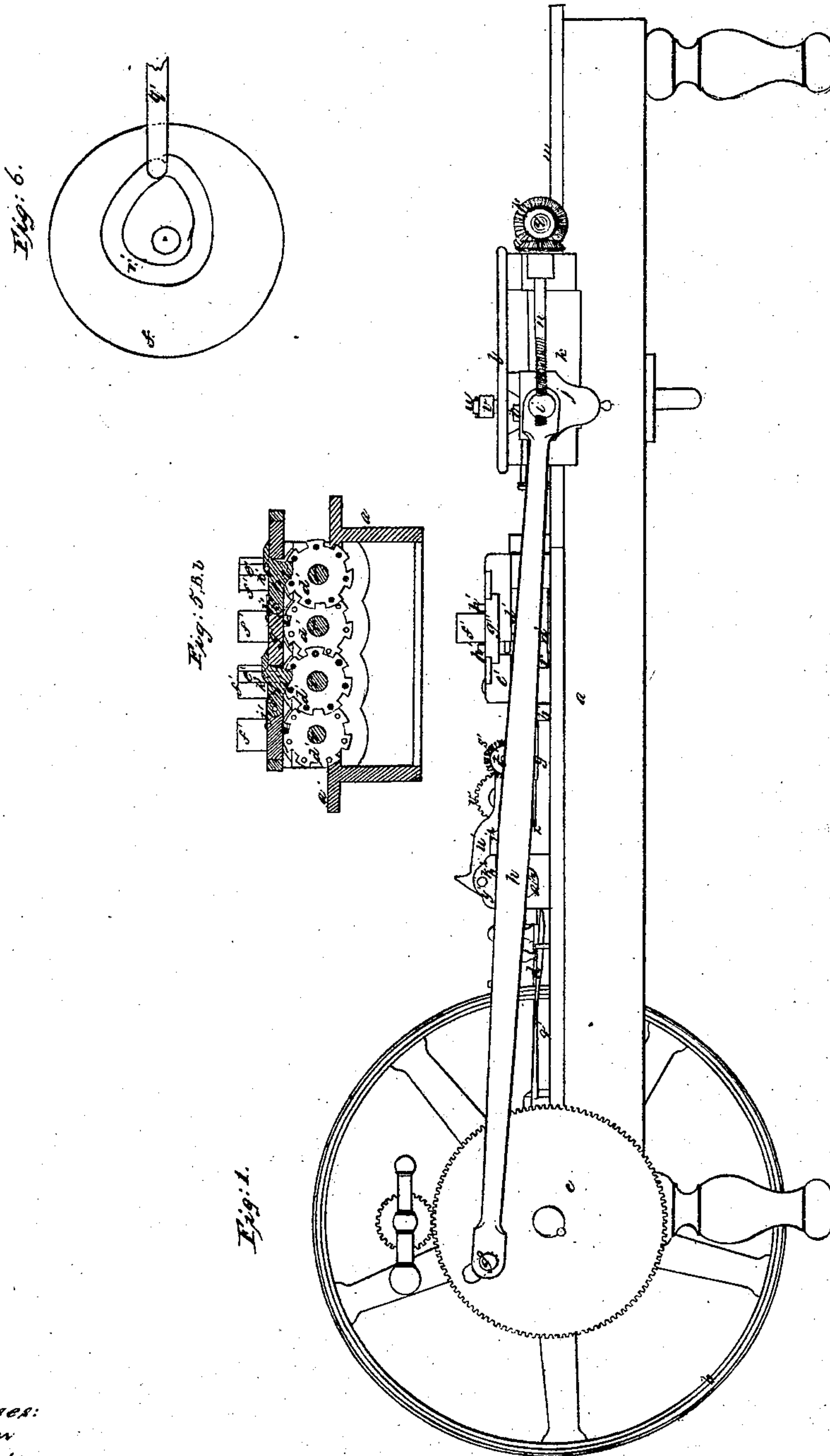


E. K. ROOT.
Rifling Machine.

No. 12,285.

Patented Jan. 23, 1855.



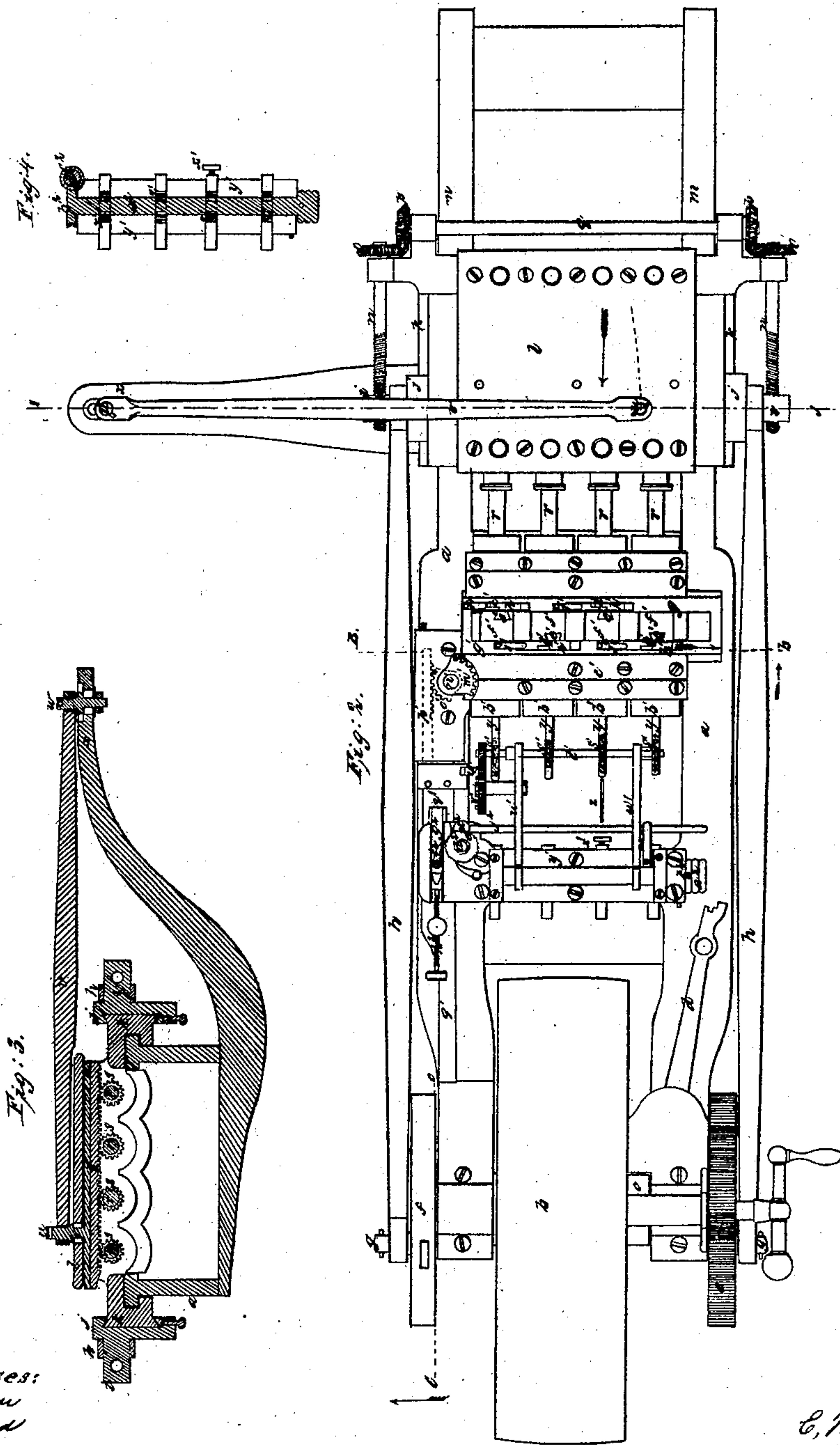
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Inventor
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UNITED STATES PATENT OFFICE.

E. K. ROOT, OF HARTFORD, CONNECTICUT.

COMPOUND RIFLING-MACHINE.

Specification of Letters Patent No. 12,285, dated January 23, 1855.

To all whom it may concern:

Be it known that I, E. K. Root, of Hartford, in the State of Connecticut, have invented certain new and useful Improvements in Machinery for Rifling the Barrels of Firearms, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1, is a side elevation of the machine. Fig. 2, a plan. Fig. 3, a vertical section taken at the line A, *a*, of Fig. 2. Fig. 4, a horizontal section through the head block *y'*: and Figs. 5, and 6 vertical sections taken at the lines B, *b*, and C, *c*, of Fig. 2.

The same letters indicate like parts in all the figures.

With my said improved machine a series of barrels can be rifled at the same time.

In machines, as heretofore constructed, the tool for rifling, as it reciprocates from end to end of the barrel, is turned by an arm provided with a roller that runs on the surface of a curved plane which gradually increases in curvature to increase the twist as it approaches the muzzle of the barrel. This mode of operation is deemed to be defective for various reasons not necessary here to enumerate.

The first part of my invention, which relates to the method of giving the increasing twist in rifling barrels, consists in deriving the required accelerating rotary motion for the spindle of the cutter from a connecting rod, or its equivalent, one end of which turns on a center which, when set, is at a fixed distance from the reciprocating carriage in which the spindle of the cutter is hung, and the other end connected with the mechanism which imparts the rotary motion to the spindle, the said connecting rod being at right angles, or nearly so, to the line of motion of the carriage at the time the cutter begins its cutting operation at the breech of the barrel. The accelerating rotary motion, thus imparted to the spindle of the cutter, progresses in the ratio that the line of the circle described by the end of the connecting rod recedes from the line of motion of the carriage, the said line of motion being tangent to the circle. And this part of my invention also consists in combining the said connecting rod or its equivalent, with the spindles of a series of cutters, by a sliding rack; by means of which the required accelerated rotary motion can be imparted to several cutters at the same time.

The second part of my invention relates to the turning of the series of chucks which carry the barrels to be rifled, to determine the distance between the several rifle grooves. In machines for this purpose the practice has been to impart the reciprocating motion to the cutter carriage by a crank, and to impart the motion to the mandrel by a curved plane or cam on the cutter carriage. The barrel cannot be turned until the cutter is entirely out, and therefore the cutter carriage must continue its motion in the same direction so far as to impart the required motion to the barrel to bring the next groove in line. In this way the whole of the time required to bring back the cutter to the breech of the barrel, is lost. The leading object of this part of my invention is to avoid this loss of time, and to this end this part of my invention consists in turning the mandrels by a slide which acts on cogs or spurs on the mandrels to turn them the required distance, in combination with a series of dogs which are lifted by the slide and which, at the end of the motion, are liberated to lock and hold the barrels to prevent them from turning during the cutting or rifling operation.

The third part of my invention relates to the method of operating a series of stops to adjust the cutters for each successive operation. The cutter is usually fitted to the end of a rod made tubular to receive a wedge formed pin which, at the end of each cutting operation, strikes a stop that forces in the wedge to wedge out the cutter, that it may project a little more for the next cut, the stop being moved forward for each operation. In my improved machine I employ the same kind of cutter and stop, but have a series of them corresponding with the number of barrels rifled at one operation, and this part of my invention consists in having a rack on the body of each stop when this is combined with a shaft having a series of pinions corresponding with, and fitted to the cogs of the several racks and receiving motion by a ratchet movement timed with reference to the other operations of the machine to advance the stops before the end of the back movement of the series of cutters. And the last part of my invention relates to the method of adjusting the range of motion of the cutters for various lengths of barrels, to avoid the necessity and labor of shifting and adjusting the barrel mandrels, cutters and stops; and this part of my

invention consists in making the cranks which operate the cutter carriage adjustable for any desired range of motion, in combination with an adjustable connection of the connecting rods with the cutter carriage, so that when the throw of the cranks is increased or decreased the position of the cutter carriage shall receive a corresponding change that the cutters may retain the same relation to the breech of the barrels and the stops which force out the cutters.

In the accompanying drawings *a*, represents a suitable frame and *b*, a loose pulley driven by a belt from some prime mover, and fitted to a main shaft with which it is connected by a sliding clutch *c*, by a shipping lever *d*. This shaft carries two wheels *e*, and *f*, one on each end, to which are fitted crank pins *g*, *g*, which are adjustable in radial slots to admit of increasing or decreasing their throw. These crank pins carry connecting rods *h*, *h*, that take hold of wrist pins *i*, *i*, on slides *j*, *j*, fitted to ways *k*, *k*, on the opposite sides of the cutter carriage *l*, which in turn slides on longitudinal ways *m*, *m*, secured to the frame. The slides *j*, *j*, are adjustable on the carriage *l*, by means of two screw shafts *n*, *n*, carrying bevel wheels *o*, *o*, which engage corresponding bevel wheels *p*, *p*, on a cross shaft *q*, so that by turning this shaft and the two screw shafts geared thereto the slides *j*, *j*, can be shifted at pleasure to regulate the position of the carriage with reference to the other parts of the machine when the crank pins on the two wheels *e* and *f*, are shifted to increase or decrease the range of motion of the carriage. In this carriage is mounted a series of parallel spindles *r*, each carrying a pinion *s*, see Fig. 3—and these pinions all engage the cogs of a transverse rack *t*, fitted to slide in ways in the carriage and at right angles to the line of motion of the carriage, so that when the rack moves in either direction all the spindles are rotated. A wrist pin *u*, passes up through a slot in the top of the carriage, and is secured to one end of a connecting rod *v*, the other end of which turns on a fulcrum pin or center *w*, adjustable in a slot in an arm *x*, projecting from the back of the frame.

When the carriage is at the extreme of its range of motion in the direction of the arrow the connecting rod *v*, is at right angles or nearly so to the line of motion of the carriage so that as the carriage recedes the end of the connecting rod *v*, connected with the rack *t*, describes a circle represented by dotted lines, see Fig. 2, and as this circular line moves from the line of motion of the carriage *l*, motion is imparted to the transverse rack *t*, and by it to the series of spindles *r*, which are thus caused to turn faster and faster the more the carriage moves back.

Each one of these spindles carries a cylindrical rod *y*, provided with a sliding cutter fitted to a slot in the tubular part of the rod; and to the tubular part of these rods are fitted small wedge formed rods *z*, which when driven in force out the cutters. As to this mode of forming, mounting and adjusting the cutters it may be well to say that they present no novelty as they have been long since used in machines for rifling barrels. The range of motion of the cutter carriage must be sufficient to carry the cutters back and forth through the length of the barrels to be rifled, the cutters performing their cutting operation as the carriage moves in the direction the reverse of the arrow.

The barrels to be rifled, are fitted to the inside of suitable mandrels *b'*, *b'*, *b'*, *b'*, mounted so as to turn freely in an auxiliary frame *c'*. The barrels are inserted in the mandrels with the muzzles toward the cutter carriage. Each mandrel carries a wheel *d'*, with as many spurs or cogs on its face, and as many notches in its periphery, as the number of grooves or rifles to be cut in the barrel; and for convenience of having the mandrels near to each other the wheels on the first and third mandrels are in the same line, and those on the second and fourth on another line. Over these wheels there are sliding dogs *e'*, *e'*, *e'*, *e'*, one over each wheel, and fitted to grooves in standards *f'*, *f'*, *f'*, *f'*, and borne down by springs, the tension of which keep them in the notches of the wheels to hold the mandrels and prevent them from turning. Directly over the wheels of the mandrels is a slide *g'*, consisting of two bars connected at the ends and the two bars are one each side of the two rows of sliding dogs *e'*, *e'*, and to the inner face of each of these bars, and fitted to recesses made therein, are levers *h'*, *h'*, that turn on fulcrum pins *i'*, *i'*, their forward ends lapping over the upper surface of the bars and held down by delicate springs *j'*, *j'*. The forward end of these small levers are wedge formed and pass under pins *k'*, *k'*, *k'*, *k'*, projecting from the faces of the dogs, so that as the slide moves forward in the direction of the arrow the dogs are lifted up out of the notches in the wheels of the mandrels which liberate them so that they can be turned freely—and so soon as they are liberated the heels or lower projection *l'*, of each lever strikes against the spur or cog on the wheel of the corresponding mandrel to turn it the required distance to determine the distance between any two of the grooves or rifles to be cut. The pins on the dogs then pass over the rear end of the inclined planes of the levers and are forced down by the springs to reengage the next set of notches in the wheels to hold the mandrels in place for the next cut. On the return motion of the slide the several

levers rise and ride over the pins of the spring dogs. The required reciprocating motion is given to this slide by a cogged sector m' , which engages rack teeth on the edge of the slide. This sector rack is on the upper end of an arbor n' , which carries another sector o' , (see dotted lines in Fig. 2) operated by a rack p' , on a sliding bar q' , which receives motion from a cam groove r' in the face of the wheel f , the form of which cam groove and its position relatively to the main shaft and the crank pin which operates the cutter carriage, is represented in Fig. 6, from which it will be seen that the slide is drawn back and begins to move forward to disengage the spring dogs as the cutter carriage completes its back movement so that the mandrels shall be turned the moment the cutters leave the barrels that there may be no time wasted in the operations of the machine.

As the cutters leave the barrels they pass under a series of brush wheels s', s', s', s' , by which they are cleaned. These brushes are all mounted on an arbor t' , hung in a swinging frame u' , so that they can be thrown up out of the way when the barrels are to be inserted or taken out of the mandrels. The arbor t' , has a pinion which engages a cog wheel v' , with spurs on its face which are engaged by a spring pawl w' , on the bar q' , as it advances to turn the mandrel, so that the same motion imparts the required rotary motion to the brushes to clean the cutters.

As the cutters leave the barrels the small wedge rods z , in the tubular end of the cutter rods y , strike a series of stops x' , by which the wedge rods are forced in to wedge out the cutters. These stops are forced forward a little at every cutting operation which is effected in the following manner. These stops slide in the head block y' , and have rack teeth on their upper surface engaged each by a pinion z' , see Fig. 4, on a shaft a^2 , provided with a spur wheel b^2 , engaged by a worm c^2 , on a vertical arbor d^2 , which at its upper end carries a ratchet wheel e^2 , operated by a ratchet hand f^2 , on a slide g^2 , which is forced back by a spring not shown in the drawings, and moved forward to give the required motion by the bar q' , which carries an adjusting screw h^2 , the end of which strikes the end of the slide g^2 . By means of this screw the amount of motion can be adjusted at pleasure.

The arbor d^2 , is hung in a bent lever i^2 , to which is jointed a hand rod j^2 , by which the worm can be disengaged from the spur wheel b^2 , to reset the stops at the end of each complete operation.

The shaft a^2 , carries a pin k^2 , which at the end of a complete operation, that is after the rifles have been completely cut in one set of barrels, strikes the end of the shipping

lever which unclutches the driving pulley from the main shaft to stop the machine.

From the foregoing it will be seen that the machine can be mounted to rifle any desired number of barrels at once, that all will be rifled alike—that the gradual increase of the twist toward the muzzle is graduated and determined with the utmost accuracy—that the mandrels carrying the barrels are liberated, turned and relocked in the time required for cleaning the cutters, and in much less time than in other machines used prior to my invention, and that the series of stops for adjusting and forcing out all the cutters at the end of each cut, are all operated with uniformity of motion.

I do not wish to be understood as limiting myself to the special construction and arrangement of the parts herein specified, but claim the privilege of modifying these so long as I attain the same result by equivalent means.

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

1. The method of giving the motion to the cutter stocks for giving the increasing twist, by means of the connecting rod or its equivalent turning on a fixed center and describing a circle at the point of its connection with the cutter carriage which moves in a tangent line, substantially as specified.

2. I also claim combining a series of cutter spindles with the said connecting rod or its equivalent by means of a sliding rack connected with the said rod and engaging pinions on the said spindles, substantially as described.

3. I also claim, in combination with the mandrels that carry the barrels the slide and its appendages to act upon and turn the mandrels, in combination with the dogs for locking and holding the barrels during the rifling operation, the said dogs being operated by the said slide, all substantially as specified.

4. I also claim, the mode of operating the series of stops to insure an accurate adjustment of the series of cutters, substantially as specified.

5. And finally I claim the adjustable crank pins for operating the cutter carriage in combination with the mode of forming the connection of the connecting rods with the carriage by means of slides governed by adjusting geared screws, substantially as specified, as a means of adapting the machine to the rifling of barrels of various lengths without the necessity of changing the relations of the mandrels and the stops for setting the cutters, as set forth.

E. K. ROOT.

Witnesses:

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BENNING MASON.