(No Model.)

L. W. MERRIAM.

MACHINE FOR MANUFACTURING METALLIC BALLS.

No. 596,899. Patented Jan. 4, 1898.

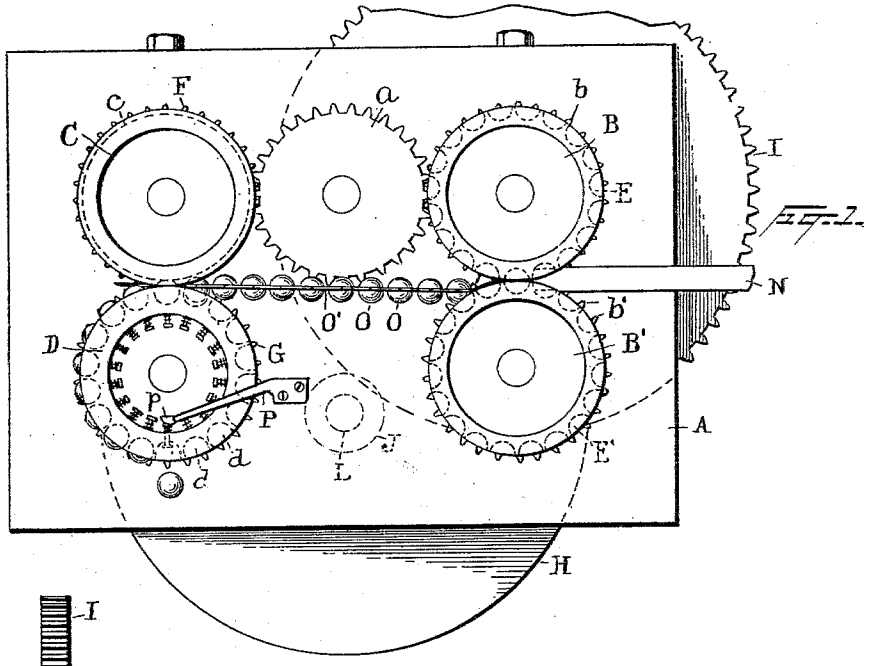


Fig. 1.

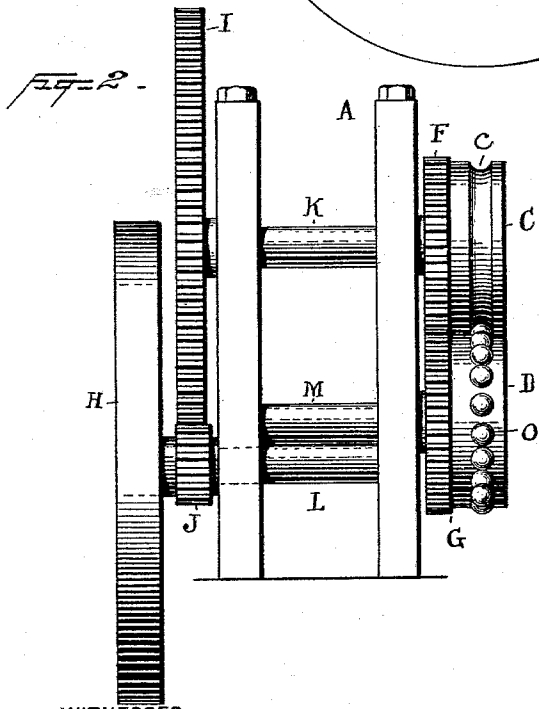


Fig. 2.

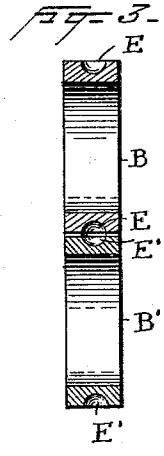


Fig. 3.

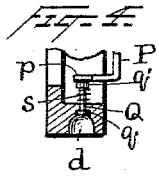


Fig. 4.

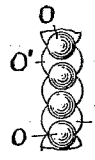


Fig. 5.

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MACHINE FOR MANUFACTURING METALLIC BALLS.

SPECIFICATION forming part of Letters Patent No. 596,899, dated January 4, 1898.

Application filed September 9, 1897. Serial No. 651,132. (No model.)

To all whom it may concern:

Be it known that I, LYMAN W. MERRIAM, a citizen of the United States, residing at Fitchburg, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in the Manufacture of Metallic Balls; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My present invention relates to certain improvements in the manufacture of metallic balls of various kinds from a rod or wire, especially those that are now employed in the ball-bearings of bicycles and similar machines.

Among the objects of the invention I may mention the improvement in the character and quality of such balls, the cheapening of their production, and the provision of mechanism whereby they may be made in large quantities with the expenditure of a small amount of power.

The invention therefore consists, essentially, in the construction, arrangement, and combination of parts, and also in the method of making, substantially as will be hereinafter described and claimed.

In the annexed drawings, illustrating my invention, Figure 1 is a side elevation of my improved ball-making machine. Fig. 2 is an end view of the same. Fig. 3 is a sectional edge view of the pair of rolls that shape the balls. Fig. 4 is a detail view of one of the devices for expelling the balls from the dies or cups of the detaching-rolls. Fig. 5 is a plan view of several balls as they appear after leaving the shaping-rolls and while still connected together by a thin web of metal.

Like letters of reference designate like parts in all the figures of the drawings.

A denotes the main framework of my improved machine, which may be varied at the pleasure of the builder.

B B′ denote two wheels or rolls, which I term "shaping-rolls," they being located one vertically above the other and having blunt-edged semicircular concavities or recesses, and their function being to shape the balls from the original blank of metal—as, for instance, rod N—by pressing said balls from the rod which is introduced (either heated or cold, acccording to the metal) between rolls B B′, as shown in Fig. 1. The balls thus shaped are shown at O O O, Fig. 1, and also in Fig. 5. It will be observed that they are still connected to each other by a thin web O′, of metal, this web having curved edges which extend from center to center of the balls. The concave dies in roll B are designated by the reference-letter E and those in roll B′ by the reference-letter E′. Both the rolls B B′ are mounted on suitable shafts, and to the roll B is attached a driving-gear *b*, which meshes with an intermediate gear-wheel *a*, that is engaged by another gear F, fastened on the wheel or roll C or its shaft, while to the roll B′ is attached a gear *b*′, that is driven by the gear-wheel *b*.

C and D indicate two rolls or wheels, which I term "detaching-rolls," for the reason that their function is to sever the web from the balls O O O and deliver the balls completely round and smooth from the machine. The roll C has only a peripheral groove *c*, although, if desired, a series of semicircular cup-shaped recesses may be provided in lieu of the groove *c*, such series of recesses being substantially equivalent to the single groove *c*. The roll D has a series of semicircular cup-shaped recesses *d d*, which are considerably deeper than the recesses or dies E′ of shaping-roll B′, and hence are not truly semicircular. Roll D is vertically below roll C. The shaped but as yet connected strip of balls after leaving the shaping-rolls B B′ is fed in any suitable way between the detaching-rolls C D, and each ball O is pressed forcibly into one of the recesses *d*, which, as I have stated, is deeper than the joint recesses E E′ in which said ball was formed, and hence the result follows that the web O′ is cut clearly from the balls which are left pressed or stuck into the recess *d*.

The gear F, which engages intermediate gear *a*, is on the shaft K of roll C and may or may not, as preferred, be attached to roll C, the shaft K being suitably held in main frame A, and said gear F engages gear G on shaft M of roll D. H denotes a drive-pulley on the shaft L, on which is a pinion J, that engages the large gear I on shaft of gear *b* and roll B. By this means or by any other suitable ar-

rangement of gearing the various rolls are actuated in the performance of their several functions.

The effect of severing the balls O from each other is of course, as already stated, to cast away the fragments of the frangible connecting-web O′ as so much waste and leave the balls O securely set in the several recesses *d d* around the periphery of the roll D. At least it is to be assumed that such will be the result, considering the pressure upon the balls, although it is fairly conceivable that some of the balls may not stick in the recesses, but may drop out by gravity. When they adhere fast in the recesses, however, as they are shown as doing in Fig. 2, it becomes necessary to provide expelling means to detach them or expel them therefrom. I have shown an example of such means in Figs. 1 and 4. Each of the semicircular dies or recesses *d* of roll D is furnished with a yielding ball-expelling pin Q, which plays in a small opening in the center of the bottom of the die *d*, the end of the pin Q in the die having a head *q*, that normally seats in a small recess, as shown, while the opposite end of pin Q has a head *q′*, the pin being likewise enveloped by a spring *s*, so tensioned as to force the pin-head *q* into its seat or away from the interior of die *d*, and hence the spring will act to normally throw the pin into its idle or inoperative position each time after it has been projected to expel a ball from the recess *d*. On the frame A is secured a projecting arm P, whose end is bent to enter at right angles the recessed face of the roll D, where it is provided with an inclined stationary shoe *p*, so located that it will be struck successively by the heads *q′* of the various pins Q, ranged around the periphery of roll D, and the result of this contact between the shoe *p* and pins Q will be that each time a pin-head *q′* rides beneath the shoe *p* the pin will have its head *q* extended into the ball-containing recess *d*, against the ball therein, which latter will be dislodged and caused to drop from the roll D into such receptacle as may be placed to receive it. The moment the pin-head *q′* is released from the shoe the pin will be restored by the spring *s* to its normal position and its head *q* will be retracted so as not to interfere with the true sphericity of the next ball that may be pressed into the die or recess. Although I have represented this means for driving the balls out of their lodgment in the various recesses *d*, yet I do not intend to be restricted thereto and wish it to be understood that equivalent means may be employed.

I am aware that heretofore metal rolls have been made having semicircular cutting-dies that are adapted to operate upon a rod or wire to cut the same into spherical or other sections, but such rolls have not operated successfully and in my opinion are wrong in principle as well as defective in result. In my machine I do not attempt to use sharp cutting edges, but blunt flat-faced dies instead, the object being to shape and not to cut, and since my object is not to cleave the wire clear through, but simply to mold it, as it were, the shaping-rolls B B′ are placed a short distance apart, sufficiently so to leave the thin web O′, which keeps the balls in a continuous string until the severing-rolls C and D act thereon.

Many changes may be made in the precise arrangement and shape of the various parts of my machine, and I reserve the liberty of making such changes without exceeding the scope of the claims.

Of course it will be understood that the severing-rolls C D may be entirely omitted and the severing accomplished by the same rolls which shape the balls, provided it is desired to have the machine operated in this way.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a metal-forming machine, the combination of a pair of shaping-rolls, the members of which pair are separated as to their edges for a convenient distance, one having a series of shaping-dies with flat or blunt edges and the other having similar dies operating in conjunction with the first-mentioned dies: a pair of detaching-rolls, one of which is provided with a series of cup-shaped dies that are deeper than the dies in the shaping-rolls; and a series of expelling-pins arranged in connection with the said series of deeper dies to eject the metallic balls therefrom, substantially as described.

2. In a metal-forming machine, the combination with the shaping-rolls, of the detaching-rolls, one of which is provided with a peripheral groove, while the other has a peripheral series of semicircular cup-shaped recesses, and a series of expelling devices arranged in connection with the said latter recesses to eject the metallic balls therefrom, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

LYMAN W. MERRIAM.

Witnesses:

FRED E. TASKER,

CHARLES S. ROGERS.