J. J. McINTYRE AND C. KOEHLER.

AUTOMATIC ROUGH BALL GRINDER.

APPLICATION FILED AUG. 21, 1918.

1,306,767.

Patented June 17, 1919

2 SHEETS—SHEET 1.

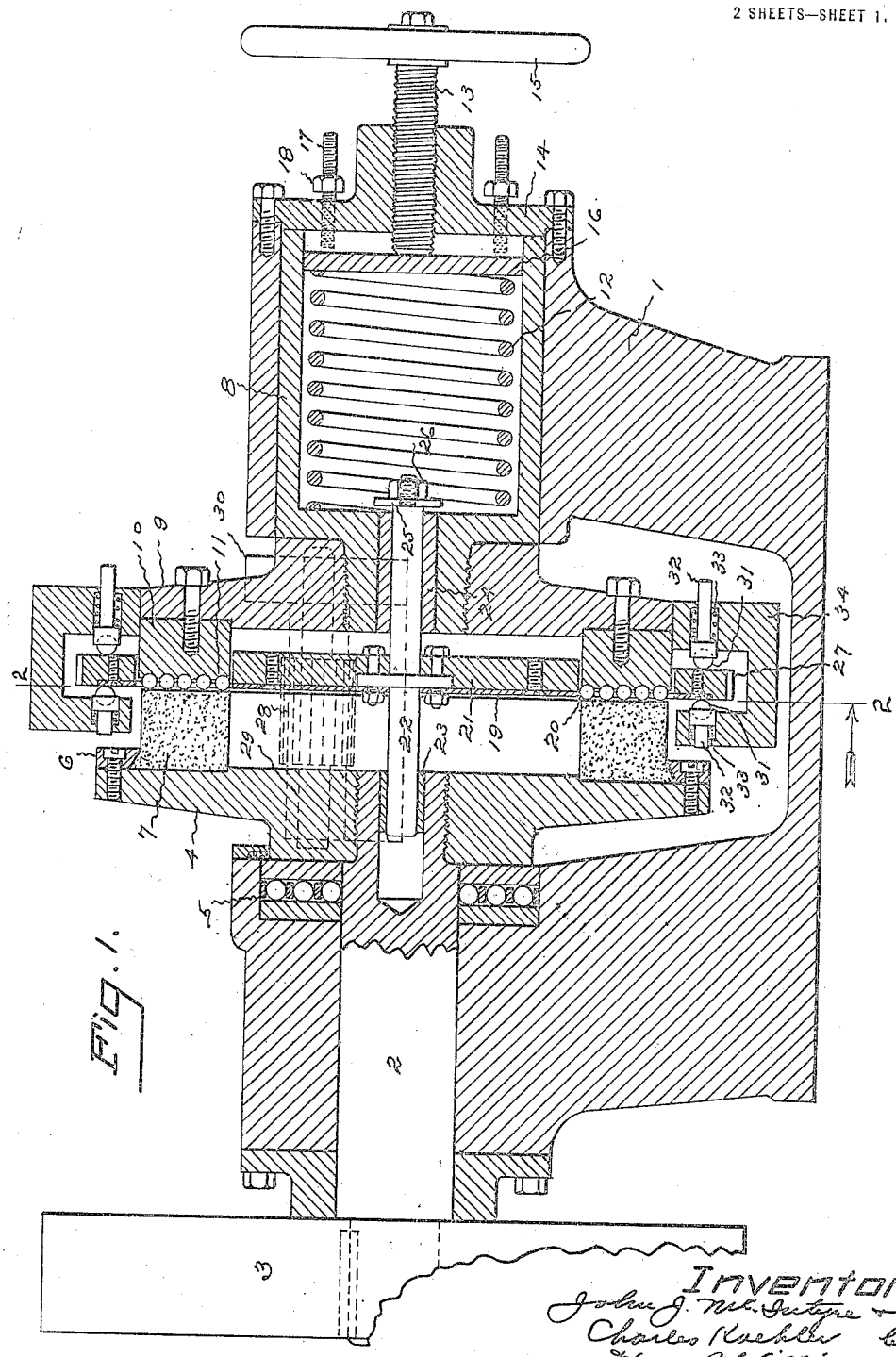


Fig. 1.

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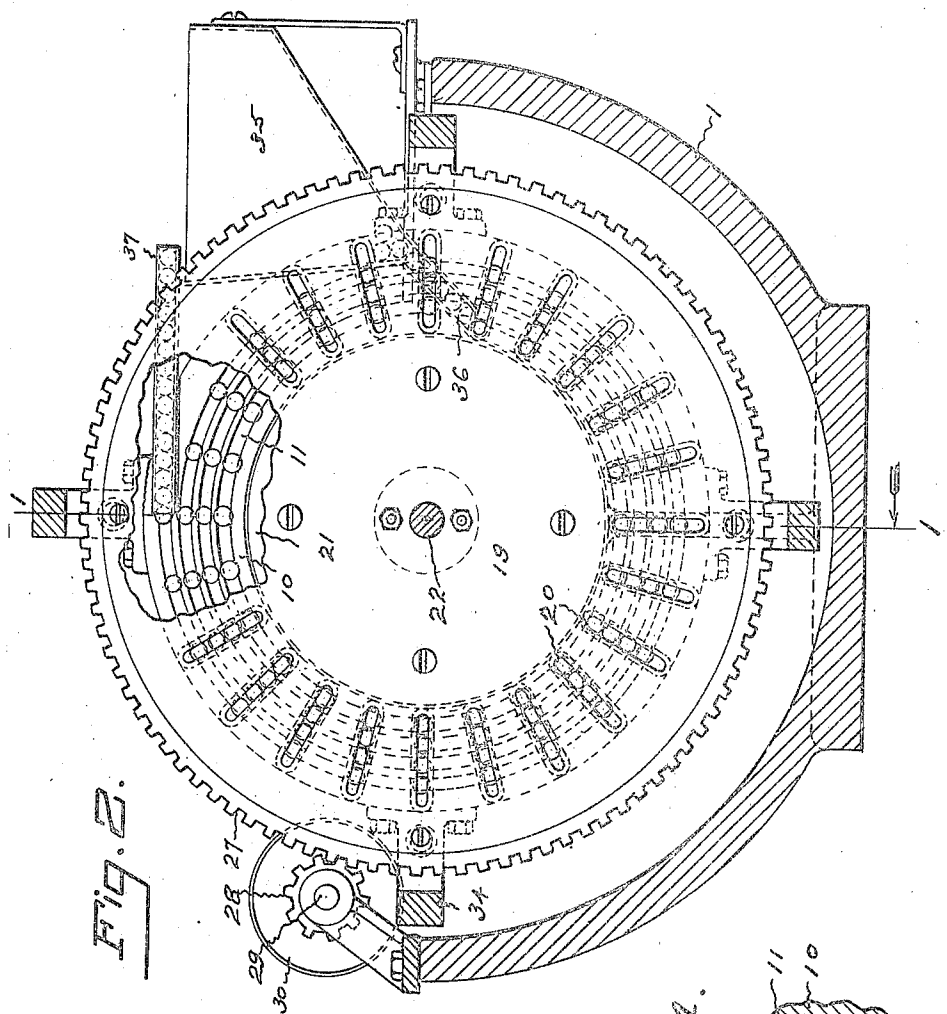


Fig. 2.

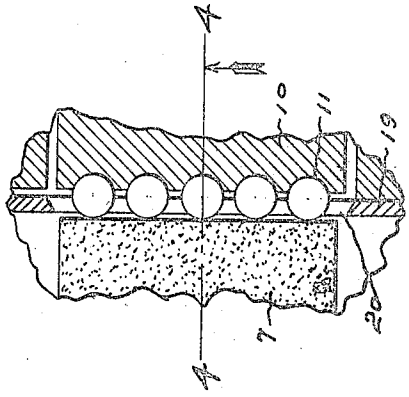


Fig. 3.

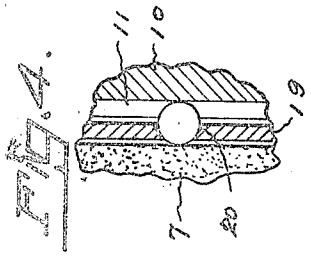


Fig. 4.

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UNITED STATES PATENT OFFICE.

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AUTOMATIC ROUGH-BALL GRINDER.

1,306,767. Specification of Letters Patent. Patented June 17, 1919.

Application filed August 21, 1918. Serial No. 250,784.

To all whom it may concern:

Be it known that we, JOHN J. McINTYRE and CHARLES KOEHLER, citizens of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented a new and useful Improvement in Automatic Rough-Ball Grinders, of which the following is a specification.

This invention relates to a machine which is designed for grinding roughly formed metallic balls to nearly finished size and shape.

The object of the invention is to provide a machine which will continuously feed and rapidly and quite accurately grind and discharge balls, and which is so constructed that a large number of balls will be ground at the same time and the coöperating grinding and feeding parts, which are capable of adjustment for balls of various sizes, will be durable and can be easily restored as they become worn and used until completely worn out when other parts may be quickly substituted.

In this machine the balls are allowed to feed from a hopper into a spiral channel formed in the face of a ring which retains the balls with a yielding pressure against the surface of a rotating grinding ring while a rotating disk carries the balls along the spiral channel and causes them to be discharged at the end when ground.

In the accompanying drawings, which illustrate an embodiment of the invention, Figure 1 shows a longitudinal vertical section taken on the plane indicated by the dotted line 1—1 on Fig. 2. Fig. 2 shows a transverse vertical section taken on the plane indicated by the dotted line 2—2 on Fig. 1. Fig. 3 shows, on much larger scale, a radial section through a portion of the channeled ring, the carrying disk and the grinding ring. Fig. 4 shows a section taken at right angles to that of Fig. 3 on the plane indicated by the dotted line 4—4 on that figure.

The frame 1 of this machine is desirably a heavy casting. Journaled in the frame at one side is a horizontal shaft 2 which is provided at its outer end with a driving pulley 3 and on its inner end has an annular plate 4. Between the plate and the frame around the shaft an anti-friction thrust bearing 5 is arranged. On the face of the plate that is fastened to the shaft, and secured by a clamp ring 6, is a grinding ring 7 which is desirably made of emery, carborundum or a similar material.

Mounted in the frame at the other side and free to move longitudinally but not rotate, is a cylindrical hub 8. Fixed on the inner end of this hub is an annular plate 9. Fastened on the face of this plate is a ring 10 preferably made of cast iron, which ring in its face opposite the face of the grinding ring has a spiral channel 11. A spring 12 is arranged in the cylindrical hub in such manner as to tend to press the plate and channeled ring toward the grinding ring on the plate fastened to the shaft. The tension of this spring is determined by means of the screw 13 that turns in a threaded opening in the cap 14 which is fastened to the end of the frame. This screw has a hand wheel 15 on its outer end and its inner end bears against a movable plate 16 at the end of the spring. Screws 17 which are threaded into the end of the cylindrical hub pass loosely through the cap and on the outside have nuts 18 which may be adjusted to limit the amount of inward movement of the channeled ring under the thrust of the spring.

Between the adjacent faces of the channeled ring, which does not rotate but has a longitudinal movement, and the grinding ring, which does rotate but has no longitudinal movement, is a thin disk 19 which is provided with a number of radial slots 20 that overlie the spiral channel in the face of the channeled ring. This disk is fastened to an annular plate 21 that is secured to a rotatable arbor 22 which has one end supported by a bushing 23 in a recess in the grinding ring shaft and its other end supported by a bushing 24 in a recess in the hub which supports the channeled ring. One end of this arbor is threaded and provided with a washer 25 and nut 26 which limits the endwise movement of the arbor with relation to the hub. Fastened around the edge of the slotted disk is a gear 27 that is engaged by a pinion 28 on a shaft 29 which is provided with a pulley 30. The

rotatable slotted disk and gear are desirably guided between anti-friction balls 31 carried by plungers 32 which are pressed toward each other by springs 33. The ball-carrying spring-plungers are mounted in brackets 34, which are fastened to the edge of the plate carrying the channeled ring.

When the machine is in use the grinding ring is revolved at the desired high speed by means of its pulley and shaft, and the slotted carrying disk is revolved at suitable slow speed in the same or opposite direction, by means of the pinion and gear, while the channeled ring is adjusted by setting the spring screw and the stop nuts so that it will press toward the grinding ring with the desired force. The balls which have been placed in the hopper 35 gravitate therefrom down through the passage 36 to the inner end of the spiral channel in the channeled ring. As the grooved carrier disk rotates, the balls at the lower end of the feed passage are picked up by the grooves in the disk and are carried around in the spiral channel by the disk with their surfaces pressed against the grinding ring until the end of the channel is reached, and then the balls pass out through the discharge tube 37 which will conduct them back to the hopper or to any other suitable receptacle.

Balls of different size, within the range of the machine, may be ground and balls of various hardness may be ground to just the desired degree by properly adjusting the tension of the pressure spring and adjusting the nuts and screws which permit the pressure to be exerted to just such an extent and no more. As the balls are fed spirally at low speed by the slotted carrier disk and channeled ring, and the grinding ring is rotated at high speed the entire surfaces of the balls are presented to and carried across the face of the grinding ring so all unevennesses in the balls are completely removed and there is a uniform wear on the face of the grinding material. As the face of the grinder wears away the channeled ring is allowed to follow it up by properly adjusting the screws which limit the movement of the plate and by adjusting the tension of the pressure spring. When the grinding ring is worn down so that no more can be used a new ring is readily substituted and when the channeled ring is worn it can be taken out and refinished or another substituted. By changing the channel ring and substituting one having larger or smaller channels balls of widely different sizes may be ground. If the balls were very much larger or very much smaller, of course this would necessitate a change in the carrier disk to one having larger or smaller grooves. If the balls discharge back into the hopper the machine can be set running and it will run continuously until all of the balls are ground down to the desired size, and as a large number of balls are in the machine at one time the output of the machine is quite large.

The invention claimed is;

1. A ball grinding machine consisting of a frame, a grinder rotarily mounted on the frame, a spiral guide mounted on the frame and movable toward and from the grinder, and a slotted carrier rotarily mounted between the face of the grinder and the face of the guide.

2. A ball grinding machine consisting of a frame, a grinding member rotarily mounted on the frame, a member with a spiral channel mounted on the frame and movable toward and from the grinding member, and a slotted carrying member rotarily mounted between the face of the grinding member and the face of the channeled member.

3. A ball grinding machine consisting of a frame, a grinding ring rotarily mounted on the frame, a ring with a spiral channel mounted on the frame and movable toward and from the grinding ring, and a disk with radial slots extending across said spiral channel rotarily mounted between the face of the grinding ring and the face of the channeled ring.

4. A ball grinding machine consisting of a frame, a grinding member rotarily mounted on the frame, a member with a spiral channel mounted on the frame and movable toward and from the grinding member, a spring for forcing the channeled member toward the grinding member, and a slotted carrying member rotarily mounted between the face of the grinding member and the face of the channeled member.

5. A ball grinding machine consisting of a frame, a grinding member rotarily mounted on the frame, a member with a spiral channel mounted on the frame and movable toward and from the grinding member, a spring for forcing the channeled member toward the grinding member, means for limiting the movement of the channeled member toward the grinding member, and a slotted carrying member rotarily mounted between the face of the grinding member and the face of the channeled member.

6. A ball grinding machine having a frame, an annular plate rotarily mounted on the frame, a grinding ring fastened to said rotary plate, an annular plate movable axially on the frame toward and from the rotary plate, a ring with a spiral channel mounted on said axially movable plate, a spring for forcing said axially movable plate and channeled ring toward said rotary plate and grinding ring, and a grooved disk rotarily mounted between the faces of the grinding ring and channeled ring.

7. A ball grinding machine having a frame, a plate rotarily mounted on the frame, a grinding ring fastened to said

plate, a plate movable longitudinally of the frame, a ring with a spiral channel mounted on said longitudinally movable plate, a spring for forcing said plate with channeled ring toward said grinding ring, and a disk with radial grooves rotarily mounted between the faces of the grinding ring and channeled ring.

8. A ball grinding machine consisting of a frame, a grinding member rotarily mounted on the frame, a member with a spiral channel mounted on the frame and movable axially toward and from the grinding member, a spring for forcing the channeled member toward the grinding member, a plate rotarily mounted between said rotary member and said axially movable member, and a slotted disk fixed to said plate between the face of the grinding member and the face of the channeled member.

9. A machine for grinding balls comprising a rotary abrasive surface, rotary means for carrying balls about a fixed axis, and stationary means for moving the balls radially with relation to said axis and against said abrasive surface as they are carried around by said rotary means.

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