July 4, 1933. A. G. SCHURICHT 1,916,492

PROCESS OF PLATING SHOT

Filed Jan. 31, 1929 3 Sheets-Sheet 1

Fig. 1.

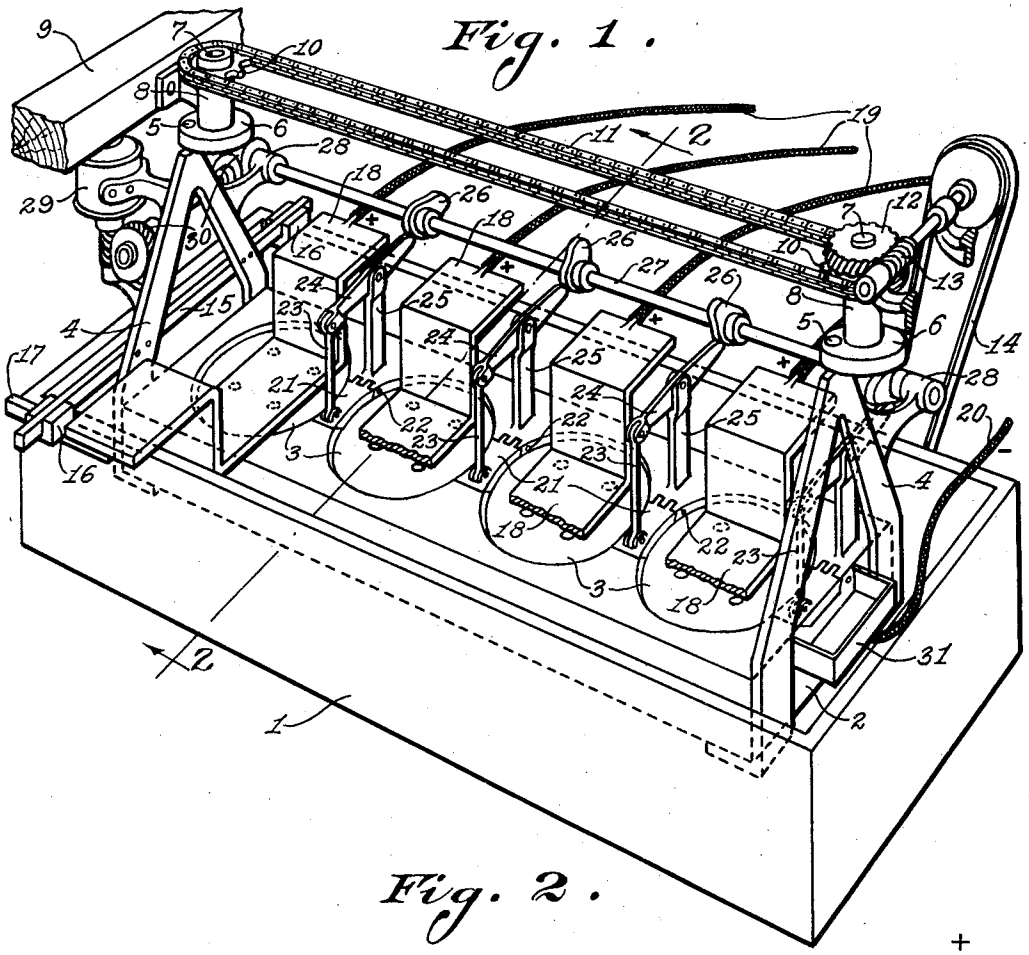
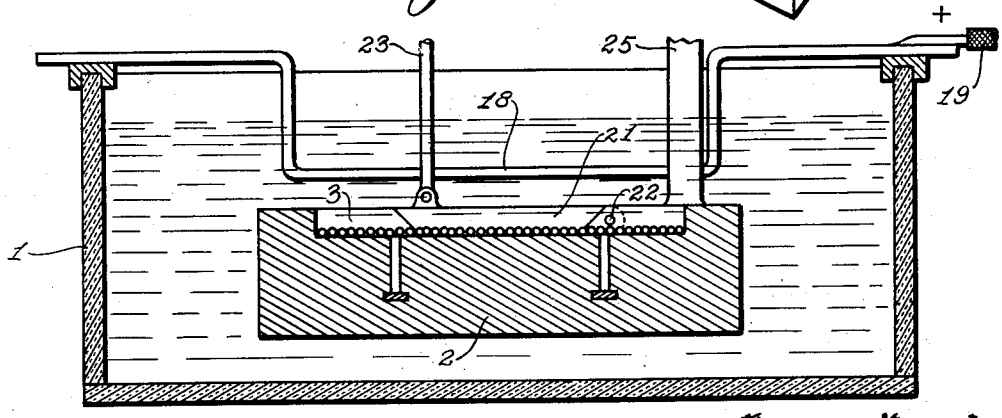


Fig. 2.



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Fig. 3.

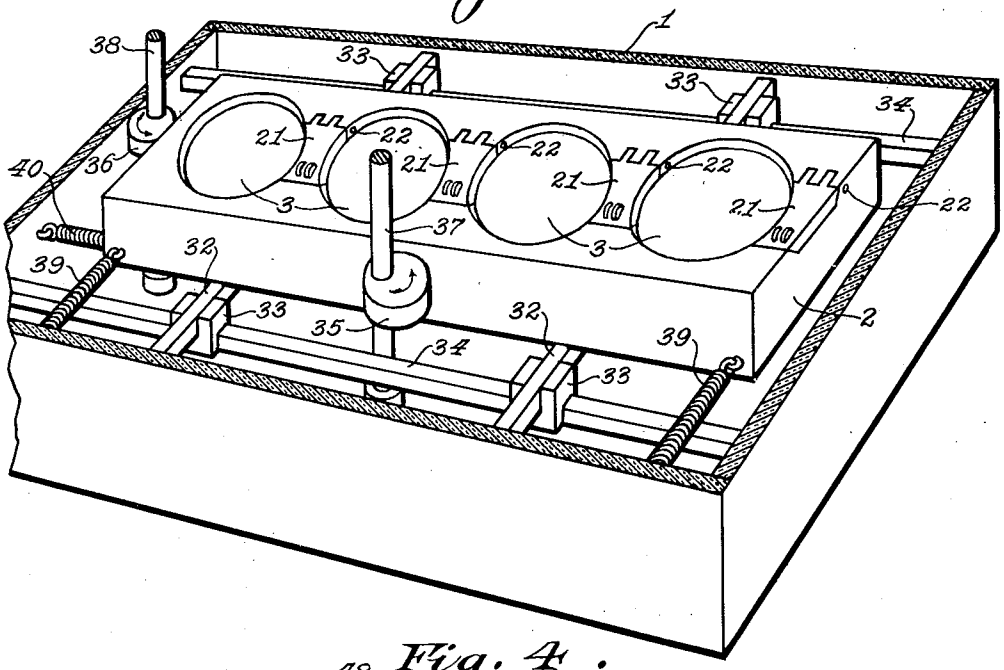
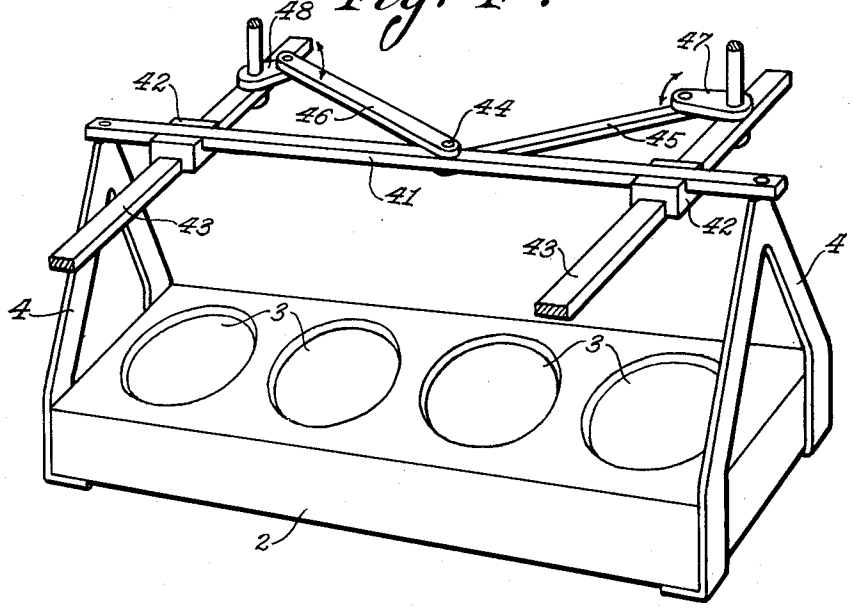


Fig. 4.



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Fig. 5.

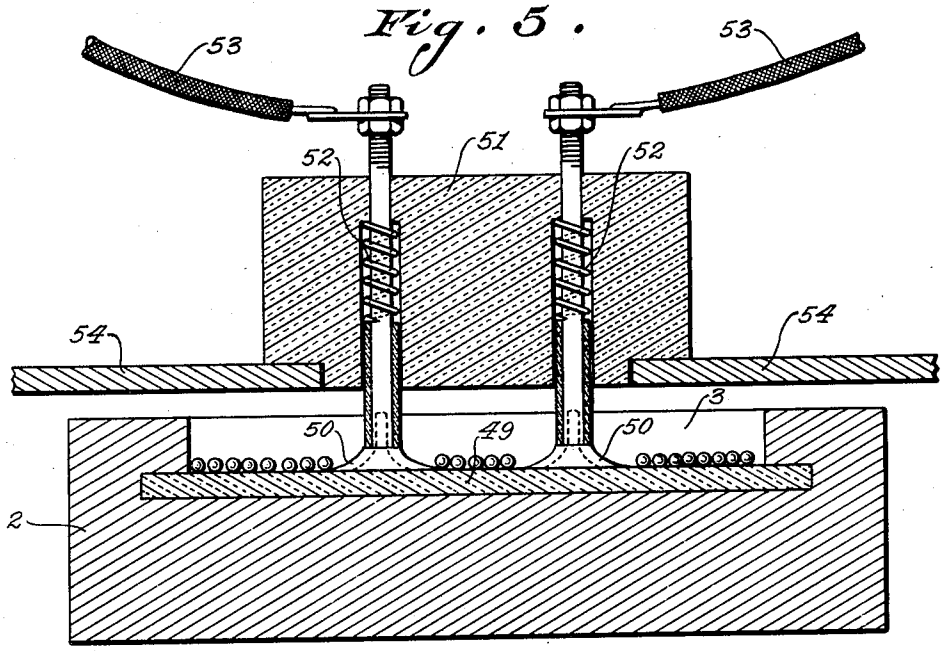


Fig. 6.

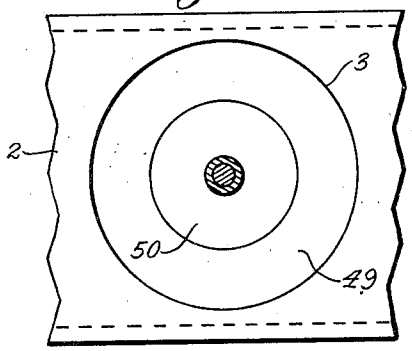


Fig. 7.

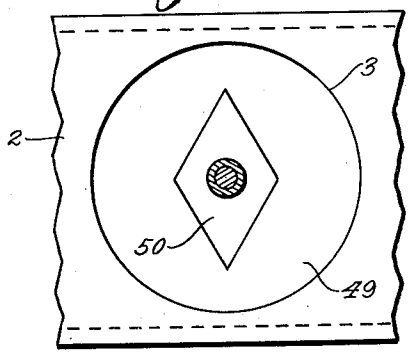
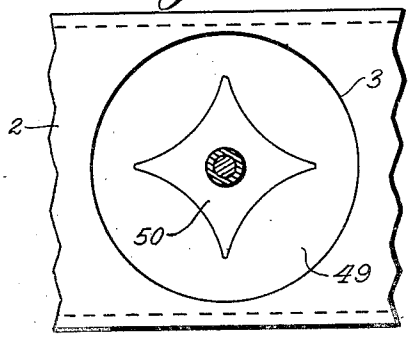


Fig. 8.



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Patented July 4, 1933 1,916,492

UNITED STATES PATENT OFFICE

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PROCESS OF PLATING SHOT

Application filed January 31, 1929. Serial No. 336,428.

This invention pertains to the plating of small round articles and more particularly to the plating of shot for shot gun shells.

In order to avoid some of the difficulties experienced with shot under the conditions of firing a shot gun, it has been advantageous to cover each pellet with a coating or jacket of another metal, such as copper. The application of such a plating may be conveniently carried out by plating as in an electroplating bath.

The plating or jacketing of the shot forms thereon a skin of tough metal which resists abrasion and provides a smooth surface. With such a plating the shot may be formed to a truly spherical shape, and the plating assists in preserving that shape, as it supports the body of the shot against deformation. It also provides a smooth, hard surface, which reduces the friction of the shot in passing through the barrel and also the resistance to movement of the pellets relatively to each other.

In order to be effective for the purposes outlined above, the plated coating must be relatively hard and tough. There must be no tendency for the plating to flake off. It is desirable, therefore, that the plated coating be compacted or condensed upon the shot so as to harden it and reduce the tendency for it to flake off. It is also highly desirable that the shot be as truly spherical as can be attained in order to improve the pattern and reduce the string of the shot load when fired.

One of the objects of this invention, therefore, is to provide a method of plating shot which will not only form a uniform coating, but which will compact or condense the plating, as it is deposited, to spherical form.

An effective method of condensing the coating is to cause the shot to roll on a hard surface as the plating is being deposited. In this way the plating is condensed by a sort of swaging action as it is being deposited; and as the rolling is continuous while the deposit is taking place, each layer of deposit is subjected to this swaging or condensing action, so that a very dense and tough plating is obtained to form a spherical pellet.

Another object of this invention, therefore, is to provide a method of plating, in which the shot are caused to roll while the plating is deposited.

Another object is to provide a method in which the shot may be handled in batches during the plating operation, each batch being subjected to a separate operation.

Another object is to provide such a method in which the rate of deposition of the coating may be varied during the plating process.

As it is essential that the rolling action take place in such a manner that the shot is caused to rotate or gyrate about all its axes, it is desirable to provide a method in which the shot is caused to spin upon continually changing axes, in order to secure a uniform condensed plating and form a spherical pellet.

Another object of this invention, therefore, is to provide a method in which the shot may be caused to roll or spin about all possible axes so as to condense every part of the plating thereof.

Another object is to provide novel apparatus for carrying out the process of this invention.

Further objects will appear from the following description, taken in connection with the accompanying drawings, in which

Figure 1 is a perspective view, with parts broken away, of an apparatus embodying this invention and adapted for carrying out the process thereof;

Figure 2 is a partial section on line 2—2 of Figure 1;

Figure 3 is a perspective view, partly in section, of a part of the apparatus, illustrating another embodiment of this invention;

Figure 4 is a perspective view, illustrating another way of producing the gyrating motion of the bed;

Figure 5 is a transverse sectional view, illustrating another embodiment of this invention; and

Figures 6, 7 and 8 are plan views, showing different shapes of contactors used in Figure 5.

In accordance with this invention, as pointed out above, the shot are plated with copper

or other suitable metal, and the plated coating is condensed by causing the shot to roll in such a manner as to spin the same on all axes, in order to secure a uniform condensed plating and form a spherical pellet.

Referring to the drawings, 1 designates the tank of a plating bath containing a suitable plating solution. Suspended in the solution in the tank 1 is a bed 2. The bed 2 is provided with one or more recesses or pockets 3 adapted to receive the shot to be treated.

The bed 2 may be supported at its ends on a pair of brackets 4 pivoted at 5 eccentrically on a pair of collars or plates 6 on a pair of shafts 7. The shafts 7 are mounted in suitable bearings 8 on a frame 9 and are equipped with sprockets 10 over which a chain 11 passes so as to cause the shafts 7 to rotate together. One of the shafts 7 may be provided with driving mechanism, such as a worm gear 12 engaging a worm 13 driven from any suitable source of power, as a belt 14.

As the shafts 7 rotate together, the pivots 5 being eccentric thereto, will carry the brackets 4 simultaneously through circular paths so as to give the bed 2 a gyratory motion. Such motion will cause a layer of shot placed in one of the pockets 3 to roll about and spin on their own axes. The brackets 4 may be provided with brace rods 15 engaging suitable guides 16 slidable on rods 17. The rods 15 will prevent swinging movement of the bed 2 without interfering with its gyratory motion.

Suspended in any suitable manner above each of the pockets 3 is an anode 18 having its central portion depressed to a position closely above the shot. A separate anode may be provided for each pocket, and the same may be supplied by leads 19 with electric current from any suitable source, not shown. A return lead 20 is attached to the bed 2, which forms the cathode for the bath.

In order that the shot in each pocket 3 may be transferred to the next pocket, a series of gates 21 is provided, establishing communication between each pocket and the next. These gates are hinged at 22 so as to open upwardly. The bed 2 may be inclined slightly, so that when a gate is opened, the shot will tend to pass from the higher to the lower pocket.

In order to provide for passing the shot successively from pocket to pocket, each gate 21 is arranged to be operated by a link 23 pivoted to a lever 24 hinged on a standard 25 on the bed 2. The other end of each lever 24 is positioned to be engaged by a cam 26 on a shaft 27 mounted in bearings 28 on the brackets 4. The cams 26 are set at progressively varying angles on the shaft 27, so that the cams will operate successively in depressing the levers 24 so as to open the gates 21. A suitable motor 29 is mounted on one of the brackets 4, so as to move with the bed, and is connected by suitable gearing 30 to rotate the shaft 27.

Any other suitable mechanism for accomplishing the opening of the gates 21 may be used; such, for instance, as operating the shaft 27 by means of a ratchet wheel engaging a stationary pawl during each swing of the bed 2, so as to be advanced step by step in accordance with the movement of the bed. It would also be possible to operate the gates by means of electro-magnet devices, whose operation is controlled by a clock movement.

In the operation of this part of the mechanism, batches of shot are deposited in any suitable manner in the pockets 3. With the bed 2 being operated as described, so as to move with a gyratory motion and with the plating current passing to the shot in each pocket, a continuous deposit of metal will be made upon the shot pellets; and at the same time these pellets will be caused to roll upon the hard surface of the bed 2 formed by the bottom of each pocket. The movement of the bed keeps the shot continually rolling about and spinning, and the axes about which the spinning takes place are changing from instant to instant. Accordingly, all parts of the surface of each pellet will be brought into contact with the hard surface and the plated coating will be subjected to a continual swaging operation which tends to compact and harden the same. The gyratory motion will also cause a uniform plating of the shot. Accordingly, shot of spherical form and having uniform condensed platings are secured.

At regular intervals, the gates 21 are opened. These are opened in succession progressively from the discharge end, or the right-hand end, Figure 1, toward the opposite end. When the last gate 21 is opened, the shot may be permitted to pass out into a suitable receiver 31, which may be removed from time to time and emptied. When the last pocket 3 has been emptied, the lower gate thereof is closed and the upper one opened by the action of the cams 26. Thereupon the shot from the second last pocket passes into the last pocket. The gyratory movement of the bed assists in causing the emptying of one pocket into the next. In this manner, the batches of shot are passed progressively from pocket to pocket until the first pocket is emptied, when a fresh supply of new shot may be placed in said first pocket by any suitable means.

In the embodiment shown in Figure 3, the movement of the bed is obtained by means of cams. The bed is mounted on rods 32 sliding in guides 33, which in turn slide on rails 34. This mounting permits the bed to move in any direction in a horizontal plane. A pair of cams 35 and 36 mounted on shafts 37 and 38 are arranged to give the bed movement in two directions. Springs 39 and 40 hold the bed in contact with the cams. The cams 35 and 36 may be set upon their shafts at any suitable angles relatively to one another, so

as to obtain a movement of the bed of any desired form. If the cams are so set that the displacement of the bed by one of them is a maximum, when that of the other is a minimum, the table will execute a substantially circular movement similar to that of Figure 1. In any other setting of the cams, movements of various forms may be obtained.

In the embodiment of Figure 4, the end brackets 4 are hung upon a bar 41 which slides in guides 42, which in turn slide upon rails 43 so as to permit movement in any horizontal direction by the bed 2. Pivoted at 44 on the bar 41 is a pair of links 45 and 46 connected, respectively, to cranks 47 and 48 mounted on suitable shafts and moved by any suitable mechanism, not shown, in such a manner as to have a rocking movement. Movement of the cranks may be timed relatively to one another so as to produce any desired movement of the bed 2.

In the embodiment of Figure 5, the bed 2 has its upper surface insulated by means of a glass plate 49. A pair of cathode terminals 50 are mounted in an insulating support 51 and pressed by springs 52 against the plate 49. The terminals are connected by cables 53 to a suitable source of current, not shown. The anode 54 is mounted directly over the bed, as shown, and the support 51 may be mounted in a perforation therein.

The shot are placed upon the plate 49 and the bed 2 is given a gyratory movement, as previously described. The terminals 50 may have any suitable geometric form, as indicated in Figures 6, 7 and 8. As the bed 2 gyrates, the shot 55 will be made to pass over or into contact with the terminals 50, so as to be brought into electric circuit therewith, in order to receive a deposit, and at the same time will be caused to spin on the plate 49. This spinning action is accomplished by the wiping or plowing action of the terminals as the shot are carried thereagainst. The terminals of different geometric form may be arranged in conjunction with the form of movement of the bed 2 so as to accomplish practically any desired spinning action on the shot.

It will be seen, therefore, that this invention provides a method and apparatus by means of which a hard, tough plated coating may be given to a mass of shot in a simple, convenient and expeditious manner. The gyratory movement of the bed causes the shot to roll about and spin upon the plate. Any desired movement may be given to the bed, so that the same will move with variable velocities involving accelerated and decelerated movement. Each of these movements has its effect on the spinning of the shot and the variation of such spinning about different axes; accordingly, shot of spherical form and having uniform, condensed platings are secured.

The arrangement for carrying out the plating in successive stages by transferring a batch of shot from stage to stage makes it possible to vary the rate of depositing metal at different stages, so that the manner of depositing the plating is under complete control.

While this invention is particularly applicable to the plating of shot, it will be understood that it is applicable in many cases to the plating of other projectiles and articles. It is also understood that certain features, operations and sub-combinations are of utility and may be employed without reference to other features, operations and sub-combinations; that is contemplated by and is within the scope of the appended claims. It is further understood that various changes may be made within the scope of the appended claims, in the details of construction and operation without departing from the spirit of this invention. It is, therefore, to be understood that this invention is not to be limited to the specific details shown and/or described.

Having thus described the invention, what is claimed is:

1. In the art of plating shot, the process comprising, rolling a batch of shot uniformly about all axes thereof on a substantially planar surface while the plating is deposited thereon and transferring the batch to another surface for similarly rolling thereon while the plating is continued.

2. In the art of plating shot, the process comprising, rolling the shot uniformly about all axes thereof in a series of batches on a substantially planar surface while the plating is deposited thereon and transferring the batches progressively to another surface while the rolling and plating are continued.

3. In the art of plating shot, the process comprising, rolling the shot uniformly about all axes thereof in batches on substantially planar surfaces arranged in series while the plating is deposited thereon, and transferring the batches progressively from surface to surface while the rolling and plating are continued.

4. Apparatus for plating shot comprising, a plating bath container, a support having a shot-receiving surface within the container, and means providing a substantially flat rolling surface and movable to impart a substantially uniform rolling movement to the shot about all axes thereof while the plating is deposited thereon.

5. Apparatus for plating shot comprising, a plating bath container, a support having a substantially flat shot-receiving surface within the container, and means for imparting movement to said support in order to roll the shot substantially uniformly about all axes thereof on the surface.

6. Apparatus for plating shot comprising,

a plating bath container, a support having a shot-receiving and rolling surface within the container, and means for imparting a side-swinging rotary movement to said support.

7. Apparatus for plating shot comprising, a plating bath container, a support having a series of shot-receiving compartments within said container, and means for imparting a side-swinging rotary movement to said support.

8. Apparatus for plating shot comprising, a plating bath container, a support having a series of shot-re eiving compartments within said container, means for imparting movement to said support, and gates between said compartments.

9. Apparatus for plating shot comprising, a plating bath container, a support having a series of shot-receiving and rolling compartments within said container, means for imparting a side-swinging rotary movement to said support, and means for effecting transfer of the shot from compartment to compartment.

10. Apparatus for plating shot comprising, a plating bath container, a support having a series of shot-receiving compartments within said container, means for imparting movement to said support, gates between said compartments, and means for opening and closing said gates.

11. In the art of plating shot, the process comprising, maintaining the shot in a single layer while plating in rolling relation on a planar surface, and oscillating the surface in a plurality of directions to roll the shot while the plating is deposited thereon.

12. In the art of making shot, the process comprising, plating the shot, and rolling the shot in a single layer with a gyratory motion on a hard smooth surface while the plating continues.

In testimony whereof I affix my signature this 14th day of January, 1929.

ALFONS G. SCHURICHT.