(No Model.)

P. D. NICOLS & T. W. WEBB.

BOLT THREADING MACHINE.

No. 272,079. Patented Feb. 13, 1883.

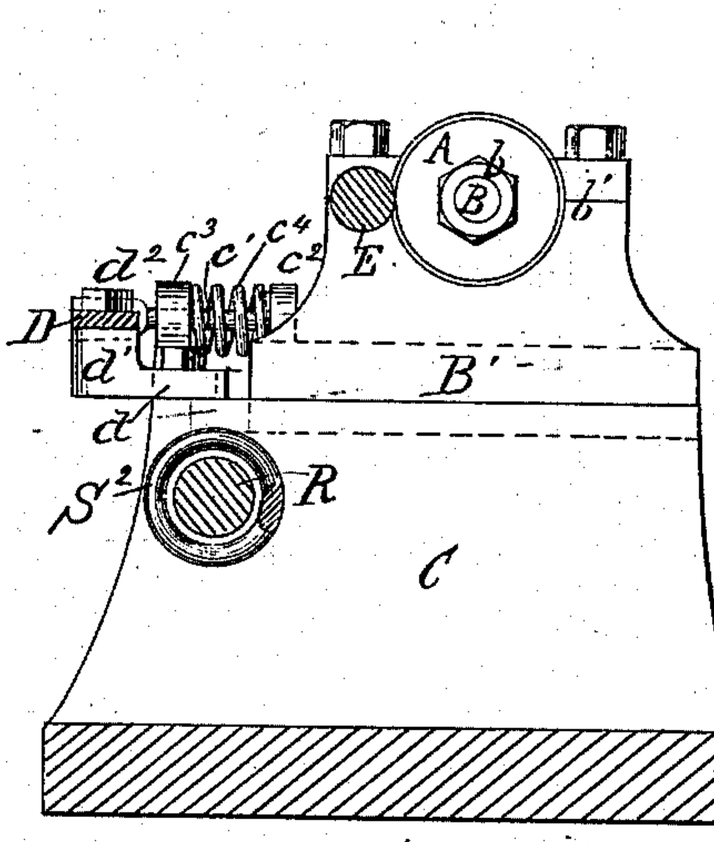

Fig. 4

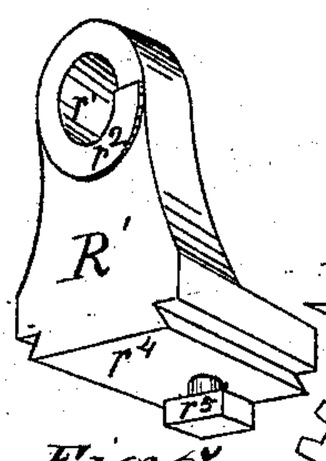

Fig. 5.

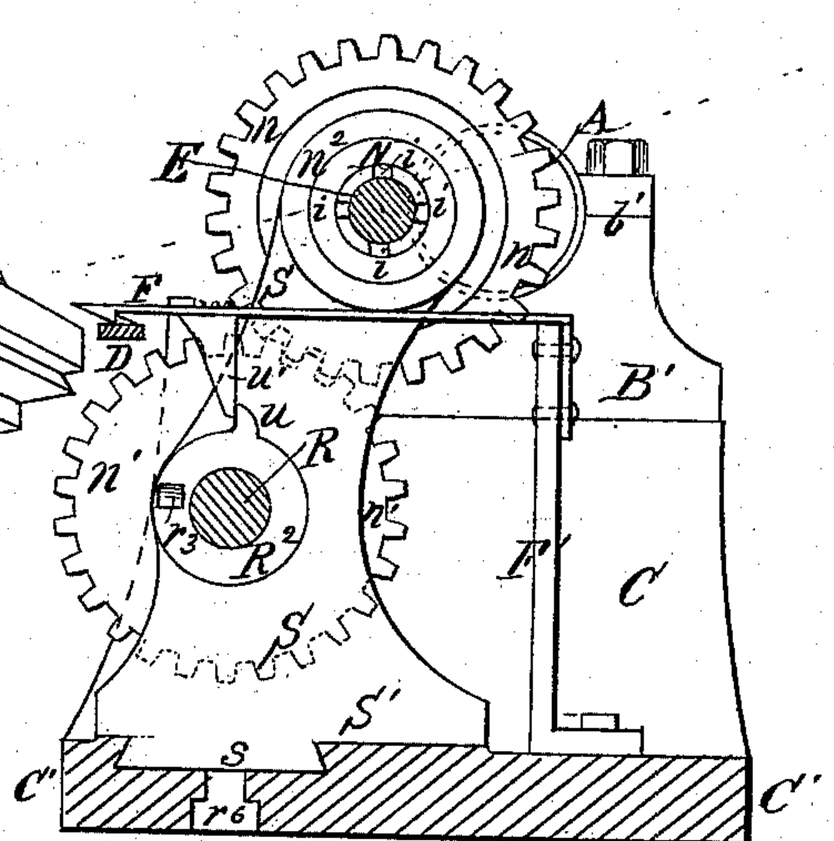

Fig. 3.

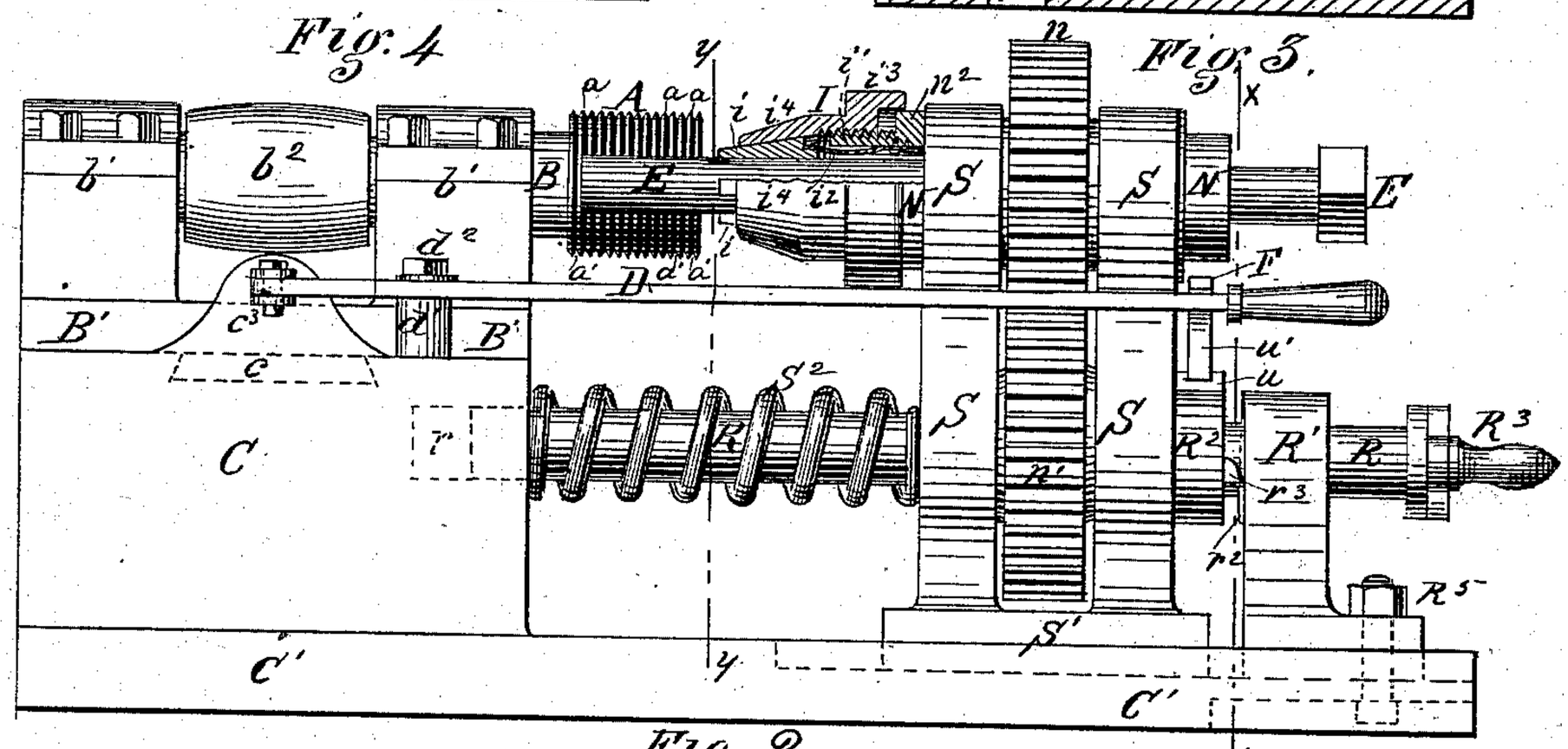

Fig. 2.

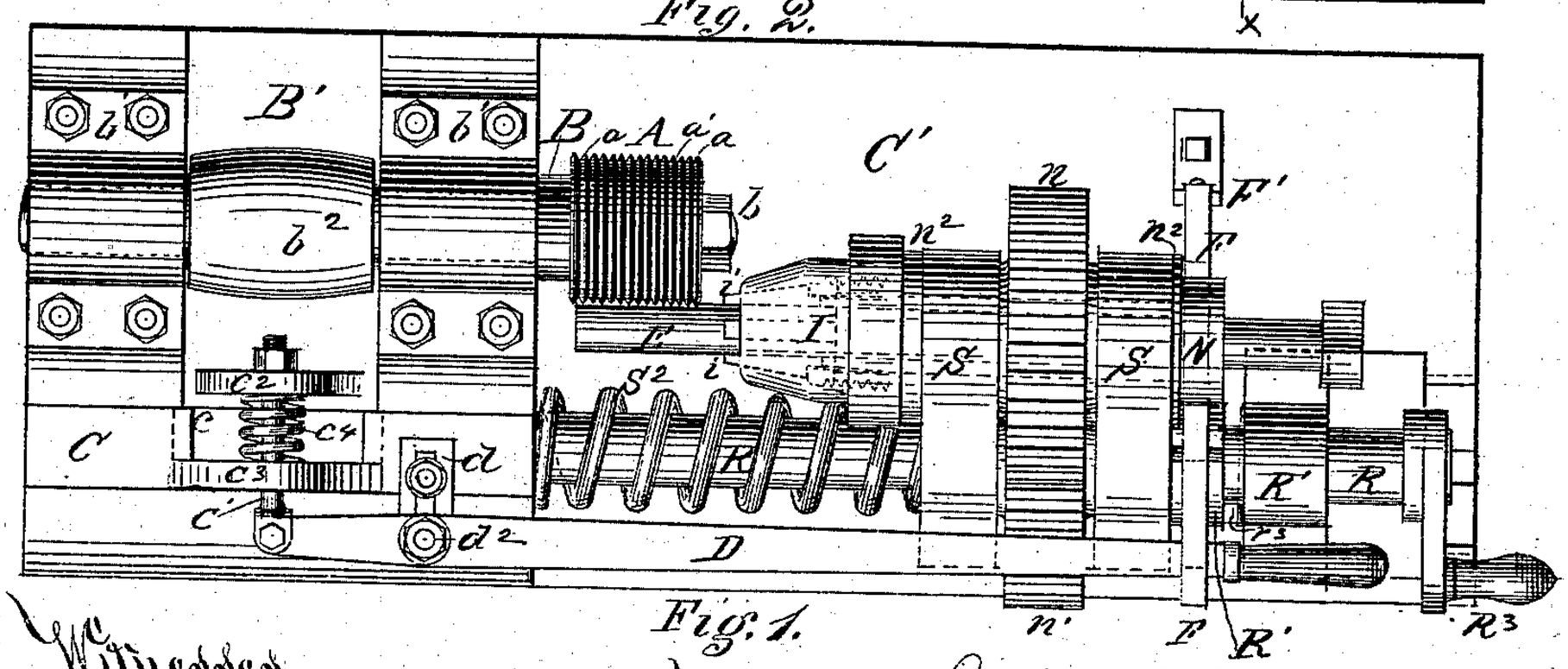

Fig. 1.

Witnesses
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UNITED STATES PATENT OFFICE.

PARSHALL D. NICOLS, OF SEWICKLEY, AND THEODORE W. WEBB, OF PITTSBURG, PENNSYLVANIA, ASSIGNORS TO SAID NICOLS.

BOLT-THREADING MACHINE.

SPECIFICATION forming part of Letters Patent No. 272,079, dated February 13, 1883.

Application filed July 8, 1882. (No model.)

To all whom it may concern:

Be it known that we, PARSHALL D. NICOLS, a citizen of the United States, residing at Sewickley borough, and THEODORE W. WEBB, a citizen of the United States, residing at Pittsburg, both in the county of Allegheny, State of Pennsylvania, have invented or discovered a new and useful Improvement in Bolt-Threading Machines; and we do hereby declare the following to be a full, clear, concise, and exact description thereof, reference being had to the accompanying drawings, making a part of this specification, in which—like letters indicating like parts—

Figure 1 is a top plan view of our improved bolt-threading machine. Fig. 2 shows a side elevation of the same. Figs. 3 and 4 are transverse sectional views taken respectively in the planes of the lines *x x* and *y y*, Fig. 2; and Fig. 5 is a perspective view of a removable bearing or adjustable tail-block used in the machine.

Our invention relates to certain improvements in bolt-threading machines; and it consists of certain combinations of devices, including a gang or series of smooth "ribs," "disks," or "saws," (so called,) adapted, under high velocity, to cut or melt into the iron bolt, and mechanism for holding the bolt, presenting it to and removing it from the saws, and giving it rotary and endwise motion while acted on by the saws, whereby spiral grooves or threads are formed, as hereinafter more fully described and claimed.

In the drawings, A represents a cylinder of soft steel or iron, having on its convex surface a gang, series, or succession of circumferential and parallel ribs, *a*, formed by cutting a similar series of grooves, *a'*, in the face of the cylinder. These ribs and grooves have depth, size, form, and intervals of succession corresponding to the screw-thread desired, except that they are separate and parallel, instead of continuous and spiral, as in a screw-thread. The surfaces or peripheries of these ribs are smooth and unbroken, and in operation are designed to melt or fuse the metal of the bolt, by an action akin to friction under high velocity, as distinguished from cutting proper or milling, as with a die or with a cutting or milling tool. Soft metal is therefore employed in making the cylinder A, which is not tempered or hardened. The number of ribs *a* on this cylinder is equal to or may be in excess of the whole number of threads desired on the bolt or article to be threaded, so that the desired part or length of such article may be threaded by giving it one revolution while in working contact with the saw or cylinder.

The cylinder is secured on the arbor B by nut *b*, and this arbor is journaled by bearings *b' b'* on a movable or sliding plate, B'. Rotary motion of high velocity may be given to the arbor and cylinder by belt-pulley b^2 and suitable connections with a driving-power; or other suitable means may be employed for this purpose.

The plate B' is seated and supported on the face of block C, which is raised at one end of the bed C', and a dovetail tongue-and-groove connection, *c*, between the plate and block holds the parts securely, and provides for sliding movement of the plate, with its arbor and cylinder, in a direction transverse to the line of the arbor and of the machine. This movement is designed for carrying the saw or cylinder A into working engagement with the bolt E, and withdrawing it therefrom when the desired work is done. Such movement may be given by any suitable mechanism, actuated either automatically or by hand, as may be preferred. The mechanism shown consists of a lever, D, pivoted to the block C by an adjustable plate, *d*, carrying on its outer end a boss or post, *d'*, and pivot-bolt d^2. A rod, *c'*, connects the end of this lever with a lug, c^2, raised on the plate B'. The rod also passes through a lug, c^3, raised on or secured to the edge of block C, and a spring, c^4, seated between these lugs, moves the plate B' in one direction—that is, to carry the cylinder A away from the bolt. Movement in the other direction is given by pressing upon the lever D, and the cylinder may be held in the desired working position against the bolt by a spring-catch, F, (see Fig. 3,) which is extended forward from a post, F'.

The bolt E is held in position with its end

to be threaded across the grooved or ribbed face of cylinder A by means of a chuck, I, which may be of any suitable or well-known construction. The one shown consists of four clamping-jaws, *i*, tapered or inclined on their outer edges. They are seated against a threaded head, *i'*, and are expanded by springs i^2. A cap, i^3, having a tapering or conical end, i^4, is screwed onto the threaded head *i'*. By screwing up this cap the jaws will be pressed upon the bolt. By unscrewing it the bolt will be released. The head *i'* is formed on the end of a tubular shaft, N, through which the bolt is passed endwise to and from the position in which it is threaded. This shaft N carries a gear, *n*, which meshes with a similar gear, *n'*, which latter is secured in any convenient way upon a rotary and endwise-moving shaft, R, one end of which is journaled in a long bearing in the block C, as at *r*, and the other in a pipe-box, *r'*, formed in the removable block or tail-piece R'. Rotary motion is given to the shaft R by crank R^3 or other suitable means, and this motion will be communicated, through the gear-wheels, shaft N, and chuck I, to the bolt.

In order to give the bolt endwise motion along with its rotary motion, the shaft N is mounted on uprights or bearing-blocks S S, which extend upward from a sliding bed or plate, S', which is connected to base-plate C' by a dovetail tongue and groove, *s*. The shaft R is passed through suitable holes, *s'*, in these uprights, and both the wheels *n n'* are secured on their respective shafts between them. On the upper shaft, N, collars n^2 cause the shaft, chuck, and gear to move with the uprights S S. On the lower shaft the fixed wheel *n'*, which bears against both uprights, causes the uprights, shaft, and wheel to move together as the former are moved on the slide *s*. Sliding motion is given to these devices by a spring, S^2, on one side, which surrounds shaft R, and bears against the block C at one end and the adjacent upright S at the other end; also by a cam or incline, r^2, raised around the box *r'* in tail-block R'.

A collar, R^2, is fixed on the shaft R in any convenient way, and a stud, r^3, projects from the side face of this collar in proper position for its end to take bearing upon the cam r^2, and thereby cause the uprights S S to move against the spring S^2 as the shaft R is rotated. When the stud r^3 reaches the drop on the cam the spring S^2 will throw the uprights S S in the opposite direction, thus moving the bolt endwise at each revolution a distance equal to the lift of the cam. The lift or pitch of this cam determines the pitch of the thread made on the bolt, which is secured by the combined rotary and endwise movement of the bolt while acted upon by the ribbed cylinder.

By using cams or inclines r^2 of different pitch any desired pitch of screw-thread may be made on the bolt. In order to facilitate such change, the tail-block R' is made removable, being connected to bed-plate C' by dovetail tongue r^4, and secured in position by bolt r^5, passed through slot r^6.

As shown in the drawings, the gears *n n'* are equal in size, and the cam r^2 corresponds in length to one revolution of the shaft R. Consequently the drop of stud r^3 off the cam will take place at the completion of one rotation of the bolt.

In order to move the grooved cylinder A back automatically out of engagement with the bolt at the moment the stud drops off the cam, a wiper, *u*, is formed on the collar R^2, and a stud or arm, *u'*, is extended down from the strap of spring-catch F in proper position to be pressed and raised by the wiper at each revolution, thereby disengaging the lever D and permitting the spring c^4 to move the cylinder A away from the bolt.

In case it is desired to give the bolt more than one complete rotation while the thread is being formed, it may be done by making the gear-wheel *n* smaller than *n'*. In this way the ribs *a* will be carried over the points where they begin to act on the bolt, thereby securing a clean and perfect thread. In this case the pitch of the thread obtained will not correspond exactly to that of cam r^2; but the variation will be a constant and determinable one, and therefore will not prevent securing the desired pitch of thread on the bolt by the use of a properly-inclined cam. By reversing the direction of motion of the bolt, either right or left hand threads may be formed thereon at pleasure.

If desired, the tubular passage in shaft N may be large enough to receive the head of the bolt, whereby short bolts may be threaded; or a bolt-gripping mechanism or chuck may be employed, which shall receive and discharge the bolt sidewise or vertically, and thereby provide for holding and threading short bolts. Such holding-chucks are in common use in screw-cutting and other machinery, and need not be described in detail.

Instead of a solid ribbed cylinder A, separate disks may be packed and bound together upon the arbor by nut *b*. We prefer, however, to make a solid cylinder and groove its exterior surface in the manner described, on account of economy in making, fitting, and keeping in good working order.

Instead of moving the cylinder to and from working engagement with the bolt, the bolt itself may be given a similar motion for the same purpose. This may be done by making a pivot or sliding connection between the uprights S S and plate S'; also, instead of moving the bolt endwise to secure a spiral direction of cut by the ribs *a*, the cylinder and its arbor may receive the requisite endwise motion in connection with a rotary motion of the bolt, whereby as the bolt is turned or revolved once each rib *a* will be advanced along the bolt the distance of one thread, so that each rib will complete its cutting or melting action

at the point where the preceding one began, and the required length on the bolt will be threaded, as before described, by one rotation of the bolt while in working engagement with the ribbed cylinder or its equivalent pack of disks.

These and other like modifications we consider as coming within our invention.

The operation of cutting iron or steel with smooth disks of soft metal (known as "saws") rotated at high speed is well known in the art of metal-working. By adapting this method of cutting to the formation of screw-threads, as above described, we secure very important advantages—for example, great rapidity in work, simplicity and cheapness in machinery, small expense for repairs, since the soft metal ribs *a* can be kept in proper shape at trifling expense, and they are not liable to injury or breakage in use. This is largely due to the low degree of heat generated in making the shallow cut required. By ordinary methods of threading bolts, as heretofore practiced, the bolt or cutting-tool must be run the entire length of the threaded part by as many revolutions as there are threads in the whole distance. In our improvement but one rotation of the bolt is required, and this can be given so quickly as to secure great rapidity in work and corresponding cheapness in manufacture; also, the thread secured in this way is not raised and weakened, as in die-cutting and in other like methods of cheap thread-cutting; and thus even in cheap bolts we secure substantially the same qualities of thread that are ordinarily secured by the costly methods of turning and milling.

We claim herein as our invention—

1. The ribbed cylinder A or equivalent series of soft-metal disks, in combination with a rotary bolt-holder for holding the end of a bolt across and against the ribs or disks, substantially as and for the purposes set forth.

2. The ribbed cylinder A or equivalent series of soft-metal disks having smooth peripheries, in combination with a bolt-holder for holding the end of a bolt across and against the ribs or disks, and mechanism, substantially as described, for giving to the bolt-holder rotary and endwise motion.

3. A rotary bolt-holder, in combination with a series of smooth metal disks or equivalent ribbed cylinder, A, arbor B, and mechanism, substantially as described, for rotating the cylinder or disks and moving them transversely to and from the side of the bolt.

4. The combination of soft-metal ribbed cylinder A, arbor B, sliding arbor-support B′, bolt-holder I, and mechanism, substantially as described, for giving to the bolt-holder simultaneously rotary and endwise motion.

5. The combination of a soft-metal ribbed cylinder, A, a bolt-holder, I, tubular shaft N, driving-shaft R, gears *n n′*, uprights S S, and mechanism, substantially as described, for moving such uprights back and forth in the line of the bolt-holder.

6. The ribbed soft-metal cylinder A, in combination with bolt-holder I, tubular shaft N, gears *n n′*, driving-shaft R, uprights S S, spring S^2, cam r^2, and stud r^3, substantially as set forth.

7. A rotary and endwise moving bolt-holder, in combination with ribbed soft-metal cylinder A, arbor B, sliding support B′, lever D, spring c^4, and a catch to hold the lever as against the action of the spring, substantially as set forth.

8. The combination of bolt-holder I, tubular shaft N, driving-shaft R, sliding uprights S S, gears *n n′*, collar R^2, stud r^3, and removable tail-block R′, having cam or incline r^2 thereon, substantially as set forth.

In testimony whereof we have hereunto set our hands.

PARSHALL D. NICOLS.
THEODORE W. WEBB.

Witnesses:
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C. L. PARKER.