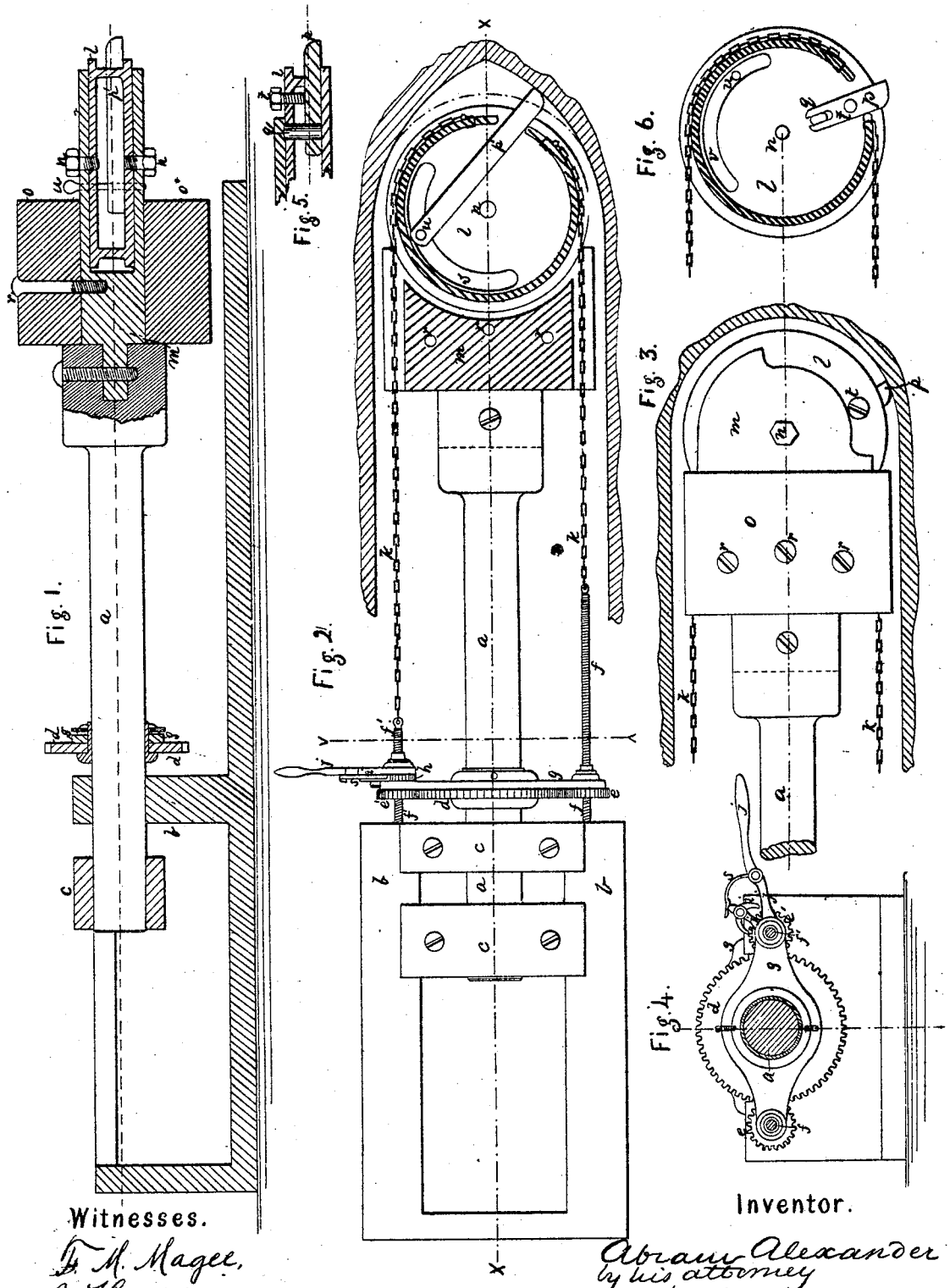
A. Alexander.

Apparatus for Planing Cannon Chambers.

No. 40225. Patented Oct. 13. 1863.



Witnesses.

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IMPROVEMENT IN APPARATUS FOR PLANING THE CHAMBERS OF CANNONS.

Specification forming part of Letters Patent No. **40,225**, dated October 13, 1863.

To all whom it may concern:

Be it known that I, ABRAM ALEXANDER, of the city of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improved Tool for Making the Bottom of Hollow Cast Guns; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings, in which—

Figure 1 is a longitudinal side view of my improved tool in section through the line *x x*, Fig. 2. Fig. 2 is a plan or top view of my improved tool, the top plate of the pulley and cheek-piece being removed to show the construction of the pulley and the arrangement of the long cutter used for traversing a spheroconical surface. Fig. 3 represents the external appearance of the end of the tool with all the parts in place. Fig. 4 is a vertical section through *v v*, Fig. 2, showing the gearing for operating the tool and changing its motion. Fig. 5 is a sectional representation of the end of the tool when arranged with a cutter for traversing a semicircular surface. Fig. 6 is a plan or top view of the interior of the pulley, showing the position and mode of attachment of the short cutter used for traversing a semicircular surface.

In the several figures like letters refer to similar parts.

In the manufacture of cannon when cast hollow it is necessary after the casting is complete, and before the interior of the gun is reamed out and turned smooth, to remove the hard scale on the inner surface of the casting. This scale is composed of fine particles of sand from the core of the casting and the iron in which it is embedded, and is so extremely hard that it is very difficult to remove it from the bottom of the chamber of the guns, which is usually either hemispherical or oval. This difficulty arises from the shape of the bottom of the bore or chamber of the gun, which renders it impossible to use an ordinary tool for boring, operating at right angles to the axis of the casting. This operation has heretofore been effected by means of a semicircular or semi-elliptical tool inserted into the cavity of the gun, and held firmly in place while the gun slowly revolves around it, the tool acting as a scraper, so that at each complete revolution of the gun the tool scrapes the whole inner surface of the chamber, and is slowly advanced so as to scrape more deeply. The surface presented by the burnt sand and iron is so extremely hard, and the length of the cutting-edge of the tool so great, that in a large gun it takes an average of ninety-six hours to remove the sand-scale, and the strain on the tool is so violent that it frequently breaks under the operation.

The object of my invention, therefore, is to furnish a tool which shall present a small cutting-surface to the scale to be removed, and which may be gradually fed forward, and at the same time travel round in the arc of a circle while the gun is revolved around it, so as by degrees to traverse the whole surface of the hollow hemisphere or sphero-conical cavity forming the chamber or bottom of the gun. This I have effected in the tool hereinafter described, by means of which the time required for removing the scale from the chamber of a large gun is reduced to one hour and twenty minutes, or from that time to three hours at furthest, as proved by actual use. The guns to be bored are secured in a horizontal position in a large lathe, by which they are revolved on their axis while the boring tool is inserted in the cavity of the gun and advanced slowly as the work progresses. In boring the cylindrical portion of the gun the tool does not itself revolve, but it is manifest that a tool to bore the bottom, unless it have a cutting-edge equal in length to the perimeter of the hemispherical bottom, must travel round that perimeter, although not revolving around the long axis of the gun.

In the drawings, *a* is a horizontal shaft, long enough beyond the frame *b*, which supports it, to project the tool to the bottom of the hollow casting, which is to be operated upon by it. This shaft *a* is strongly supported in the journal-boxes *c c* in the frame *b*. On the shaft *a*, near to the frame *b*, is a cog-wheel, *d*, which revolves upon it, and on either side of the cog-wheel *d* is a pinion or small toothed wheel, *e* and *e'*, which gear into the cog-wheel *d*, and in the center of each of which is cut a female screw, the threads of which correspond with the threads of the screw cut on the rods *f f'*, which work in the female screw in the pinions *e e'*. The screw-rods *f f'* are placed horizontally parallel to the shaft *a*, and are kept in their proper po-

sition by passing through the pinions *e e'*, which are attached to the plate *g*, which surrounds the shaft *a* and extends beyond it on each side. The pinions *e e'* revolve on their axes on the plate *g*. On the revolution of the cog-wheel *d* the pinions *e e'*—one on each side of it—revolve in opposite directions, causing the screw-shafts *f f'* to move horizontally, the one advancing as the other recedes. By changing the direction in which the cog-wheel *d* revolves, the motion of the shafts *f f'* is also reversed, that one which before advanced commencing to recede, while the other advances. This change of motion is effected by means of a small toothed wheel, *h*, attached to one of the pinions *e*, and a double pawl, *i*, which works in it, as seen in Fig. 4. The double pawl *i* is pivoted to the short arm of a lever, *j*, which has its center on a collar projecting from the face of the toothed wheel *h*, and a spring, *s*, extending from the lever *j* and pressing on the double pawl *i*, causes it to remain in the position desired, with either point of the double pawl taking into the teeth of the wheel *h*. The revolution of the large cog-wheel *d* being effected by raising and lowering the lever *j*, the direction of its motion is regulated and altered at pleasure by setting the double pawl *i*.

To the front extremity of each of the screw-rods *f f'* is attached a chain, *k k'*, which extends to the pulley *l*, which contains the cutting-tool. One end of each of the chains *k k'* is attached to the pulley, as seen in Fig. 2. The pulley *l* is set in a block, *m*, at the forward extremity of the shaft, and turns on two center pins, *n n*, placed on opposite sides of the pulley-block, on the axis of the pulley, but not passing through it, as that would interfere with the free motion of the cutter *p'*. The pulley is a hollow circular box, having an opening at one point in its circumference, through which the cutter or tool projects. At the end of the shaft *a* are two cheek-pieces, *o o*, extending partly over the pulley-block and secured thereto by screws *r r*. If the bore of the chamber of the gun is hemispherical, a small cutter, *p*, is inserted in the pulley, as shown in Figs. 5 and 6, a slot at the rear end of the tool passing over a pin, *q*, which passes through both sides of the pulley, and a set-screw, *t*, which enters the cavity of the pulley from the upper side, (see Fig. 3,) presses on the side of the cutter and holds it firmly in place. By means of the set-screw *t* and the slot in the cutter the degree of projection of the cutter *p* from the outer face or periphery of the pulley is regulated at pleasure. When the cutter is set, as shown in Figs. 3 and 6, and the tool is inserted into the bore of the casting, the gun is turned on its axis, the point of the cutter removing the scale in a circle around the chamber. At each revolution of the gun the lever *j* is moved slightly, which, by advancing the screw-rod *f*, and causing the other rod, *f'*, to recede a little, turns the pulley on its axis, and with it the cutter, so that its point advances very slightly toward the axis of the gun and the bottom of the bore, and when the pulley has been turned one-quarter round the point of the cutter will, by means of the motion of the cutter and the revolution of the gun on its axis, have traversed the entire hemispherical cavity of the chamber of the gun and cut away the scale. A reaming-tool of the usual kind is then inserted to complete the work of boring the chamber. It is obvious that the same effect would be produced if the whole tool revolved and the gun remained stationary; but it is usual with the largest guns to place them in a lathe and cause them to turn on their axis, as described.

The construction of tool described is for cutting away the scale where the chamber or bottom of the bore of the gun is a hemispherical cavity. Where it is oval or elliptical it requires that the cutter should have another motion besides that of turning round in an arc of a circle with the pulley. To effect this I use a longer cutter, *p'*, with a round hole through it at its rear end, through which passes a pin, *u*, which enters from the outside of the pulley-block to which it is attached and passes through the pulley, a slot, *v*, in the pulley being made to allow of the turning of the pulley one-quarter round, while the pin *u* and the rear end of the long cutter *p'* remain stationary. The forward end of the long cutter *p'* projects through the same hole in the circumference of the pulley as that through which the small cutter *p* passes, pressing against the side of the hole in the pulley so that the revolution of the pulley on its axis will cause the point of the cutter to describe the arc of a circle having the pin *u* for its center, and the center of motion *n* of the pulley *l* being different from the center of motion *u* of the long cutter *p'*, the curve described by the point of the cutter will not be a semi-circle, such as is described by the point of the short cutter *p*, which has its center of motion the same as the pulley. The degree of departure of the curve formed by the long cutter *p'* may be regulated by the position of the pin *u*.

The curve described by the point of the long cutter will be circular and not elliptical, (see Fig. 2,) but when the scale is removed from the casting, exposing the surface of the iron below it, the reaming-tool afterward used will give the exact shape required to the chamber of the gun.

Having thus described my improved tool for removing the scale from the bottom of hollow cast guns, what I claim as my invention, and desire to secure by Letters Patent, is—

1. The use of a tool, consisting of a pulley or cutter-holder, capable of at least a partial revolution on its axis in the plane of the axis of the casting to be acted upon, operating as a feed-motion to advance the point of the cutting-tool gradually forward in a curved line toward the axis of the casting, the tool being either turned within the casting or the casting revolved around the tool, substantially in the

manner and for the purpose hereinbefore described.

2. The combination of a revolving or partially-revolving pulley or cutter-holder, carrying a tool or cutter and attached to a shaft or other support, with suitable gearing and chains or connecting-rods for giving to the cutter or tool a feed-motion in the arc of a circle in the plane of the axis of the gun or hollow casting to be operated upon, for the purpose of causing the tool or cutter to traverse a spherical or sphero-conical surface by the revolution of the tool inside of the hollow casting or of the casting around the tool, substantially as described.

3. The use of a revolving or partially-revolving pulley or cutter-holder, carrying a cutter, the center of motion of which is eccentric to that of the cutter-holder, so as to cause the point of the tool to traverse a sphero-conical surface on the revolution or the casting around the tool or of the tool inside of the casting, substantially as described.

In testimony whereof, I, the said ABRAM ALEXANDER, have hereunto set my hand.

ABRAM ALEXANDER.

Witnesses:
A. S. NICHOLSON,
W. BAKEWELL.