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C. T. SCHNITZER.

MACHINE FOR MAKING METAL BALLS.

APPLICATION FILED MAY 12, 1905.

Fig. 5.

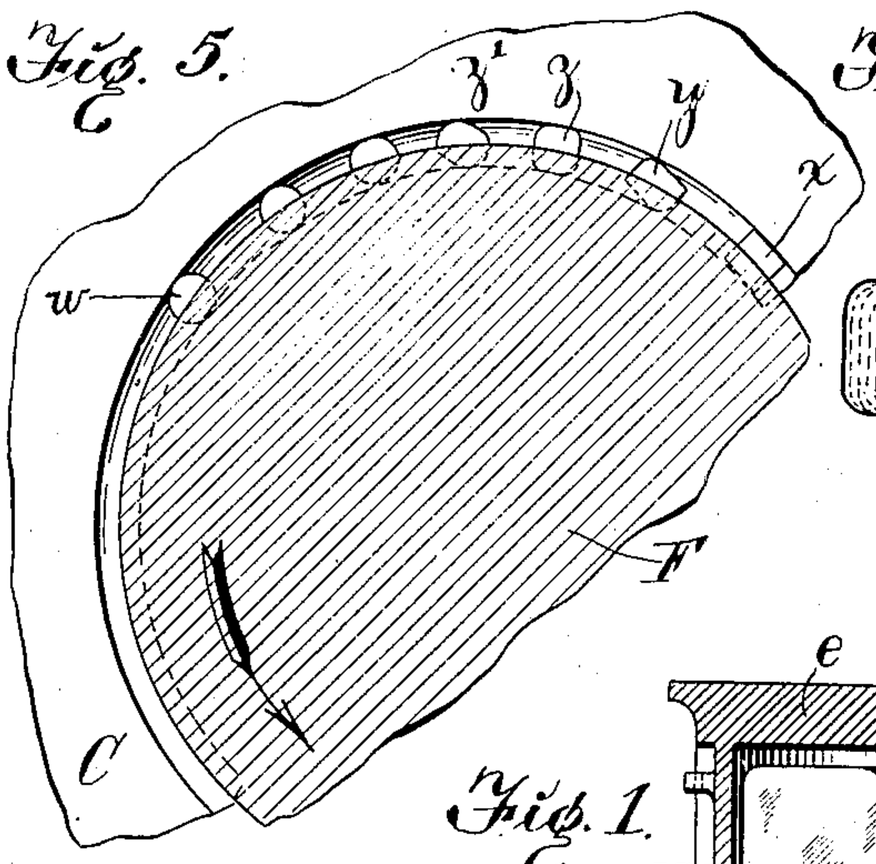


Fig. 6.

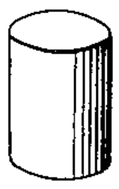


Fig. 7.

Fig. 8.

Fig. 9.

Fig. 10.

Fig. 1.

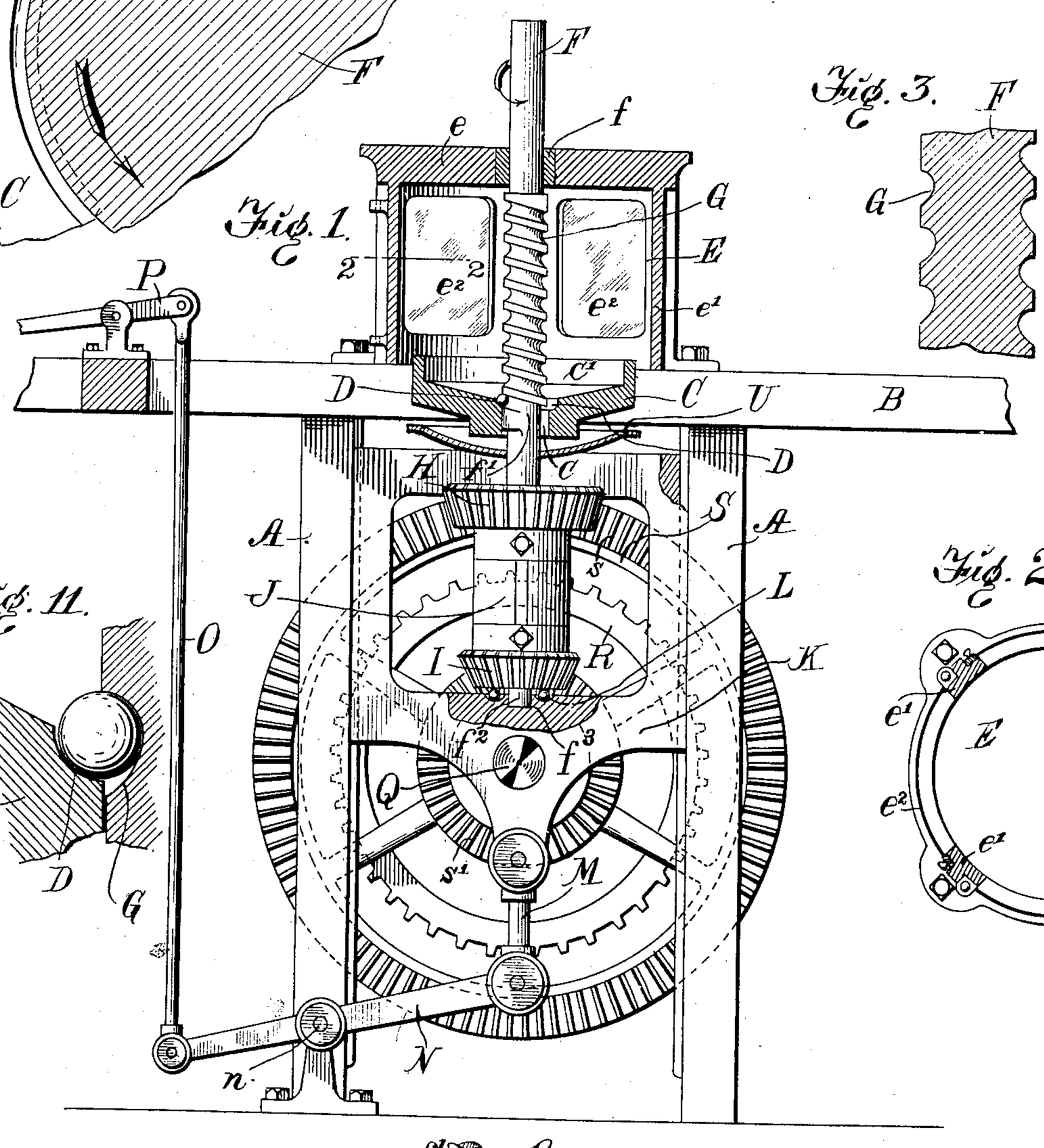
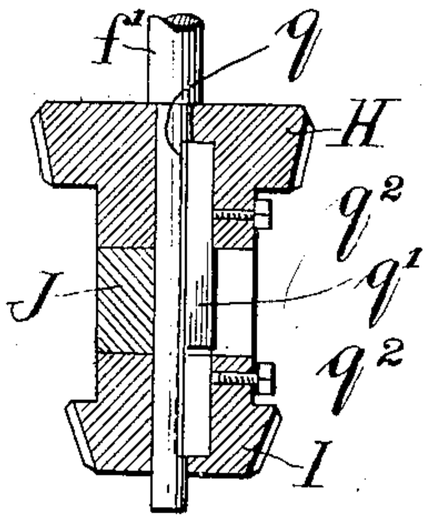


Fig. 3.

Fig. 2.

Fig. 11.

Fig. 4.



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UNITED STATES PATENT OFFICE.

CARL T. SCHNITZER, OF CLEVELAND, OHIO.

MACHINE FOR MAKING METAL BALLS.

No. 814,807. Specification of Letters Patent. Patented March 13, 1906.

Application filed May 12, 1905. Serial No. 260,110.

To all whom it may concern:

Be it known that I, CARL T. SCHNITZER, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Machines for Making Metal Balls, of which the following is a specification.

My invention relates to machines for forming and finishing balls, such as are employed for ball-bearings and for other purposes.

The main object of my invention is to form the balls in an expeditious manner by a compressing and kneading process from blanks so that the grain of the metal is distributed throughout the ball, being interlaced in such manner that there is no danger of the ball breaking or cracking.

In carrying out my invention I provide a shaft or roller formed with a spiral groove and extending through a die, at the mouth of which is formed a groove, preferably annular and which coöperates with the groove of the shaft or roller to form and finish the ball. The machine is so constructed that as the shaft or roller is rotated it is moved through the die so that the blank or ball while being formed is caused to traverse the spiral groove, in this way being compressed into shape, rolled into spherical form, and finished,

In the accompanying drawings, Figure 1 shows a front elevation of a machine embodying my improvements with parts in section and parts broken away. Fig. 2 is a local section on the line 2 2 of Fig. 1 of the casing where the blanks are rolled. Fig. 3 is a detail view showing a vertical section of a portion of the grooved roller or shaft. Fig. 4 is a detail view, in vertical section, of the clutch mechanism for connecting the beveled spur-wheels with their driving-wheels. Fig. 5 is a diagram illustrating the manner in which a cylindrical blank is rolled and compressed by the grooved shaft or roller and the die into spherical form. Figs. 6 to 10, inclusive, illustrate the manner in which the blank is formed into a sphere, Fig. 6 showing the blank as it is first cut from a bar and as it is placed into the machine. Fig. 7 shows a longitudinal section through such a blank, illustrating by dotted lines the arrangement of the grain of the metal. Fig. 8 shows how the blank is rounded over at its ends, and the dotted lines indicate how the grain is knit or interlaced. Fig. 9 shows the arrangement after the rolling operation has further progressed. Fig. 10 shows the arrangement after the sphere is completed. Fig. 11 is a detail view, on an enlarged scale, showing the relation of the groove in the roller and the groove in the die, a ball being shown arranged in the grooves.

The framwork may be of any suitable construction adapted to support the working parts of the mechanism. As shown, the standards A support a table B. In this table is supported a die C, formed with a central opening *c* and having around the mouth of this opening on its upper side an annular groove D. This die is fixed to the table B. Above it is arranged a housing E, consisting of a closed top *e*, vertical posts *e'*, and intermediate sections e^2. These may be made of transparent material, such as mica, and one of the sections may be removable, constituting a door, by means of which access may be had to the interior of the housing and through which the blanks may be inserted. Through the housing extends vertically a shaft or roller F. The upper portion of this roller is shown as plane and cylindrical and of smaller cross-section than the grooved portion below and is adapted to move vertically through a guide *f* in the top of the housing E. Within the housing the roller is formed with a continuous spiral groove G of the form more clearly illustrated in Fig. 3. Below the die the roller is made plane or ungrooved at *f'*, and it extends through beveled gear-wheels H I and a collar J. The lower end f^2 of the shaft or roller F extends into a seat or socket f^3 in a frame K. A ball-bearing L is preferably arranged between the frame K and the lower gear-wheel I, so that the gear-wheels and shaft may have their weight borne by the rollers, and therefore can revolve freely. The frame K is adapted to move vertically in guides in the standards A. The lower end of the frame is connected by a link M with a lever N, pivoted at *n* to a suitable support and connected by a link O with a lever P, by means of which the frame K may be raised and lowered either by hand or by suitable automatic mechanism connected therewith. The frame K carries a short shaft Q, to which is secured a chain-wheel R and a spur-wheel S. A chain may be applied to the chain-wheel R in any suitable manner so as to revolve the shaft Q, but allow the frame K to move up and down to a limited extent without stopping the rotation of the shaft Q. The spur-wheel S is provided with two series of teeth *s* and *s'*, the teeth *s* being adapted to gear with the beveled wheel H, and the

teeth s' are adapted to gear with the beveled wheel I.

In the construction shown all the wheels are in gear with each other; but by the mechanism shown in Fig. 4 only one of the wheels H or I is connected with the roller or shaft F at one time. As there shown, the lower portion f' of the shaft is formed with a groove q, in which fits a key q', that is adapted to slide therein. The beveled wheels H and I are formed with grooves or recesses adapted to receive the key q', and set-screws q^2 are employed for connecting the wheels H and I with the key, so that either one of the wheels may be rigidly secured to the shaft F, so as to revolve therewith, while the other wheel will revolve freely around the shaft. Other mechanism may be employed for connecting and disconnecting the wheels H and I. In this way the speed of rotation of the shaft F may be varied.

The mechanism operates in the following manner: Blanks of the form shown in Fig. 6 are cut from a bar, and while still hot a blank is introduced into the housing E and falls onto the inclined surface c' of the die C. It then rolls down into the groove D in the manner shown at x in Fig. 5. The shaft F is rotated in the direction indicated by the arrow, and its groove G receives the blank in the manner illustrated. As the shaft is rotated it is gradually lowered, and the blank for the ball is carried downward and horizontally forward, as indicated in Fig. 5. Inasmuch as the die is stationary while the shaft is revolving the blank will be turned in the manner indicated at y in Fig. 5, its corners being rounded. Afterward it will be further turned and rounded, as indicated at z and z', until finally after having traversed the groove G and repeatedly traveled around in the groove D it will assume a spherical form, as indicated at w in Fig. 5. The blank is larger than the spiral groove, but is smaller than the distance between the upper reduced end of the shaft F and the sides of the opening C in the die, and consequently is held between the spiral groove on the roller and the groove in the die-plate until the shaft F has descended so that its upper reduced end is in the opening in the die-plate, when the blank, which is now a finished ball, drops onto the receiver U, carried by the moving frame K.

It will be understood that the blanks when delivered to the mechanism are hot, and as it is desirable to keep them so I provide the housing E, before mentioned. I have shown a single spirally-grooved roller or shaft F and a single die; but it is obvious that the number may be increased and operated simultaneously.

Balls made by the mechanism described are strong, hard, and durable and need no further treatment.

I claim as my invention—

1. A machine for making balls, comprising an endwise-movable revoluble spirally-grooved shaft or roller and a die through which said roller operates.

2. The combination of a die having a vertical opening and a groove surrounding the opening, a shaft formed with a spiral groove and extending through the die and means for rotating the shaft and for moving it endwise.

3. A machine for making and finishing balls comprising a stationary die, a spirally-grooved shaft extending through the die and means for rotating said shaft and for moving it endwise.

4. A machine for making balls comprising a stationary die having an inclined surface, a central opening, and a groove surrounding the opening, a housing covering the die, a spirally-grooved shaft extending through the die, and means for rotating the shaft and for moving it endwise.

5. A machine for making balls comprising a stationary die, its housing, a spirally-grooved shaft extending through the die, a vertically-movable frame supporting the shaft and means for moving the frame vertically and for rotating the shaft.

In testimony whereof I have hereunto subscribed my name.

CARL T. SCHNITZER.

Witnesses:

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