

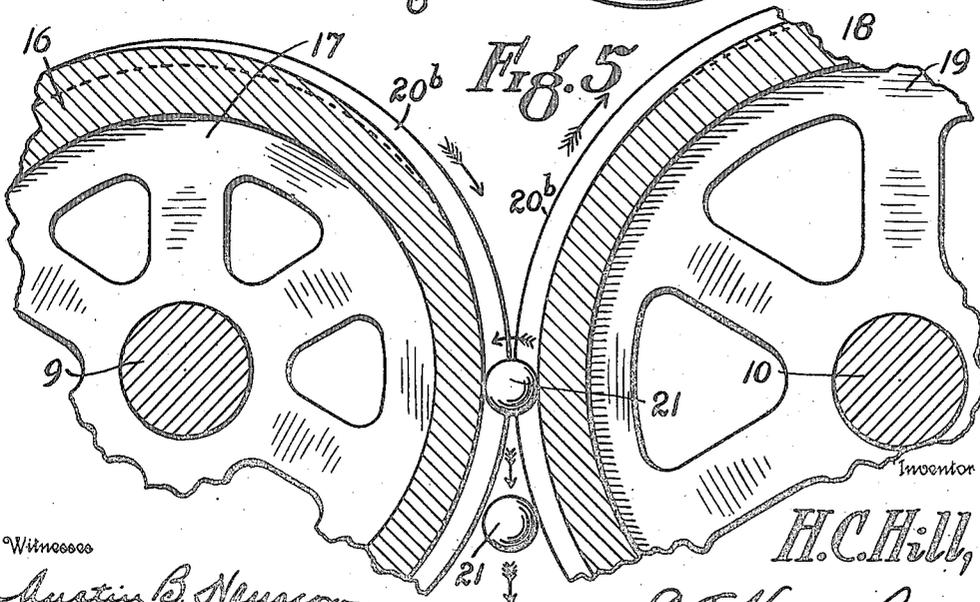
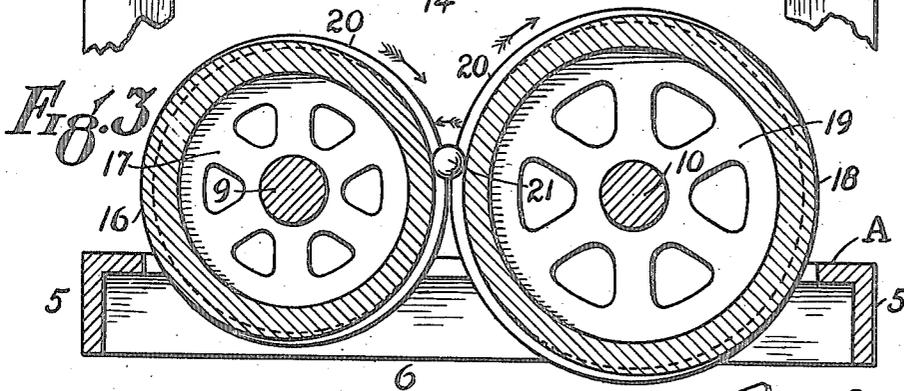
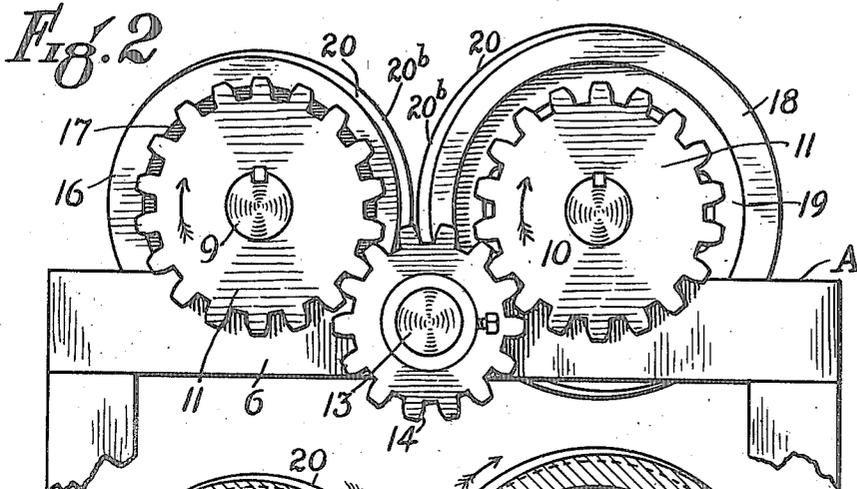


H. C. HILL.  
 MACHINE FOR MANUFACTURING SPHERICAL BODIES.  
 APPLICATION FILED NOV. 23, 1914.

1,164,718.

Patented Dec. 21, 1915.

3 SHEETS—SHEET 2.



Witnesses

Austin B. Newcom  
 A. L. McClinton

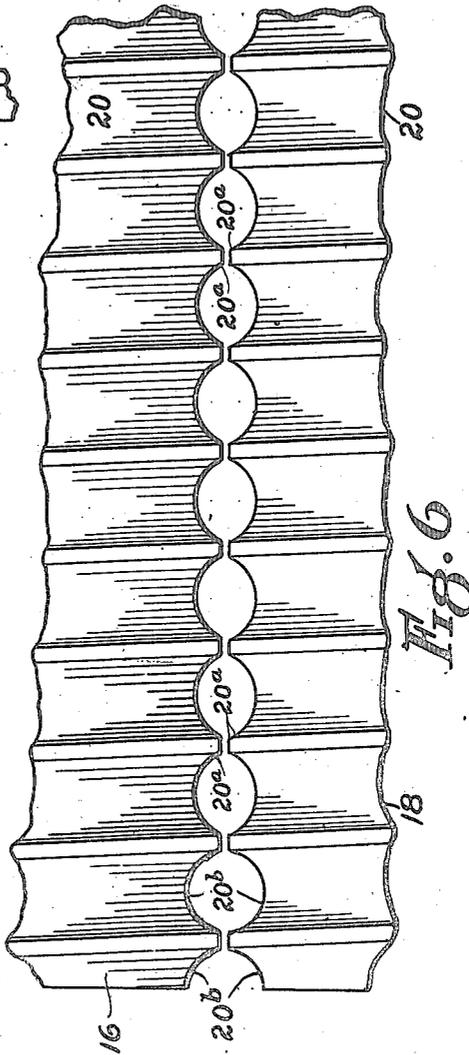
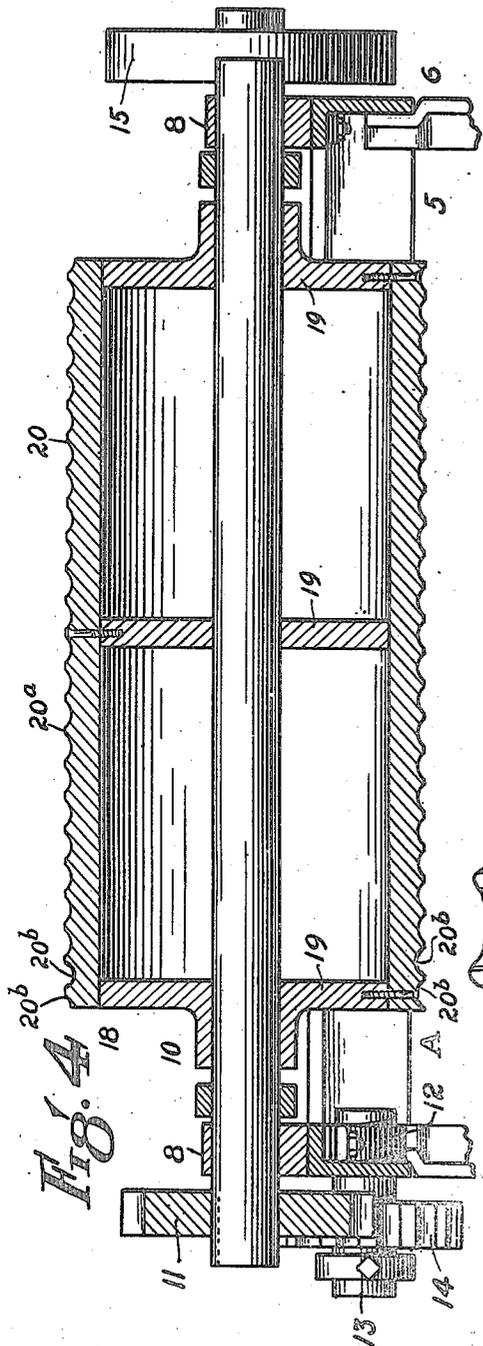
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# UNITED STATES PATENT OFFICE.

HORACE C. HILL, OF CLARKSBURG, WEST VIRGINIA, ASSIGNOR TO THE AKRO-AGATE COMPANY, OF CLARKSBURG, WEST VIRGINIA, A CORPORATION OF WEST VIRGINIA.

MACHINE FOR MANUFACTURING SPHERICAL BODIES.

1,164,718.

Specification of Letters Patent.

Patented Dec. 21, 1915.

Continuation of application Serial No. 721,229, filed September 19, 1912. This application filed November 23, 1914. Serial No. 873,533.

To all whom it may concern:

Be it known that I, HORACE C. HILL, a citizen of the United States, residing at Clarksburg, in the county of Harrison and State of West Virginia, have invented new and useful Improvements in Machines for Manufacturing Spherical Bodies, of which the following is a specification.

This invention relates to new and useful improvements in machines for manufacturing spherical bodies.

The principal object of the invention is to provide a machine for molding or rolling various materials into spherical bodies and completely finish the same.

Another object of the invention is to provide a continuously operated machine, of an efficient, simple and durable construction, which is adapted to receive in succession pieces of suitable material irrespective of the kind while in a plastic state, and of proper size to produce balls or spheres of predetermined diameter.

A further object of the invention is to provide a machine of the character described for molding a piece of material into the form of a perfect sphere, and to discharge it completely finished without recourse to any other machine.

With the foregoing and other objects in view, the invention consists in the novel construction, combination and arrangement of parts constituting the invention to be hereinafter specifically described and illustrated in the accompanying drawings which form a part hereof wherein is shown the preferred embodiment of the invention, but it is to be understood that changes, variations and modifications can be resorted to which come within the scope of the matter hereinafter claimed.

In the drawings in which similar reference numerals indicate like parts in the different figures, Figure 1, is a plan view of a machine constructed in accordance with this invention; Fig. 2, is an end view thereof; Fig. 3, is a cross sectional view on line 3—3 of Fig. 1; Fig. 4, is a longitudinal sectional view on line 4—4 of Fig. 1; Fig. 5, is a detail cross sectional view of the discharge end of the machine on line 5—5 of Fig. 1; and, Fig. 6, is a fragmentary plan view of a portion of the mechanism shown of the opposing faces of the cylinders.

Referring to the drawings, A designates generally the main frame of the machine which comprises longitudinal sills 5, 5 united by end sills 6, 6. Mounted on each end sill are adjustable bearings 7 and 8. Mounted in the bearings 7 is a shaft 9 and in the bearings 8 is mounted a shaft 10. The shaft 9 bears a belt pulley 15, at one end and at the opposite end of the machine both shafts 9 and 10 are provided with similar spur gears 11 spaced from each other. On one end sill 6, between and below the axes of the shaft 9 and 10 is an adjustable bearing 12 in which is a stub shaft 13 on which is mounted for rotation, an idler pinion 14 arranged to mesh with the gears 11 where- by the shafts 9 and 10 are simultaneously rotated in the same direction. Mounted on the shaft 9 are a plurality of disks 17 on which is fixedly mounted a roll 16 and on the shaft 10 are a plurality of similar disks 19 on which is a roll 18 of greater diameter than the roll 16. The peripheral surfaces of each of these cylinders are respectively provided with a single, continuous, helical groove 20, the grooves of the two rolls being symmetrical in every particular except what difference there may be due to the difference in diameter of the two rolls. These grooves form an arc of a circle, in cross section and are less in depth than a semi-circle in their molding and forming portions and although it is not absolutely necessary, it has been found that it is best to have the corners 20° of said grooves approximately sharp, or, in other words, side walls of the grooves extend outwardly in a true arc of a circle and insert the peripheries of the rolls without any outward flaring or oval formation being imparted to them. The length of these grooves or the number of convolutions each groove makes about its roll depends upon the size of the article which the machine is constructed to manufacture, together with the time required for the material worked, to set or harden, so that the complete sphere may be discharged from the machine and retain its shape.

The rolls 16 and 18 are so arranged that the peripheral surfaces thereof are opposed to each other and are set as near together as possible to accomplish the forming operation as clearly shown in Fig. 6 of the drawings. The peripheral surfaces of the

two rolls are adapted to be used for rapidly and cheaply converting different kinds of material into spherical shape, but the device is particularly adapted to the manufacture of glass balls or spheres and for the description of this device it may be assumed that the machine is adapted to the production of glass balls, such as are used in the manufacture of furniture casters, graining for lithographers' use, as part of check valves, as marbles commonly used by children, or for ornamental or other purposes.

It has been stated that a completely finished sphere or ball with polished surface may be formed or produced by this machine and that no other or additional work is required upon the ball to prepare it for use. This result or effect is obtained by means of the particular construction or arrangement of formation of the rolls 16 and 18 and the grooves 20. The distance between the rolls is so adjusted as to bring the forming portion of the grooves so closely together as to prevent the body of the material being rounded from passing downwardly through the space between the two rolls and sustain the material in the process of formation a slight distance above the dead-center line between the shafts 9 and 10. Attention may be directed to the fact that the resting place in forming portion of the grooves during the molding operation being above the dead center line serves to sustain the spheres while being turned and rolled and as the peripheral speed of the larger roll 18 is greater than the peripheral speed of the smaller roll 16 and the movement or travel of the surface of the larger roll where it engages the article is moving upwardly at its working point and the surface of the smaller roller is moving downwardly, the article is thereby rolled and turned and supported from being drawn downward either by gravity or frictional engagement with the peripheral face of the smaller groove.

In practice, suitable pieces of material are placed successively in the grooves at the right end of the machine in Fig. 1, and as the rolls revolve the bodies of material are turned on constantly changing axes of rotation, whereby all portions of their surfaces are rolled and smoothed and the body, as it gradually is being rounded to shape, travels to the left until it reaches the deepened grooves 20<sup>b</sup> which are of such a depth as to provide an opening large enough to permit the formed spheres to drop between them into a suitable receptacle. The length of travel of the articles made by this machine is such that by the time the articles have reached the grooves 20<sup>b</sup> they will not only be perfectly formed, but hardened to

retain their shape after their discharge from the machine.

It will be noted that besides the constant rolling of a body due to the rotation of the two rolls, which would, under ordinary circumstances, only rotate the article on an axis, practically parallel with the axes of either of the shafts 9 and 10, the slight inclination of these helical grooves is sufficient to constantly turn the article about on constantly changing axes, whereby all portions of the surfaces thereof are engaged by the grooves, and the bodies gradually rounded and molded in true spherical form and where the material is glass a high polish is imparted to them.

I claim:—

1. In a machine for manufacturing spherical bodies, a pair of oppositely arranged rolls having helical peripheral grooves, and means for simultaneously rotating said rolls to move same upwardly and downwardly at their working points respectively, with the roll moving upwardly at its working point having a greater peripheral speed than the roll moving downwardly at its working point.

2. In a machine for manufacturing spherical bodies, a pair of oppositely arranged rolls of different diameters and having helical peripheral grooves, and means for simultaneously rotating said rolls at the same angular speed to move the roll having the greater diameter upwardly at its working point and the roll having the lesser diameter downwardly at its working point.

3. In a machine for manufacturing spherical bodies, a pair of oppositely arranged rolls formed with helical peripheral grooves of uniform pitch respectively, and means for simultaneously rotating said rolls upwardly and downwardly at their working points respectively at the same angular speed with the roll moving upwardly at its working point having a greater diameter and peripheral speed than the roll moving downwardly at its working point.

4. In a machine for manufacturing balls or other bodies, a pair of oppositely arranged rolls having helical peripheral grooves less than a semi-circle in cross section in their forming portions, the last, circumvolution of each groove being gradually deepened and widened for automatically discharging a body therebetween.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

HORACE C. HILL.

Witnesses:

JOHN F. STIDHAM,  
J. E. SMITH.