(No Model.)

G. H. HATHORN.

BALL GRINDING MACHINE.

No. 598,510. Patented Feb. 8, 1898.

Fig 1

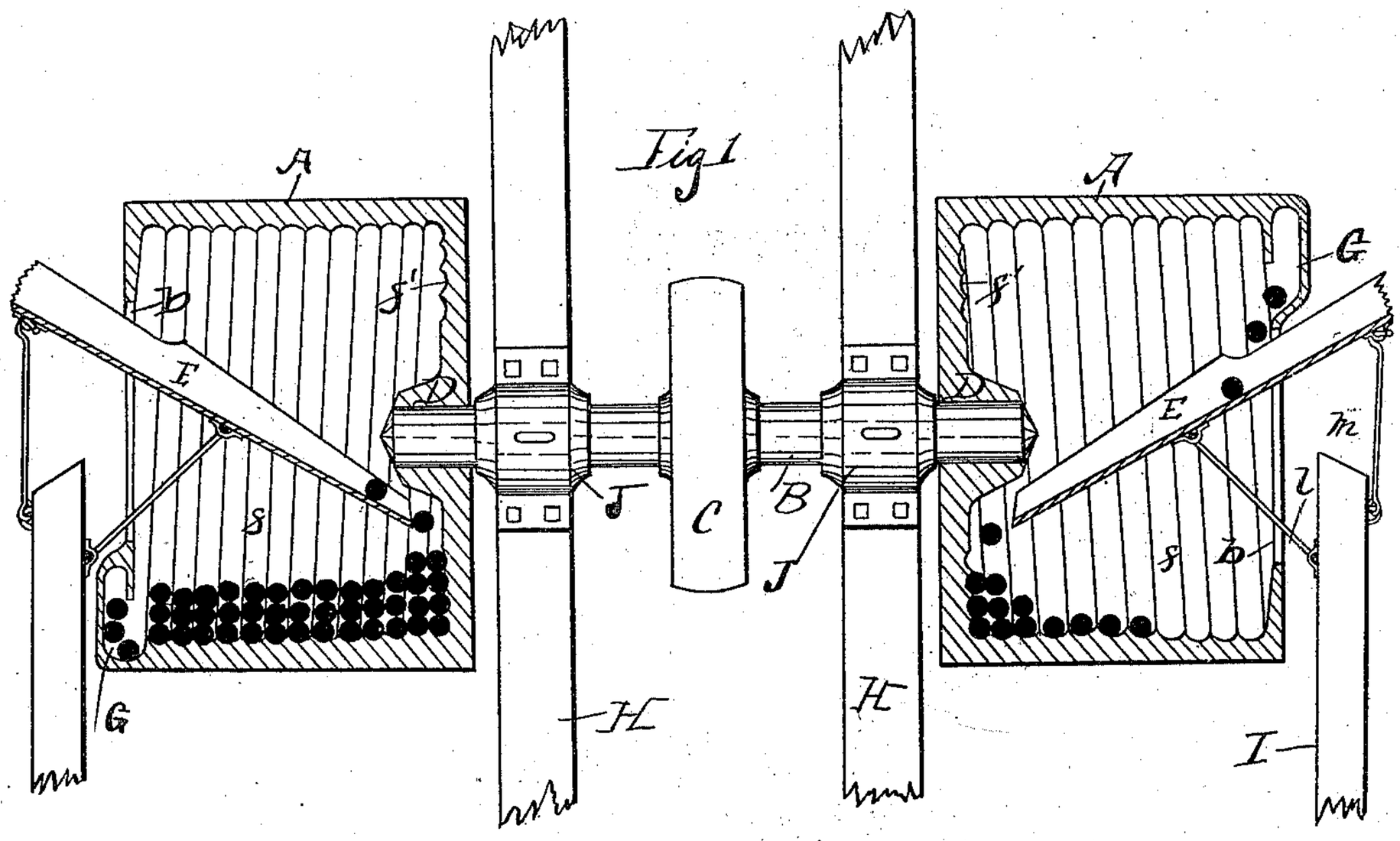


Fig 2

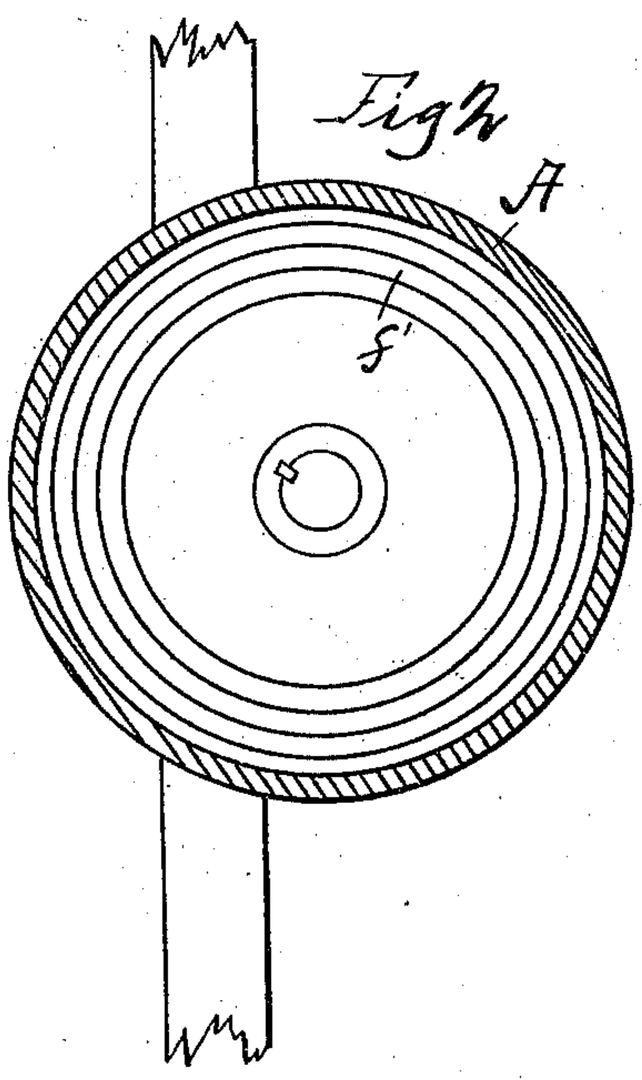
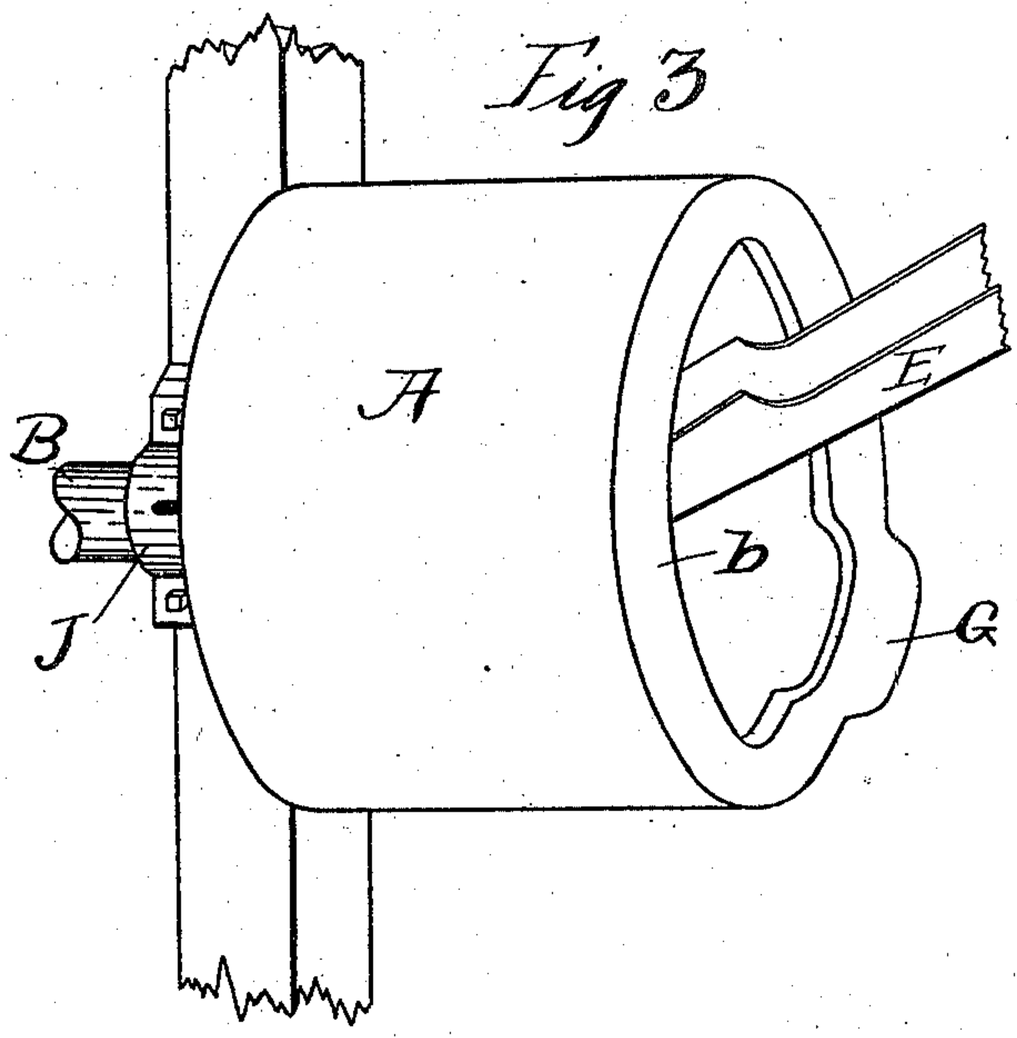


Fig 3



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GEORGE H. HATHORN, OF BANGOR, MAINE.

BALL-GRINDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 598,510, dated February 8, 1898.

Application filed May 22, 1897. Serial No. 637,780. (No model.)

To all whom it may concern:

Be it known that I, GEORGE H. HATHORN, a citizen of the United States, residing at Bangor, in the county of Penobscot and State of Maine, have invented a new and useful Ball-Grinding Machine; and I do hereby declare that the following is a full, clear, and exact description of the same, which will enable others skilled in the art to which it appertains to make and use the said invention.

My invention relates to a machine for spherically grinding steel balls, though it may be used for other purposes, as for grinding and polishing balls composed of other materials.

Throughout the description reference is made to the accompanying drawings, forming part of this application, in which—

Figure 1 represents an elevation of my device complete, showing vertical section through the drums and ball-conductors. Fig. 2 shows an end view and vertical section through the ball-grinding drum, showing the concentric grooves in the same. Fig. 3 is a perspective view of the ball-drum attached to a portion of standard and showing end flange with ball-pocket and relative position of ball-conductor.

Similar letters of reference refer to corresponding parts throughout the different figures.

The object of my invention is to produce a machine that will grind steel balls in quantities into spherical shape and also arranged to conduct the balls to be reground from one grinder into another.

Referring to the drawings, A represents the ball-drums of my device, constructed cylindrical in shape with parallel sides and having one of their ends closed and provided with means for attachment to a shaft B. In the drawings I have the shaft B attached at each end to a ball-drum A A by having the latter constructed with a central and inwardly-protruding hub D D, which is cast of the same material as said drum, though it is not my intention to limit myself to this exact construction, for the said shaft can be provided with a face-plate, which is subsequently secured to said drums, or other suitable and convenient means can be employed for the purpose and will accomplish the same result.

Turned upon the rear walls of the drums A A, upon the inside and near the junction with the cylindrical portion, are one or more concentric grooves *f' f'*, concaved at their bottom, which serve to rotate balls placed in the drums at this end to be ground as the drums are turned, as will hereinafter be more fully understood. The inner surface of the cylindrical portions of the drums A A are provided with concave grooves *f f*, cut in the form of a thread and extending from their rear walls to the front ends of said drums. The front or open ends of the drums A A are constructed with an inwardly-depending flange *b b*, several inches in depth and extending toward their axial centers, which serve to prevent the contents of said drums from rolling out. At the outward ends of the concaved thread-shaped grooves *f f*, where they terminate at the front flanges *b b*, is provided a hollow outward projection called a "pocket" G G, so constructed that when articles roll into the same in their lowermost positions they will be held and carried as the drums are revolved until nearly their uppermost positions are reached before they discharge their contents.

A conductor E is supported in an inclined position at each drum A directly under the discharging-points of the pockets G G, which conductor I have shown in Fig. 1 of the drawings extending into the interior of each drum toward the rear walls of the same and terminating at a sufficient distance from said walls to permit a free discharge of their contents.

It can be readily understood that my machine as thus far described consists of a drum or drums mounted on a shaft B, the latter being provided with a band-wheel C, which is adapted to be belted to any suitable power medium. The shaft B is supported in position by axle-boxes J J, fixed to suitable uprights H H, which may be posts or a frame made for the purpose. As both drums A A are fixed to one shaft B, it is necessary in order to have both drums work in the same manner to cut the concaved thread-shaped grooves *f f* in opposite directions—that is, the grooves in one drum cut in a right-hand direction, while those in the other drum are cut in a left-hand direction. These drums A A consist of iron castings, which, being

slightly porous, allow the particles of emery or other grinding material used to enter their minute openings and produce a rough grinding-surface to reduce the surface of the balls intended to be placed therein. The size of the grooves *f* and *f'* depend somewhat upon the size of the balls to be ground, and as they wear away they also deepen and keep their relative shape and position.

The operation of my device is as follows, viz: A quantity of steel balls are placed within each drum A A and the latter revolved at a moderate rate of speed in a direction opposite to the threaded pitch of the grooves *f f*. As the larger the quantity of balls the greater the pressure obtained, consequently the turning of the drums causes the balls to roll over each other, those underneath entering the grooves *f f* and are held down by the pressure of those above. As oil and emery are mixed with the balls within the drums their rolling over and against each other has a tendency to round off any unevenness of surface, and as they are continuously changing places each one comes in contact with the grooves in the drums and travels therein for a certain distance until knocked out of place by another ball. Consequently they seldom roll twice in the same direction, which brings all their surfaces to wear. Furthermore, the threaded form of the grooves *f f* works the balls slowly toward the outer ends of the drums, and as they reach the end of the thread they enter the pocket G G and are carried upward and discharged into the conductor E, which, inclining inward, conducts the balls to the opposite ends of the drums, where they commence again to travel the same course and regrind until the proper size is produced, which is found by trial and gaging.

In the drawings I have shown the conductor E supported by connection with a stationary upright I, having a long link *l* secured at one end to said upright and its opposite end pivoted to the bottom of the conductor near its mid-length. A long hook or hasp *m* is also attached to said upright I and extends upward to be hooked into an eye on the conductor at a position that will produce the proper angle to incline the latter. This arrangement allows the conductor E to be changed when the machine is running by unhooking the hasp *m*, drawing the said conductor out, lowering its rear end, and again hooking the hasp in another eye, which produces an outward pitch, and the balls then discharged from the pocket G in the drum will enter the conductor and roll outward until the entire drum is emptied. It has been found that even plain grooves in the drum A in addition with oil and emery can be used to round steel balls, but not in so perfect a manner as by the use of the thread-shaped grooves hereinbefore described. The curved bottom of the grooves produces more bearing-surface against the balls, with the consequent increased frictional wear of the particles of iron, which, together with the emery, helps to produce round surfaces in a more even manner.

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

1. The combination of one or more drums attached to a shaft and adapted to be revolved by a suitable power medium; internal grooves in said drum constructed with concave bottom and threaded form; a flange at open end of said drum, and a pocket in said flange at the terminus of the thread-shaped grooves in the drum, said pocket adapted to receive the balls and discharge into a conductor which returns them to the opposite end of the drum, for the purpose described, and substantially as shown and set forth.

2. The combination of a horizontal shaft secured to an upright, and connected with the source of power, drums on the shaft and provided with internal, concaved thread-shaped grooves cut in the wall of the drum, flanges at the unconfined ends of said drums, pockets in the flanges at the termination of the groove, a conductor pivoted to be inclined in either direction, and means for locking same in the desired position, as set forth.

3. In a device of the character described, a hollow body adapted to be rotated and provided with a grooved inner wall, for the purpose described.

4. In a device of the character described, a hollow body adapted to move and means on the inner wall for directing the contained matter from end to end, for the purpose described.

5. In a device of the character described, a hollow body adapted to be rotated, said body having a groove with a concaved bottom and threaded form, said groove serving to convey the lower strata of the contained matter to one end and force the upper layers to the opposite end, for the purpose described.

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