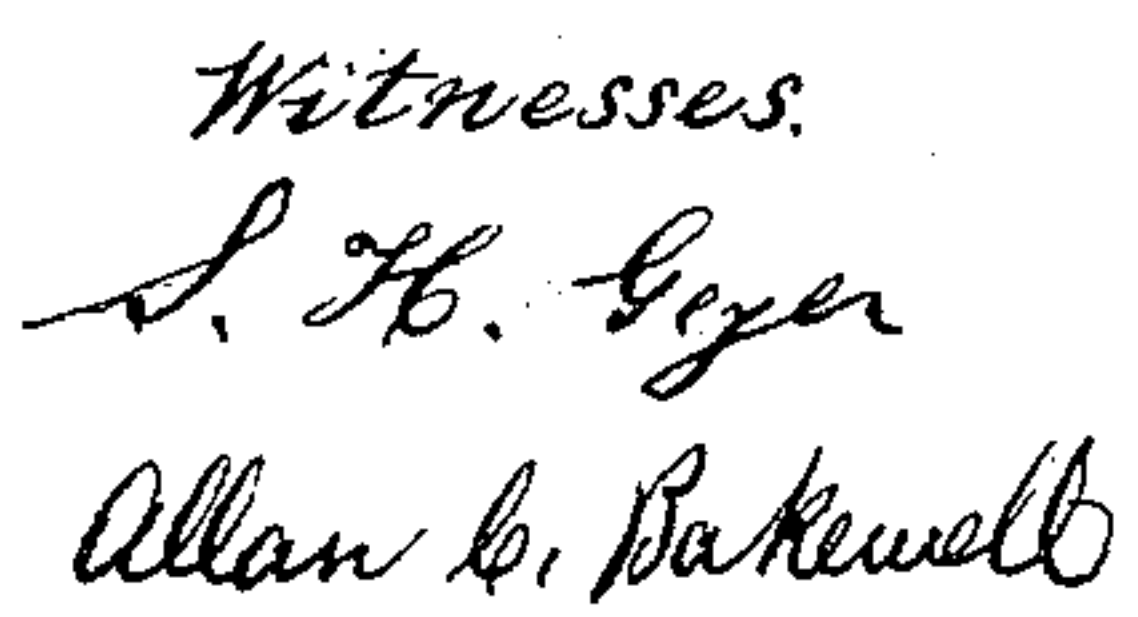


## Making Cannon Balls.

*Patented Jan. 23, 1866.*



Inventor.  
Charles Foster  
by his attorney,  
W B Atwell

# UNITED STATES PATENT OFFICE.

CHARLES FORSTER, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR TO HIMSELF AND ROBT. C. TOTTEN.

## IMPROVEMENT IN LATHES FOR TURNING SPHERICAL SHOT AND SHELL.

Specification forming part of Letters Patent No. 52,244, dated January 23, 1866.

*To all whom it may concern:*

Be it known that I, CHARLES FORSTER, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Lathes for Turning Spherical Shot or Shell; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a plan or top view of my improved lathe. Fig. 2 is a front elevation thereof. Fig. 3 is a side view of the mandrel and bit. Fig. 4 is an end view of the bit.

In the several figures like letters of reference denote similar parts of the machine.

The object of my invention is to enable spherical shot and shell to be turned in a lathe more accurately and rapidly than can be done by the machinery heretofore used for that purpose.

On account of the shape, size, and weight of spherical shot and shell it has been found very difficult to center them accurately in a lathe and to hold them in place with sufficient firmness to receive the action of the planing-tool without being dislodged from the center-bits of the lathe.

To enable others skilled in the art to construct and use my improved lathe, I will proceed to describe its construction and operation.

To the bed-plate *a* are attached the head-stock *b* and tail-stock *c*, the former carrying the live spindle *d*, which runs in two bearings, *e* *e'*, and the latter carrying the spindle-holder *f*, which is secured in place in the tail-stock *c* by the handle-nut *g*.

To the end of the live spindle *d* is attached a cup, *h*, having a cavity of the shape of a segment of a sphere less than a hemisphere, the diameter of the sphere of which the cavity of the cup *h* is a segment being the same as that of the shot or shell *o* to be turned, so that when the spherical shot or shell *o* is placed in the cup *h* more than one-half of the shot or shell will be exposed to the action of the turning-tool or cutter. The axis of the live spindle *d* and stationary spindle-holder *f* are in the same right line. *k k* are cone-pulleys for driving the live spindle *d*.

In the axis of the spindle *d*, inside and at the bottom of the cup, is a hole bored to re-

ceive a small loose spindle, *i*, the extremity of which is tapering, so as to enter the fuse-hole in the shell to be turned in the lathe, and of such diameter as to fit tightly in the fuse-hole, and thus hold the shell firmly. *i'* is a similar loose spindle or mandrel, which is set and turns in the spindle-holder *f*, and serves to hold the shell by the fuse-hole when that side of the shell is to be turned.

In Fig. 3, *m* is a loose bit having a cylindrical bore at one end, so as to fit and turn freely on the mandrel *i'* of the tail-stock. This bit *m* has at its outer end a circular face, with projecting knife-edges *n* radiating from its center, designed to take hold of the surface of solid shot, which have no hole to receive the loose spindle *i'*, as the shell has.

On the bed-plate *a*, between the head-stock *b* and the tail-stock *c*, is set the revolving slide-rest *p*, which turns on its center on a swivel-post projecting from and fastened to the bed-plate, in the manner usual with revolving slide-rests.

*q* is the tool-holder, which works on a mitred slide, *r*, on the top plate, *s*, of the revolving slide-rest *p*, and is moved backward or forward by the hand-wheel *t*.

To the periphery of the top plate, *s*, of the revolving slide-rest *p* is attached an arc (rather more than a quadrant) of a worm-wheel, *u*, into which gears the worm-wheel *v*, which is on a horizontal shaft, *w*, and is turned by the hand-wheel *t*. The axis of the swivel-post, on which the revolving slide-rest turns, is exactly in a vertical line, intersecting at right angles the horizontal axial line of the spindles *d* and *i'*, so that the center of motion of the revolving slide-rest *p* is exactly under the center of the spherical shot or shell *o* to be turned in the lathe.

As it is all important to the accurate operation of the lathe, so as to insure its turning a true sphere, that the center of the shot or shell should be set exactly in the vertical line passing through the center of motion of the revolving slide-rest *p*, a set-screw, *x*, passing through an arch, *y*, at the end of the head-stock *b*, presses upon the end of the live spindle *d*, so that by regulating this screw *x* the position of the center of the shell or shot *o*, placed in the cup *h*, may be accurately fixed.

As a further means of retaining the shell or



shot in the proper position relatively to the revolving slide-rest *p* while being operated upon by the cutter, the head-stock *b* and tail-stock *c* are connected together by a strong arch, *z*, which prevents any springing of the head and tail stocks, and permits the spindle-holder *f*, with its mandrel *i'* or bit *m*, to be pressed up against the shot or shell with sufficient force to hold it firmly in place and prevent it being dislodged by the action of the cutting-tool.

The arch *z* is placed back of the central line of the lathe, so as not to interfere in any way with its operation, and from the arch *z* over the cup *h* projects a bracket, *j*, with a set-screw, *x'*, which presses upon the revolving cup *h*, and serves still further to prevent any departure of the shell or shot *o* from its true position.

The operation of my improved lathe is as follows: If a shell is to be turned it is placed in the cup *h* with the fuse-hole outward, and the point of the mandrel *i'* of the tail-stock is inserted into the fuse-hole. The shell is then accurately centered by the set-screws *x* and *x'*, and the cutter being moved up to the surface of the shell, the lathe is set in motion, which causes the shell to revolve with its center of revolution coincident with its true center. The point of the cutter being started at the edge of the cup *h* and gradually moved round toward the mandrel or center *i'* by means of the hand-wheel *t'* revolving the slide-rest on its swivel-post, the point of the cutter traversing an arc of somewhat more than ninety degrees. By the revolution of the shell in the lathe at least one-half of its surface is thus accurately turned. When this is effected the shell is removed and is replaced in the cup *h* with its fuse-hole inward.

In order to steady the shell the loose spindle *i* is inserted in the hole in the center of the

live spindle *d*, so that the tapered point of the loose spindle enters the fuse-hole in the shell *o*, and the bit *m* being placed on the mandrel *i* at the tail-stock end of the lathe, the spindle-holder *f* is screwed up toward the shell *o* until the knife-edges *n* of the bit *m* take firm hold of the surface of the shell, and the spindle-holder being fastened by the handle-nut *g*, the operation of turning is resumed, and the other half of the shell is turned.

A solid shot is turned in the same way, excepting that the loose spindle *i* in the head-stock is dispensed with, and the bit *m* is used on the mandrel *i'* for turning both halves of the shot.

Having thus described my improvement in lathes, I do not claim the use of the cup *h*, nor of the revolving slide-rest *p*, as both these devices are old; but

What I do claim as my invention, and desire to secure by Letters Patent, is—

1. The use of the cup *h* in combination with the arch *z*, connecting the head-stock and tail-stock of the lathe, with or without the bracket *j* and screw *x'*, for securing the accurate centering of the shot or shell during the operation of turning.

2. The revolving slide-rest *p*, operated by a worm and worm-wheel, in combination with the cup *h* on the live spindle *d*, and the tapered mandrel *i*, for fitting into the fuse-hole of shells, or the bit *m*, with knife-edges on its face for holding solid shot, the whole being constructed, arranged, and operating substantially as hereinbefore described.

In testimony whereof I, the said CHARLES FORSTER, have hereunto set my hand.

CHARLES FORSTER.

Witnesses:

ALLEN C. BAKEWELL,  
W. D. LEWIS.