

Feb. 24, 1931.

E. G. STONE

1,794,041

BALL OR TUBE MILL

Filed Dec. 9, 1929

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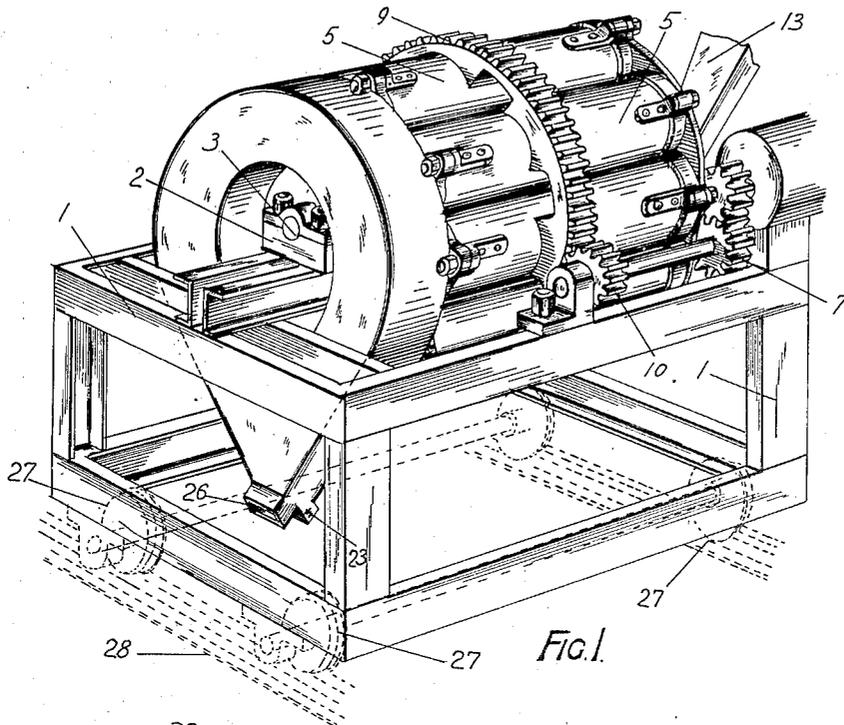


FIG. 1.

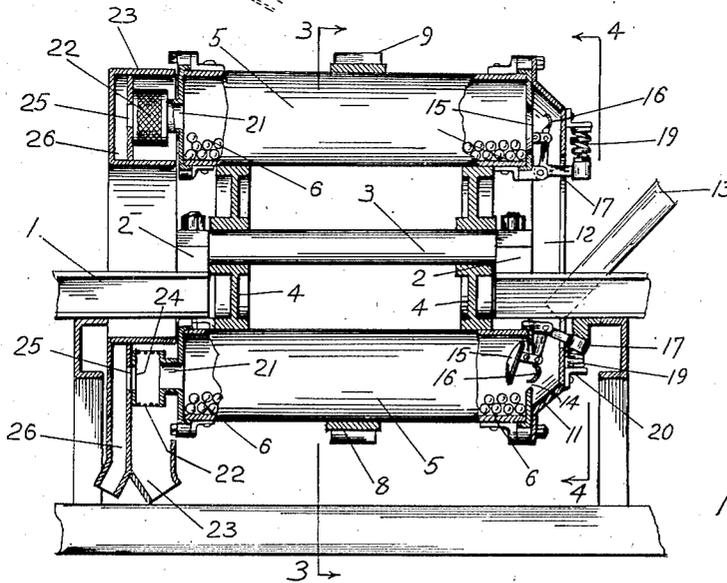


FIG. 2.

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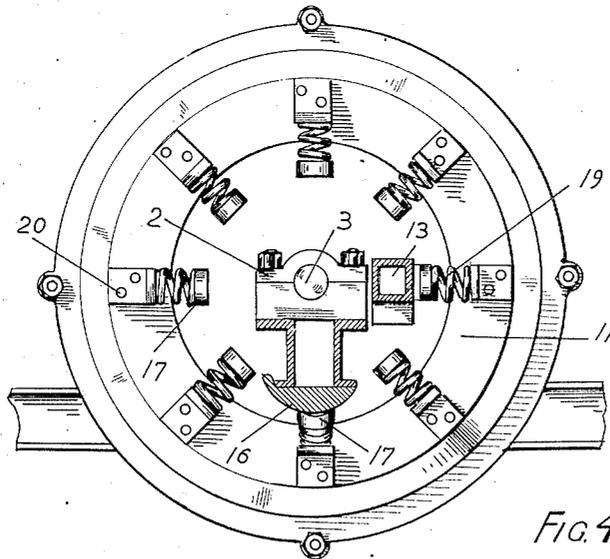
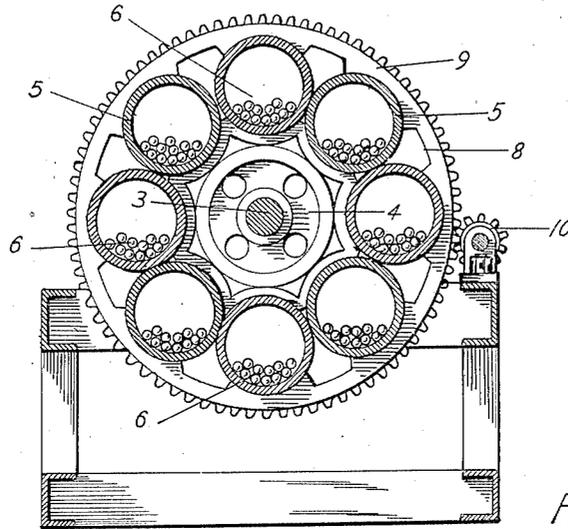
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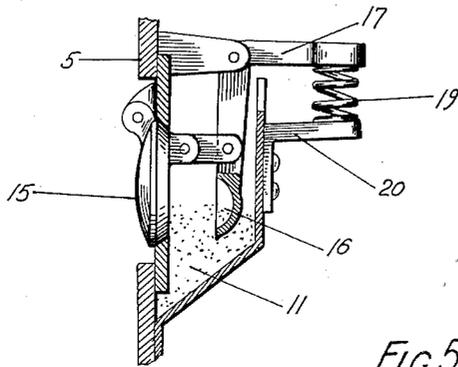


FIG. 5.

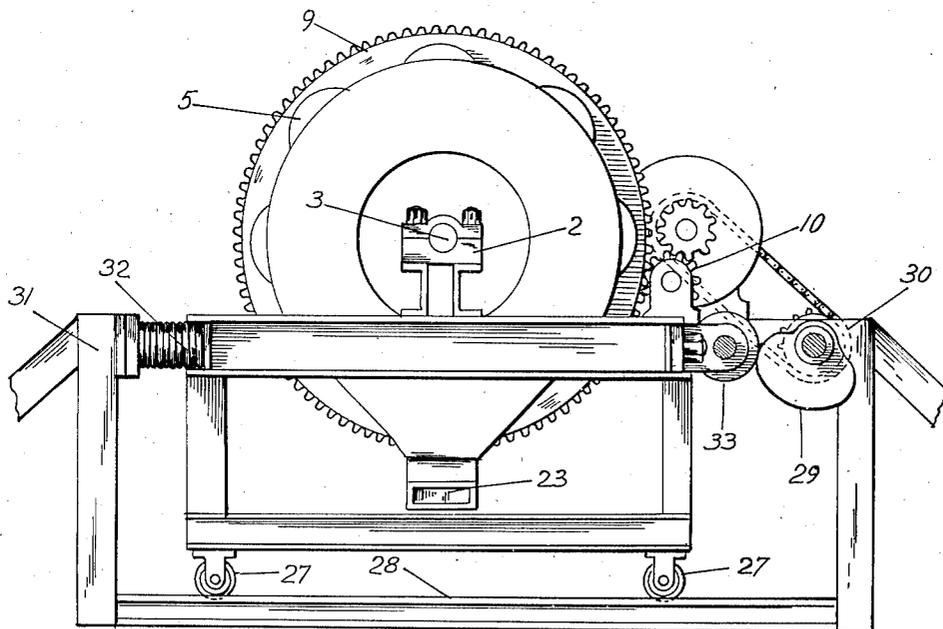


FIG. 6.

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UNITED STATES PATENT OFFICE

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BALL OR TUBE MILL

Application filed December 9, 1929, Serial No. 412,649, and in Australia January 21, 1929.

This invention relates to ball or tube mills. The object of the invention is to provide apparatus whereby the running and repair costs thereof will be greatly minimized and better balance of the apparatus will be maintained during motion thereof.

Referring to the accompanying drawings in which the invention is illustrated, Fig. 1 is a perspective view of the apparatus the framing thereof being shown mounted on wheels and rails shown in dotted lines; Fig. 2 longitudinal sectional elevation; Figs. 3 and 4 cross-sectional elevations on lines 3—3 and 4—4 respectively, Fig. 2; Fig. 5 sectional detail view of feed valve mechanism; Fig. 6 end elevation showing means for permitting agitation or reciprocation of the apparatus.

It is to be understood that the apparatus may be utilized for operating upon material with or without providing in association with the apparatus means for agitating or reciprocating same.

The apparatus is furnished with a suitable framing 1 upon which is supported bearings 2 in which the rotatable shaft 3 is journaled. Such shaft 3 has keyed thereto spiders 4 to which are fixed a radial series of cylinders 5 in which are carried a number of loose balls 6. A ring 8 is fixed preferably centrally around the whole of the said cylinders 5, the said ring 8 being furnished with spur teeth 9. Rotation of the cylinders 5 as a whole may be effected through the pinion wheel 10 meshing with the teeth 9 and also with a driving wheel 7 which latter is driven from any suitable source of power.

An annular hopper 11 is fixed to one end of the cylinders 5 and such hopper has an opening 12 into which may project the discharge end of a feed chute 13 for material to be treated in the cylinders 5. At the end of each of the said cylinders 5 at which the hopper 11 is located is an opening 14 with which is pivotally associated a valve 15 with which is also pivotally associated spoon feed means 16 for feeding material from the hopper 11 into the respective cylinders 5. The valves and spoon feeders 16 are respectively pivoted to the cylinders 5 and the spoon feeders 16 have connected to them an arm

17 adapted to contact with a cam 18 fixed to the framing 1 when the respective arms 17 are brought into contact with the said cam 18 upon rotation of the cylinders 5. Normally the valves 15 are adapted to close the openings 14 but when the arms 15 contact with the cam 18 the valves 15 are opened from their seatings on said openings 14 and the spoon feeders 16 are also simultaneously operated to feed a proportion of the material admitted to the hopper 11 into the respective cylinders 5. Upon the arms 17 leaving the cam 18 the compressible coil spring 19 operates to automatically close the valves 15 on their said seatings. Spring 19 is supported on a bracket 20 on the hopper 11.

At the opposite end of the separate cylinders 5 is an opening 21 through which material treated in the said cylinders 5 may pass. Associated with each said openings may be a wire gauze or other suitable screen 22 into which passes the treated material to be screened whereby fine material can pass therefrom into the delivery chute 23, and coarser material may pass through an opening 24 in the screen 22 to an opening 25 in delivery chute 26. Such chutes are fixed to the framing 1.

Should it be desired to provide the apparatus with means whereby it may be given a reciprocating agitating movement transversely of the shaft 3 while the cylinders 5 are rotating wheels 27 may be provided for the framing 1. Said wheels 27 may run on rails 28 set below the apparatus. When such agitating means are furnished, the framing 1 has associated with one end thereof a rotatable roller 33 which is adapted to contact with a cam 29 rotatably carried on a subsidiary framing 30. The cam 29 may be belt connected to the driving means for the cylinders 5 whereby rotation of the said cam 29 can be effected. Associated with the opposite end of the framing 1 is another subsidiary framing 31 having thereon a buffer spring 32 adapted to return the apparatus to normal position in relation to the cam 29 after each movement of the apparatus in one direction through the operation of the cam 29.

In operation, when material to be treated

is fed to the annular hopper 11 by means of the feed chute 13 and the cylinders 5 are rotated, a portion of the said material is fed from such hopper 13 into the respective cylinders 5 by operation of the arms 17 through their contacting with the fixed cam 18 whereby the spoon feeders 16 will be operated with the simultaneous operation and opening of the valves 15. The material so fed into the cylinders 5 is operated upon by the balls 6 in the cylinders 5 and is thus broken or crushed in its passage through the cylinders 5. At the exit end of the cylinders 5 the treated material may be passed into the screens 22 and delivery chutes 23 and 26.

If the agitation means above described are associated with the apparatus the balls 6 will also be given a greater agitating movement and dynamic effect in the cylinders 5 as well as the material therein.

What I claim as my invention and desire to secure by Letters Patent is:—

1. A ball or tube mill comprising a frame, a series of cylinders rotatably mounted on said frame and carrying a plurality of balls for crushing material, a hopper for bulk material being treated and associated with said cylinders, means for gradually feeding said bulk material into said cylinders separately, comprising a pivotally mounted valve over an opening in said cylinder, the said valve having pivotally associated therewith a spoon feeder for material, the valve and the spoon feeder being adapted to be operated simultaneously upon rotation of the cylinders, whereby upon the opening of the valve a portion of material in the hopper will be fed therefrom into the respective cylinders by the spoon feeder associated therewith, means are provided in association with the apparatus whereby said valve will be closed when material has been fed to said cylinder and said spoon feeder will be returned to normal position thereof, and means permitting discharge of treated material from said cylinders.

2. A ball or tube mill, as claimed in claim 1, in which the spoon feeder has an extending arm adapted to contact during rotation of the cylinders with a cam fixed to the framing of the apparatus, cooperation of said arm with said cam enabling opening of the said valve and the feeding of material by the spoon feeder to its respective cylinder, and spring means associated with the framing of the apparatus cooperates with the said arm to close the said valve and to return the spoon feeder to normal position thereof.

3. A ball or tube mill comprising a frame, a series of cylinders rotatably mounted on said frame and carrying a plurality of balls for crushing material fed to said cylinders, a hopper for bulk material to be treated in said cylinders associated with said cylinders, means for gradual feeding of said bulk material from said hopper into said cylinders

separately, and means permitting discharge of treated material from said cylinders comprising a compartment fixed discharge chute, separate screens associated with said chute whereby a portion of the treated material is screened and passes into one compartment of the discharge chute and the other portion of the material after being caught in the respective screens passes therefrom into the other compartment of the discharge chute.

4. A ball or tube mill comprising a frame, a series of cylinders rotatably mounted on said frame and carrying a plurality of balls for crushing material fed to said cylinders, a hopper for bulk material to be treated in said cylinders associated with said cylinders, means for gradual feeding of said bulk material from said hopper into said cylinders separately, means permitting discharge of treated material from said cylinders, rail carriers upon which the frame is reciprocally mounted and means for enabling the frame with ball carrying cylinders thereon to reciprocate during rotation of the said cylinders transversely of the shaft upon which the said cylinders are carried.

5. A ball or tube mill according to claim 4, in which the main framing of the apparatus is fitted with a rotatable roller adapted to coact with a rotatable cam on a subsidiary framing to move the apparatus in one direction another subsidiary framing has arranged thereon a buffer spring adapted to return the apparatus in opposite direction for operative relation with said cam.

In testimony whereof I affix my signature.
EDWARD GILES STONE.