of the respective bosses.

3. A crushing mill comprising a cylindrical shell mounted to rotate about a horizontal axis, heads closing the ends of said shell and having faces transverse to its axis of rotation, an annular mortar having its inner surface within the said shell, a circular muller loosely supported upon the said surface, and blocks secured at opposite sides of the said muller contiguous to the said faces.

4. A crushing mill comprising a cylindrical shell mounted to rotate about a horizontal axis, heads closing the ends of said shell and having faces transverse to its axis of rotation, a plurality of annular mortars having their inner surfaces within the said

shell, circular mullers loosely supported upon the respective surfaces, blocks secured at the outer sides of the outermost mullers contiguous to the said faces, and blocks extending laterally from adjoining mullers, contiguous to each other.

5. A crushing mill comprising a cylindrical shell mounted to rotate about a horizontal axis, an annular mortar having its inner surface within the said shell, a circular muller loosely supported upon the said surface, means for feeding material into the said shell, a series of buckets upon the interior surface of the shell for conveying material fed into the same, to a point above its axis of rotation, and a ring spaced concentrically from the said series of buckets and having oblique riffles upon its outer surface.

6. In a crushing mill, a cylindrical shell mounted to rotate about a horizontal axis, a plurality of annular mortars within the said shell in spaced relation to its ends and to each other, the said shell having guiding surfaces at its ends, and circular mullers loosely supported in said mortars and having laterally projecting parts in engagement with the corresponding parts of the adjoining mullers and with the said faces maintaining them against lateral displacement.

7. In a crushing mill, a cylindrical shell mounted to rotate about a horizontal axis, a plurality of annular mortars within said shell in spaced relation to each other, and circular mullers loosely supported in the respective mortars and rigidly connected in pairs, each pair having laterally projecting parts in engagement with corresponding parts on the adjoining pair maintaining them against lateral displacement.

In testimony whereof I have affixed my signature in presence of two witnesses.

JOSEPH S. BARTLEY.

Witnesses:

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G. J. ROLLANDET.