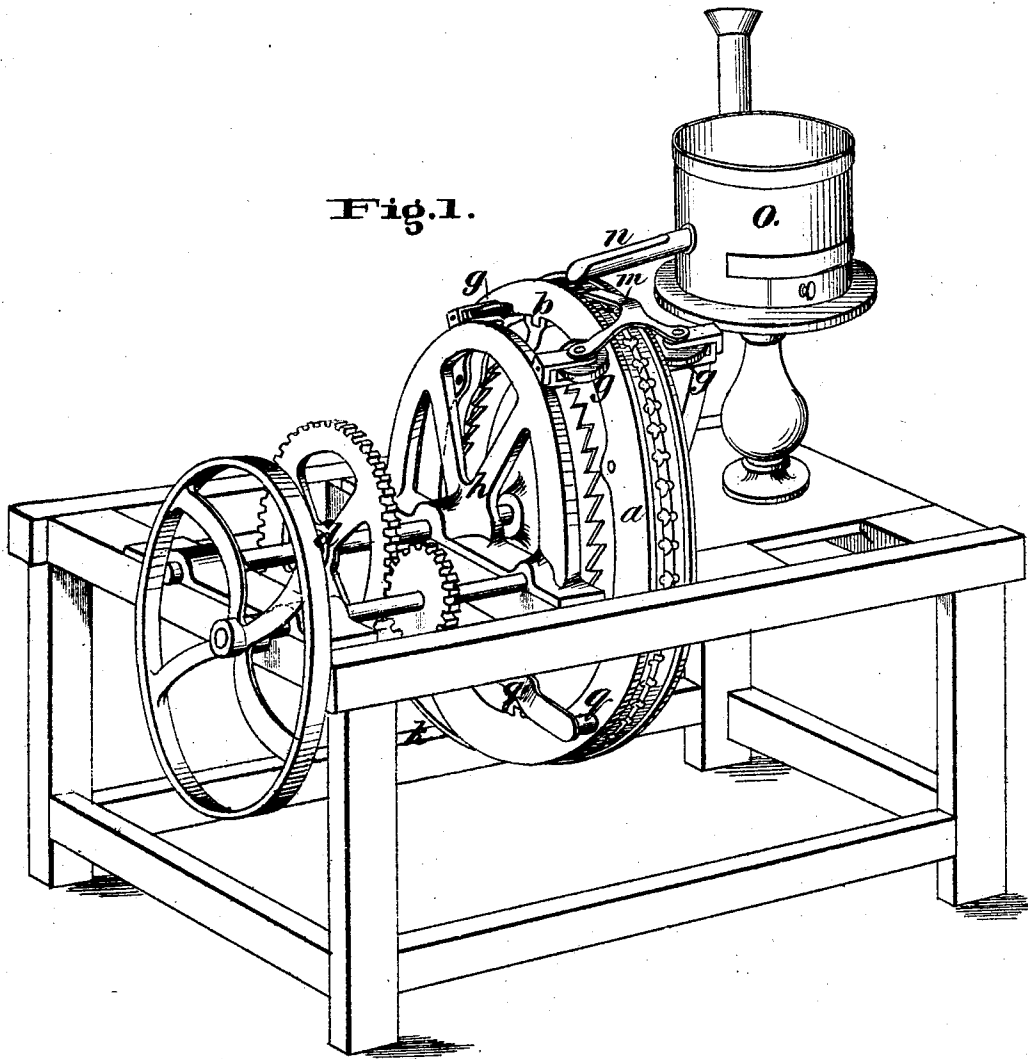


J. BRADFORD.
Revolving Bullet-Molds.

No. 135,197.

Patented Jan. 28, 1873.



Witnesses.
Joel S. Peyton.
Ed. Davidson.

Inventor.
John Bradford.
per Amos B. Resnick
Attorney

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Fig. 2.

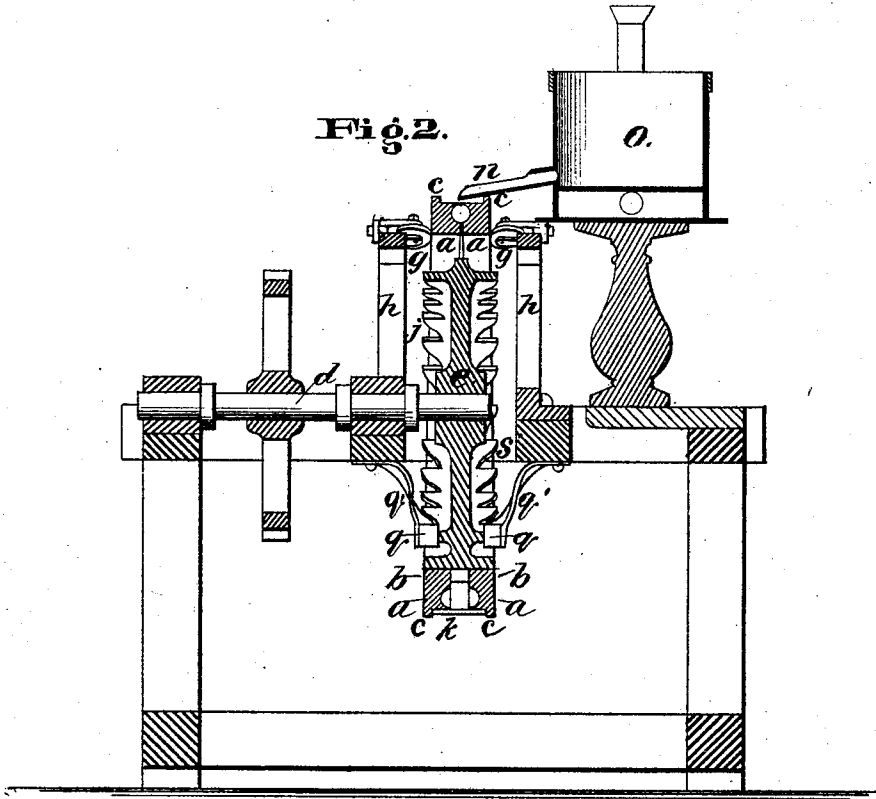
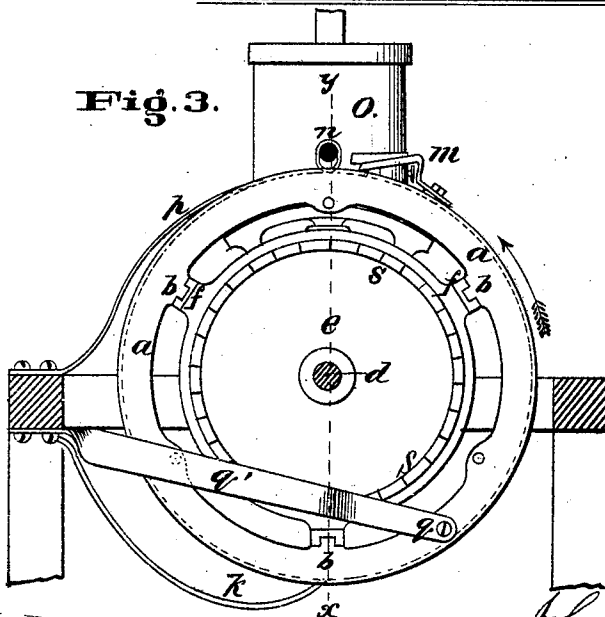


Fig. 3.



Witnesses.

Joe I. Peyton
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UNITED STATES PATENT OFFICE.

JOHN BRADFORD, OF CHICAGO, ILLINOIS, ASSIGNOR TO CHICAGO SHOT-TOWER COMPANY.

IMPROVEMENT IN REVOLVING BULLET-MOLDS.

Specification forming part of Letters Patent No. **135,197**, dated January 28, 1873.

To all whom it may concern:

Be it known that I, JOHN BRADFORD, of Chicago, Cook county, in the State of Illinois, have invented a new and useful Machine to be Employed in the Manufacture of Bullets, Buck-Shot, and various small articles which are castings of the more fusible metals, such as lead, tin, antimony, zinc, &c., and the alloys thereof; and that the following taken in connection with the drawing is a full, clear, and exact description of my invention.

In the drawing which is a representation of the precise construction preferred by me and now in use—

Figure 1 is a perspective view of the machine. Fig. 2 is a vertical section partly in elevation through the axis of the mold-rings on the line *x y* of Fig. 3. Fig. 3 is a vertical elevation of one of the rings and its accessories, the frame-work being partly shown in section.

The mechanical idea upon which my machine is founded is, that, a series of half molds of bullets or other small articles may be formed in the adjacent faces of two rings, which are capable of being slightly sprung out of a true plane, or warped so that they (the adjacent faces of the rings) may be held in close proximity through a certain arc of their whole circumference, and at another part of the circumference may be caused to separate so widely that the cast articles may drop out or be forced out of the molds. If such rings are held together at top and forced apart at bottom and caused to revolve, a stream of molten metal applied on the top will fill the molds as they come round in succession; the articles when cast will cool and at the locality where the rings are sufficiently separated will drop out. The adjacent faces of the rings should be held in contact long enough to permit the cast articles to cool on their surfaces to such extent that no fin will be formed when the faces commence to separate, and these adjacent faces must afterward separate sufficiently to enable the articles to drop or be forced out.

I have said that one-half of each mold is to be formed in each ring, but it is evident that less than one-half of the mold may sometimes be formed in one ring, and also that with some articles, such as lead buckles, the whole mold

may be formed in one ring, and the face of the other ring may act merely as a cover to the molds. These rings must in some way be coupled together in such manner that the halves or parts of the same mold shall be in proper relation the one to the other during the rotation of the rings. After this idea was conceived, many ways occurred to me of putting the same in practice; or rather, and more definitely, many ways of supporting, springing, and actuating the rings.

The drawing, as before stated, represents the plan which I have adopted in practice.

In the drawing, two rings, each provided with a series of half molds in their adjacent faces, are represented at *a a*. The molds are such as are proper for the casting of balls, buck-shot, &c.; and from each half mold a half gate leads out to the periphery or circumference of each ring. One of these rings has pins like dowel-pins secured in it, and in the other ring are holes or notches to receive the projecting parts of the pins, (or some of the holes and pins may be in one ring and some in the other.) These projecting ends slide in the holes as the adjacent faces of the rings approach and separate during each revolution. Each ring has, making part of or attached to its inner periphery, lugs or projections *b b*, and making part of or attached to its entire periphery, or supported in such manner as to bear upon its outer periphery, a flange, *c*. These lugs are the means by which the rings are supported, and have rotary motion communicated to them, and the flanges merely serve as a gutter or channel-way to retain the molten metal and direct it into the gates.

Upon a shaft, *d*, supported in a proper frame, and capable of being revolved by any appropriate machinery or by hand, is mounted the crown or disk *e*. This disk is provided upon its periphery with slots or recesses *f f*, each long enough (measuring in the direction of the shaft) to contain two lugs on different rings at the same time. The lugs fit easily in the slots, and slide therein during the revolution of the rings—the lugs of each pair approaching each other as they rise and separating as they fall during the rotation of the rings. These lugs and slots are, when well fitted, sufficient to insure the proper relative

position of the half molds; but I prefer to use the dowels as an additional security. For the purpose of holding the rings together at the top, I employ four rollers *g g g g*, which are to be supported in any proper manner—two frames *h h* serving that purpose in the present machine; and I prefer to make the carriages of these rollers adjustable so that they may be made to bear properly, two on the outer face of each ring. These rollers form a vise or clamp to hold the adjacent faces in contact. For the purpose of holding the rings apart at bottom, I employ a separator, *k*, which is by preference a spring attached to the frame, the acting part or true separator being the end of the spring (see Fig. 3) which lies between the two flanges *c c*. Small friction-rollers bearing against the inner sides or flanges form a good separator. A dam, *m*, which is a piece of metal lying between the flanges and resting on the circumference of both rings, prevents the molten metal which flows through the gutter *n* from running down the channel formed by the tops of the rings and their flanges, and a chisel or plane, *p*, cuts the sprues off as they come round in succession. This chisel, like the separator, fits between the flanges. A kettle, *o*, supplies the molten metal; and when a stream from it runs into the channel between the flanges it fills the molds as they are brought round in succession by the revolution of the rings actuated by the revolving crown-plate. The rollers hold the rings together long enough to permit the surfaces of the cast articles to chill or become hard; the chisel cuts off the sprues, and the separator springs apart the adjacent faces of the rings so that the cast-

ings may fall out. For the purpose of aiding the cooling of the bullets, &c., I apply a stream of water upon the rings, by preference, between the spout and the chisel; and in order to insure the discharge of the castings I apply two hammers, *q q*, mounted upon spring-handles *q' q'*; these hammers are forced apart by cam-teeth *s* on the disk or crown-plate, and as each tooth passes the projection from the hammer-handle upon which it acts, the hammers fly together and beat upon the rings, jarring them continually. I intend sometimes to use a positive discharge, such as a thin eccentric, to push the articles out of the molds.

In practice I employ rings about thirty inches in diameter and of the proportions shown in the drawing.

I claim as my own invention—

1. The combination of two rings provided with molds and capable of being warped, arranged relatively and operating substantially as described.

2. The combination of two rings capable of being warped and provided with molds, with a clamp and a separator, all substantially as specified.

3. In combination the following parts or elements of a machine—viz., first, two rings provided with molds and capable of being warped; second, a clamp; third, a separator; and, fourth, a crown-plate capable of revolution; all these parts being combined and capable of operating substantially as hereinbefore set forth.

JOHN BRADFORD.

In presence of—

N. H. BLATCHFORD,

FRANCIS H. WIGHTMAN.