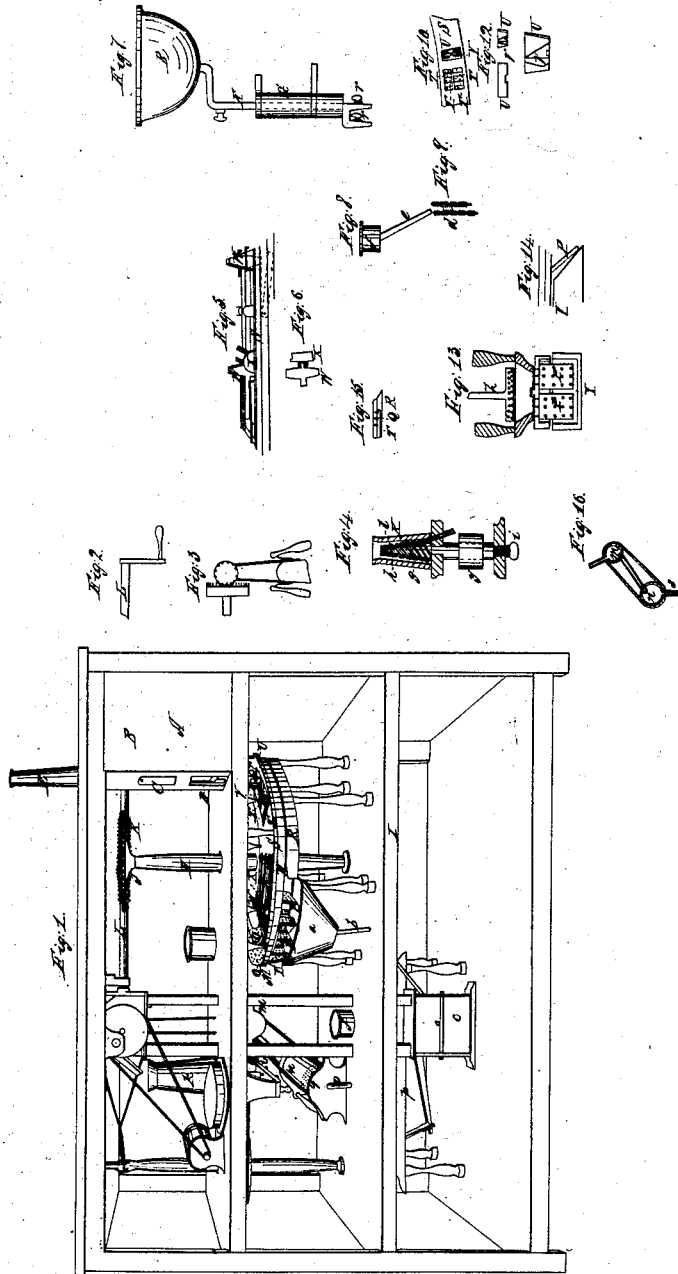


# A. Duvall, Making Shot.

N<sup>o</sup> 727.

Patented May 8, 1838.



# UNITED STATES PATENT OFFICE.

ALFRED DUVALL, OF BALTIMORE, MARYLAND.

## MACHINE FOR MANUFACTURING SHOT.

Specification forming part of Letters Patent No. 727, dated May 8, 1838.

### *To all whom it may concern:*

Be it known that I, ALFRED DUVALL, of the city and county of Baltimore, and State of Maryland, have invented a new and useful Machine for Manufacturing Shot, which is described as follows, reference being had to the annexed drawings of the same, making part of this specification.

A, Figure 1, represents a furnace for heating the crucible in which the lead is put to be melted for molding into shot. This furnace is constructed in brick-work, in any convenient situation, at a proper elevation above the molds. Over this furnace is arranged the crucible B, Fig. 7, in which the lead is melted. In front is constructed a door, C, Fig. 1, for the introduction of fuel, and another door, D, for air. On top is constructed a chimney, E, for carrying off the smoke. In the bottom of the crucible is inserted a tube, F, for conveying the melted lead to the molds, branched at the lower end for conducting the melted lead to various kinds of molds, surrounded on the outside by another tube, G, Fig. 7, leaving a space between the two for heated air to keep the inner tube warm for preventing the lead cooling. The outer tube commences after leaving the furnace and extends as far as the branches. The tube also has a stop-cock at top, at the bottom of the crucible, for shutting off the flow of the lead when required, and another at each of the branches *v v*.

On the second floor, I, of the building in which the operation of shot-making is to be carried on, or in any convenient situation, is placed an upright shaft, H, turning in a step on said floor, and its upper end turning in a bridge-tree above, or in any convenient fixture, on which end is a small screw-wheel, J, into which works a screw or worm, K, fixed on a horizontal shaft, L, turned by crank, pulley or any suitable gearing by hand, horse, or other power. On the upright shaft is a horizontal wheel, M, a little lower than the level of the bottom of the crucible, in order that the melted lead shall flow freely to the molds in said wheel. In this wheel is left a number of concentric spaces, in which are arranged circular plates O, in concentric circles, containing molds of various sizes for the several kinds of shot required. The circular plates O are in segments and smooth on top. The molds for the shot are on the under side of these

plates, made by drilling cavities or depressions half the size of the intended shot, or in the form of a semisphere figure, with small perforations leading to them from the surface of the plate, for the introduction of the lead. On the under side of said plates are flanges, to which are hung, by hinges or otherwise, separate plates P, Figs. 1, 13, 14, the segments of circles agreeing with the upper plates, in which are drilled corresponding cavities or depressions to those in said upper plates, which, when brought together, form the spherical cavities or molds for shot. The under sides of the lower plates are hollowed to admit anti-friction rollers Q, Fig. 15, which are intended to roll over the way or table herein-after described, for keeping the lower plates against the upper plates while molding, which said lower plates, as soon as they pass said way, drop at one end and discharge the shot. The shaft, wheel, way, &c., may be inclined a little.

Under the molds is the way or platform R, Fig. 1, before mentioned, over which the rollers on the under side of the lower sections of the molds roll. This way may extend half, a third, or a quarter round the circle in which the wheel moves, and is supported on columns, or in any other mode. Perpendicularly over this way is hung a frame, S, Figs. 1, 5, 10, by means of hangings projecting downward from the under side of the third floor, or in any other convenient position, in which frame are rollers T, Figs. 1, 10, pressing on the top of the upper sections of the molds, to prevent them from springing while molding, also the receiver or hopper U, Figs. 1, 10, 12, to receive the melted lead from the tube previous to passing to the molds, the lower edge of the rear side of which serving as a shear for taking off the particles of lead projecting above the upper surface of the upper plates. It likewise contains an inclined partition, V, in the middle, over which the lead is thrown. This frame also contains tappets or trip-hammers W, Figs. 1, 5, 6, for striking the upper plates for discharging the shot should they remain in the molds after the lower plates have dropped, which hammers are raised by means of a roller, X, with pins, cogs, or projections in its surface, turned by its friction on the revolving wheel.

Nearly opposite the way is a curved trough,

Y, Figs. 1, 13, 14, containing water for cooling the molds, and through which they pass after having discharged the shot, said trough being supplied by water passing from a reservoir above through a straight tube, Z, Fig. 13, then through a perforated tube at right angles to the one last mentioned, and then through the molds in the upper plates.

The hopper *a*, to receive the shot, is placed between the trough and way, and has a tube, *b*, leading from its smaller end to the elevator-box *c* on the ascending side, for conveying the shot to the elevators *d*, Fig. 9, which convey it to the upper part of the building. The elevator-belt consists of two chains passing around drums in an elevator-box similar to that used in common flour-mills.

The buckets *d*, Fig. 9, for raising the shot, are made of perforated sheet-iron, and fastened to the chains by wire, and placed at equal distances apart. Water is introduced into the ascending side of the elevator-spout by means of a tube, *e*, Fig. 8, leading from a reservoir, *f*, Figs. 1 and 8, and for the purpose of cooling the shot, the perforated buckets suffering the water to descend through these to the bottom.

The shot, when elevated, are discharged into a machine, by which they are compressed for rendering them perfectly round. This machine consists of a frustum of a cone, *g*, Fig. 4, fluted on its surface in a spiral, *h*, from one end to the other, the spiral flute being in depth equal to half the diameter of the shot to be compressed therein. A section of this flute will present a semicircle. A shaft passes through the center of this frustum of a cone, turning on the point of a screw, *i*, passing through a bridge, having on said shaft a pulley, *y*, by which it is turned. It is raised or lowered by a screw, *z*, to adapt it to the kind of shot to be compressed, Figs. 1 and 4. This solid fluted frustum of a cone is surrounded by a hollow frustum of a cone, *k*, Figs. 1 and 4, flanged at the bottom and secured by bolts to the floor. Its inner surface is smooth. The angle of the side of the solid frustum of a cone or runner, being greater than the side of the bed or stationary hollow frustum of a cone, will produce a space, *l*, between the two of a wedge shape, the largest end of the space being toward the small end of the runner, the axis of which stands in a vertical position. The upper end of the hollow frustum of a cone is made flaring to serve as a hopper. The shot, being introduced at this end, will be gradually compressed and rounded as they descend by the rotary motion of the fluted runner, the shot constantly changing their position from

the spiral form of the groove. After the shot leave this machine at the bottom thereof, they are received into a spout which conveys them into a horizontal revolving cylinder, *m*, Figs. 1 and 16, in which the shot become heated, and from thence they pass by a spout to another cylinder, *n*, Figs. 1 and 16, in which is put pulverized black lead for polishing them, the heat causing the black lead to adhere to them. The shot pass to the end of this cylinder, which is perforated with holes *q*, to serve as a screen. From this cylinder the shot is conveyed by a spout, *s*, Figs. 1 and 16, to a common vibrating screw-board, *p*, for separating the perfect from the imperfect shot, the former rolling off the end of the board into a receiver, and the latter remaining on the screw-board. This completes the operation.

The gearing for moving the several parts of the machine may be arranged in any convenient manner known to mechanics.

The invention claimed and desired to be secured by Letters Patent consists—

1. In molding shot by means of a horizontal revolving wheel of molds, which receive the melted lead directly from the crucible and discharging the shot, when molded, by dropping the under section of the molds as they pass from the end of the way, whether constructed and operated in the manner before described or in any other or similar principles.

2. The double-handed tube and receiver for conveying the melted lead to the molds, and the construction of the receiver for shearing off the surplus lead from the top of the molds and convey it over the center partition of said receiver to the forward part of the same.

3. The combination and arrangement of the hanging-frame rollers and hammers for keeping the molds from springing upward, and for discharging the molds by the action of the tappet-hammers upon the mold-plates.

4. The arrangement of the reservoir, tubes, and trough for cooling the molds, as before described.

5. The perforated elevators and column of water passing through them for cooling the shot.

6. The arrangement of the cylinder for polishing the shot.

7. The construction and arrangement of the frustum of cone for compressing and rounding the shot.

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Witnesses:

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