No. 607,368. Patented July 12, 1898.

G. H. HATHORN.

MACHINE FOR GRINDING AND POLISHING.

(Application filed May 25, 1897.)

(No Model.) 2 Sheets—Sheet 1.

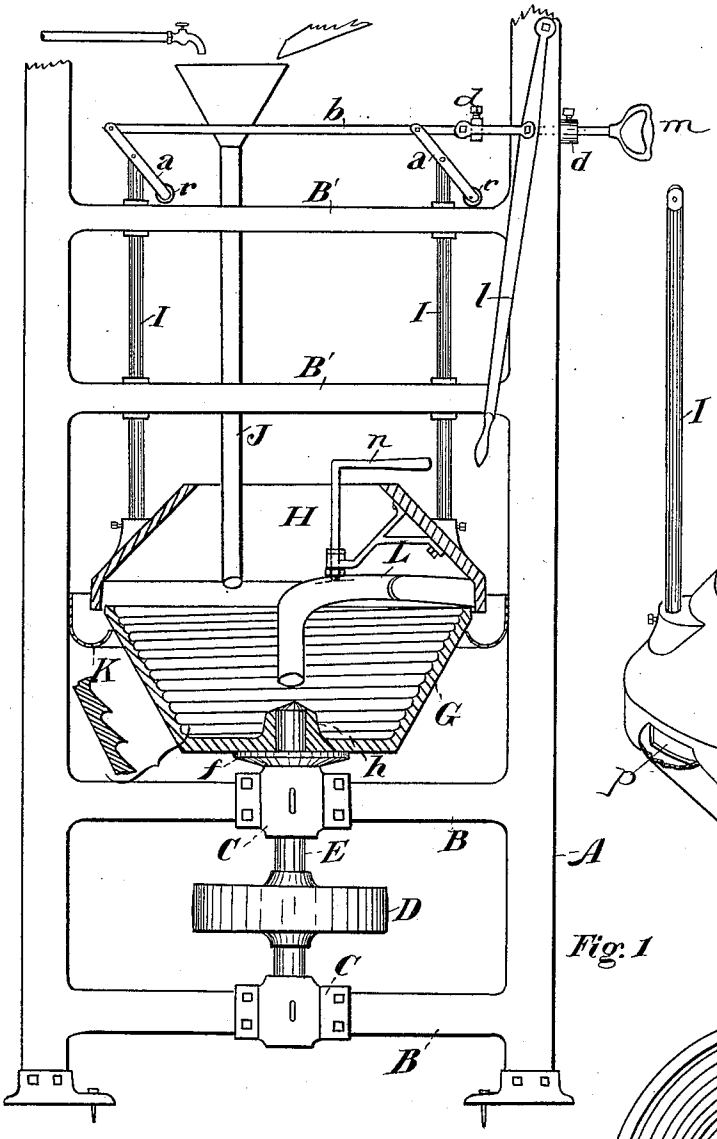


Fig. 1

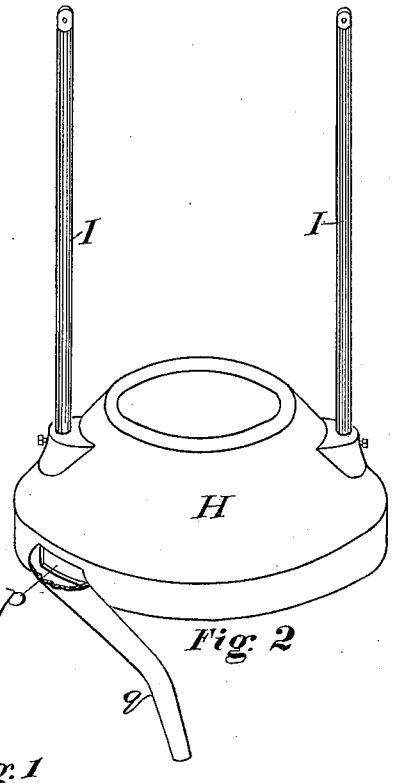


Fig. 2

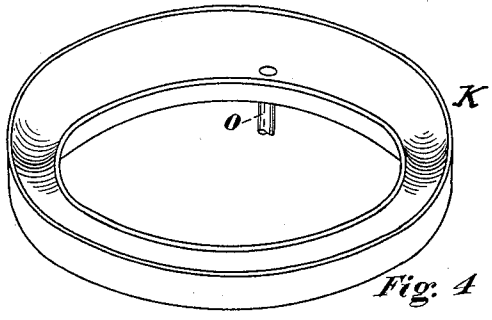


Fig. 4

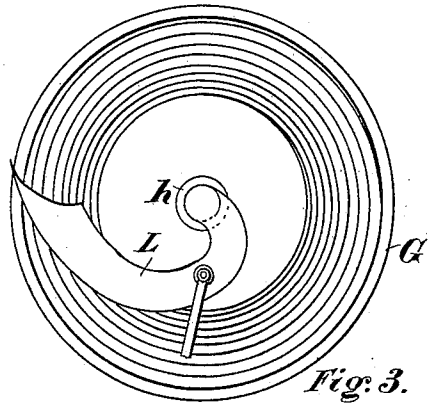


Fig. 3.

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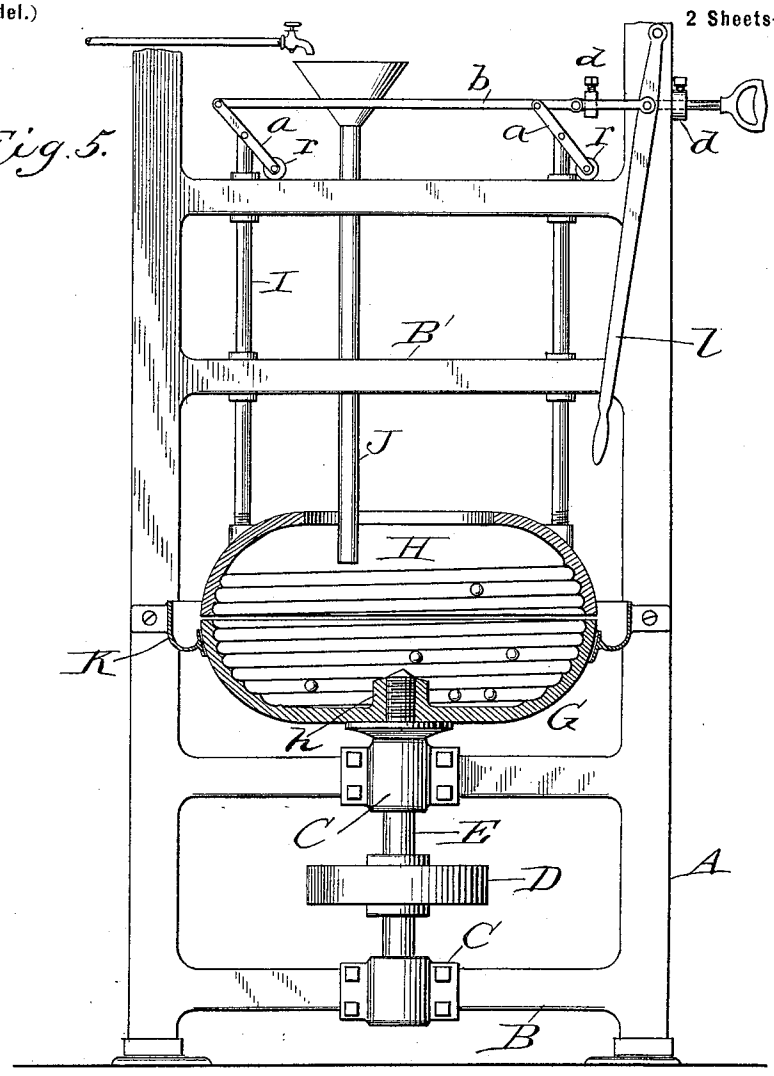
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Fig. 5.



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UNITED STATES PATENT OFFICE.

GEORGE H. HATHORN, OF BANGOR, MAINE.

MACHINE FOR GRINDING AND POLISHING.

SPECIFICATION forming part of Letters Patent No. 607,368, dated July 12, 1898.

Application filed May 25, 1897. Serial No. 638,065. (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 certain new and useful Improvements in Methods of and Machines for Grinding and Polishing, of which the following is a specification.

This invention pertains to a machine for grinding and polishing bodies to render them truly spherical; and it consists in a number of novel features, combinations, and details hereinafter explained, whereby a peculiarly efficient machine is produced.

In the drawings forming part of this specification, Figure 1 is an elevation of my improved machine, partly in section; Fig. 2, a perspective view of the hood or cover removed; Fig. 3, a top plan view of the containing vessel, showing also the spout or conveyer by which the bodies under treatment are returned to the bottom of said vessel; Fig. 4, a perspective view of the drip pan or trough by which escaping oil and grinding or abrading materials are caught; Fig. 5, a view similar to Fig. 1, but showing a different form of vessel and hood or cover.

Stated in general terms the method of grinding and polishing carried out consists in causing the bodies requiring treatment to be carried, together with suitable grinding or abrading material, over a spiral track or plane through centrifugal force, and thus to be turned in every direction and acted upon on all faces.

The apparatus best suited to carrying out this method consists, essentially, of a circular vessel with sloping or flaring walls containing spiral grooves and means for rotating said vessel at high velocity. The effect of such rotation is to generate a strong centrifugal force tending to throw the bodies contained in the vessel outward and by reason of the flare or inclination of its walls to carry them upward, while the spiral grooves determine the travel of the bodies and prevent them from passing too quickly out of the vessel.

For the purpose of subjecting the bodies to the repeated action of the apparatus I provide a hood which directs them back toward the center of the vessel or a scroll-shaped spout which performs the same function, or both may be provided.

The construction of the machine may be best explained in connection with the drawings, in which A indicates a frame of any suitable material and construction, to the horizontal members B of which are secured boxes or bearings C, in which is carried a vertical shaft or spindle E, provided with a band wheel or pulley D.

In the drawings the boxes or bearings are represented conventionally; but in practice it is deemed better to carry the spindle E in a step at its lower end and to provide for its upper bearing a box capable of limited movement in a horizontal plane in all radial directions, after the manner of centrifugal extractors and the like, in order that vibration may be reduced to a minimum. I do not, however, restrict myself to such construction.

The upper end of spindle E is formed or provided with a horizontal disk *f*, which serves to support a vessel G, bored to receive the upper extremity of the spindle and made fast thereto in any convenient manner, as by keying, bolting, or screwing upon the spindle in a direction opposite to that of rotation.

The form of vessel G may vary considerably; but it will be found essential to observe and retain two features therein—namely, an outward slope or curvature of the walls of the vessel from the bottom upward and a spiral grooving or channeling of the walls to receive and guide the bodies treated.

The degree or angle of inclination of the walls, the pitch of the spiral, and the depth and form of the grooves may all vary within quite wide limits and in accordance with the size, weight, and character of the bodies treated, lighter and smaller bodies admitting of a nearer approximation to a horizontal position of the walls than heavier ones and the size of the grooves bearing a general relation to the size or sizes of the objects treated.

Above the vessel G there is placed a hood or cover H, which is preferably made separate from the vessel and held stationary while the machine is in operation. It may be smooth or grooved on its interior, and its walls may be inclined or curved, as deemed best; but in any event the walls should draw inward

toward the axis of the vessel at the top, so that bodies thrown against it may be directed inward and caused to fall back into the vessel as they lose their momentum. The hood or cover is open at the center, and the bodies to be ground or polished, as well as oil and emery or other grinding or polishing materials, may be introduced through this opening. For this purpose a hopper and delivery-tube J may be supported in the frame-work A, as indicated.

To afford convenient access to the interior of the vessel G, it is found desirable to provide mechanical devices for elevating and sustaining the hood or cover H. The means adopted for this purpose may vary; but that illustrated in the drawings will be found well suited to the purpose. This consists of rods I, two or more, rising vertically from the hood or cover, movable through guides in or upon the horizontal upper members B′ of the main frame A and carrying at their upper ends levers *a*, provided with rollers *r*, which rest upon the upper member B′ of the frame. The levers are connected by a rod or bar *b*, which is in turn connected with a hand-lever *l*, by which the levers *a* can be caused to assume a vertical or substantially vertical position, and in doing so to lift the rods I and the hood or cover H. Instead of the lever *l* a bail or hand-pull *m* may be provided, stops *d* being provided in either case to limit the movement of levers *a* and to hold them when carried slightly past the center or past a vertical position, so that they may stand alone and maintain the hood in its elevated position.

K indicates an annular trough which is secured to frame A and encircles vessel G and the skirt of hood H. Its purpose is to arrest the oil and emery escaping at the line of separation of the vessel and hood and to carry them by a pipe or spout *o* to a suitable receptacle for reuse.

By making the walls of the hood to converge toward the center the bodies treated will be directed inward and deposited at or near the center of the vessel, the walls being curved both inward and downward, if necessary, under any special working conditions, such as would otherwise tend to throw the bodies out through the central opening. In practice I prefer, however, to adopt a different means of returning the balls to the vessel, either in addition to the converging top or in lieu thereof. This is merely a scroll-shaped spout or conduit L, one end of which lies normally in contact with or in close proximity to the inner wall of the hood at the skirt thereof and immediately over the rim or edge of the vessel G. A wide-open mouth enables this spout to gather in the bodies raised to its plane by the action of vessel G, while its scroll form gradually arrests their motion and delivers them at or near the center of the vessel.

As there is little motion within a radius of an inch or so from the center, I make the top of the spindle E conical, so that any bodies delivered thereon shall be caused to roll off toward one side.

The spout or conductor L is suspended from a bracket or hanger, and a rod or stem provided with a lever *n* may be provided for swinging the receiving end of the spout to and from the skirt of the hood.

Just in rear of the receiving end of the spout L as the latter stands when in use there is formed a delivery or discharge opening *p*, which is normally covered or shielded by said spout, but which may be uncovered by swinging the latter about its spindle by the lever *n*. When the opening is thus uncovered, the balls or bodies will be elevated by centrifugal force, as before, and following around on the vertical skirt of the hood they will find their way into and through said opening and be delivered through a discharge-spout *q* into a suitable receptacle.

It will readily be seen that the details of construction may vary within reasonably wide limits, the construction of the frame, its material, the manner of adjusting and supporting the hood or cover, and similar points being largely matters of option or convenience. So, too, the spindle E may rise from the bottom of the vessel G and be carried in boxes above, and two or more spiral grooves may be provided instead of only one. The form of the grooves may vary, but the general form indicated in Fig. 1 will be found suitable ordinarily. The vessel or the hood, or both, may be curved, as in Fig. 5, and the spiral groove may be carried into the hood, as shown.

In rolling against the wall or surface of the groove the bodies rotate about constantly-changing axes, owing to the travel lengthwise of the grooves coupled with an upward travel which constantly shifts or changes the axis of rotation.

Having thus described my invention, what I claim is—

1. In a machine for grinding and polishing, the combination of a vessel having flaring or outwardly-inclined walls provided with a spiral groove; and means for imparting rotary motion to said vessel, substantially as set forth.

2. A machine for grinding and polishing spherical bodies, comprising a circular vessel increasing in diameter toward its top; a hood or cover placed above said vessel and of decreasing diameter toward its top; and means for imparting to the vessel a continuous rotary motion in one direction.

3. In combination with a suitable supporting-frame, a vertical spindle E provided with a spirally-grooved vessel G, and with means for rotating the same; and a hood or cover above said vessel adapted to receive and direct inward the articles thrown off by centrifugal force at the circumference of the rotatable vessel.

4. In combination with rotatable vessel G, spout or conductor L having one end in prox-

imity to the circumference of the vessel, and the other end near the center thereof, whereby it is adapted to receive objects carried centrifugally to the circumference of the vessel, and to carry them inward toward the center thereof.

5. In combination with rotatable vessel G and hood H; annular trough K encircling the vessel and serving to collect the abrading and polishing materials thrown off by the vessel.

6. In combination with rotatable vessel G; stationary cover H provided with outlet *p* and spout *q;* and conductor L having its outer end normally in proximity to the skirt of the hood and across the outlet *p*, but capable of being thrown inward from its normal position, substantially as and for the purpose set forth.

7. In combination with rotatable vessel G; hood or cover H; rods I; levers *a;* connecting-rod *b;* and a lever or handpiece for moving the rod *b* and the levers *a*, and thereby elevating the rods I and hood H.

In witness whereof I hereunto set my hand in the presence of two witnesses.

GEO. H. HATHORN.

Witnesses:

WILLIAM W. DODGE,

HORACE A. DODGE.