

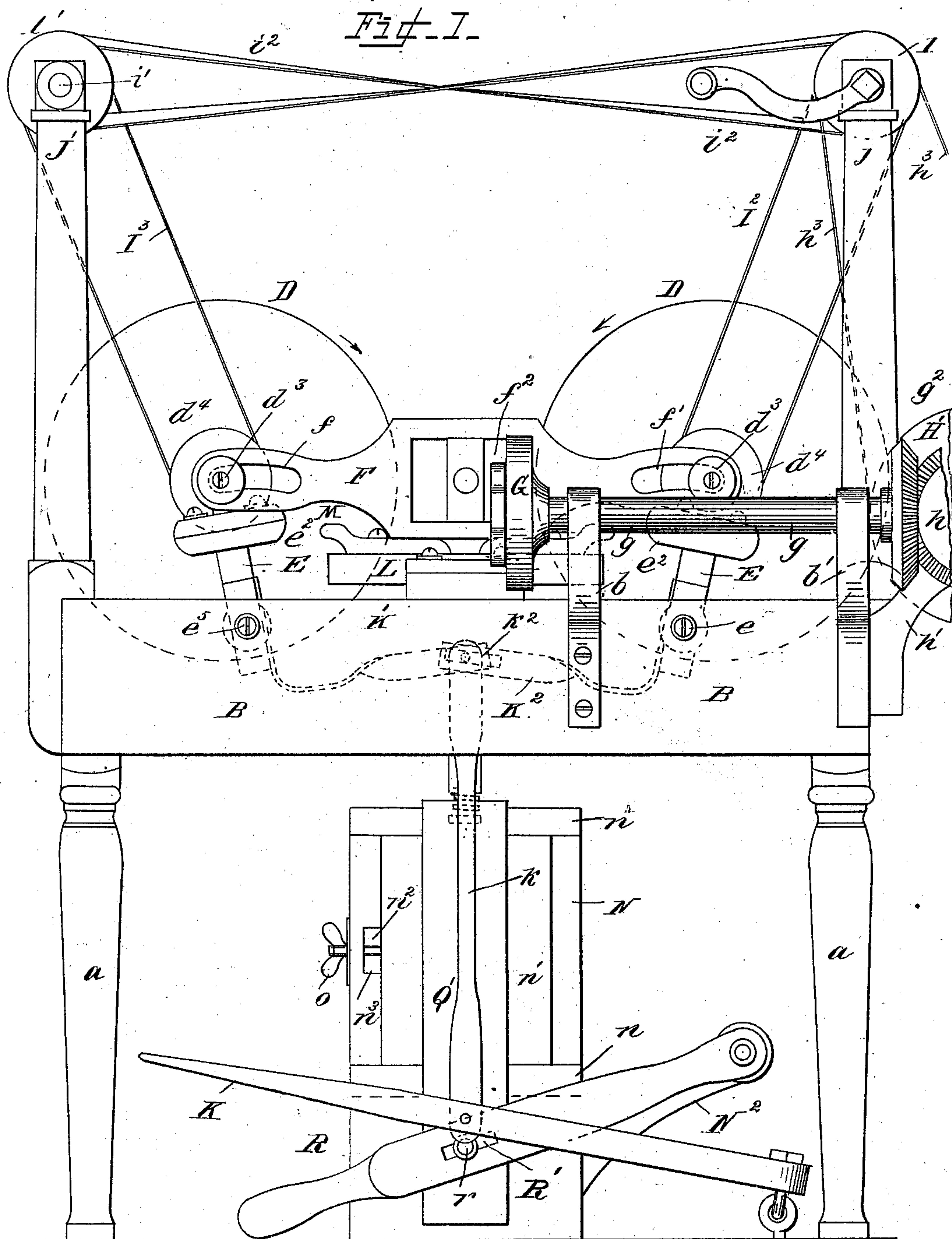
(No Model.)

3 Sheets—Sheet 1.

H. A. AXTELL.  
GRINDING AND FINISHING MACHINE.

No. 560,886.

Patented May 26, 1896.



Attest:  
M. R. M. Frayser.  
R. E. Auld

Inventor.  
Henry A. Aptell  
By E. B. Clark  
Atty.

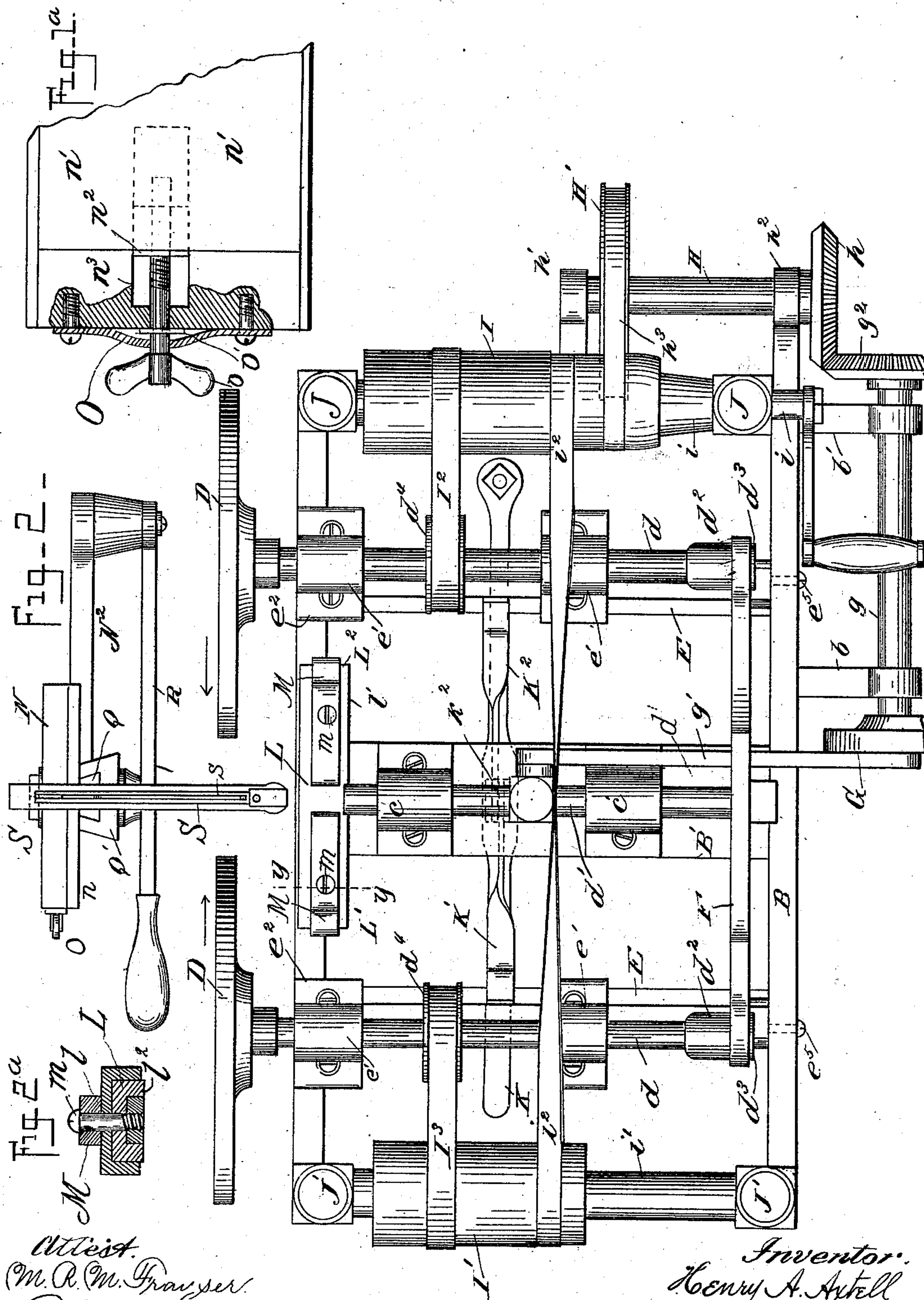
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M. R. M. Grayser.  
R. E. Auld

Inventor.  
Henry A. Axtell  
By E. H. Clark Atty.



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3 Sheets—Sheet 3.

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Fig. 3.

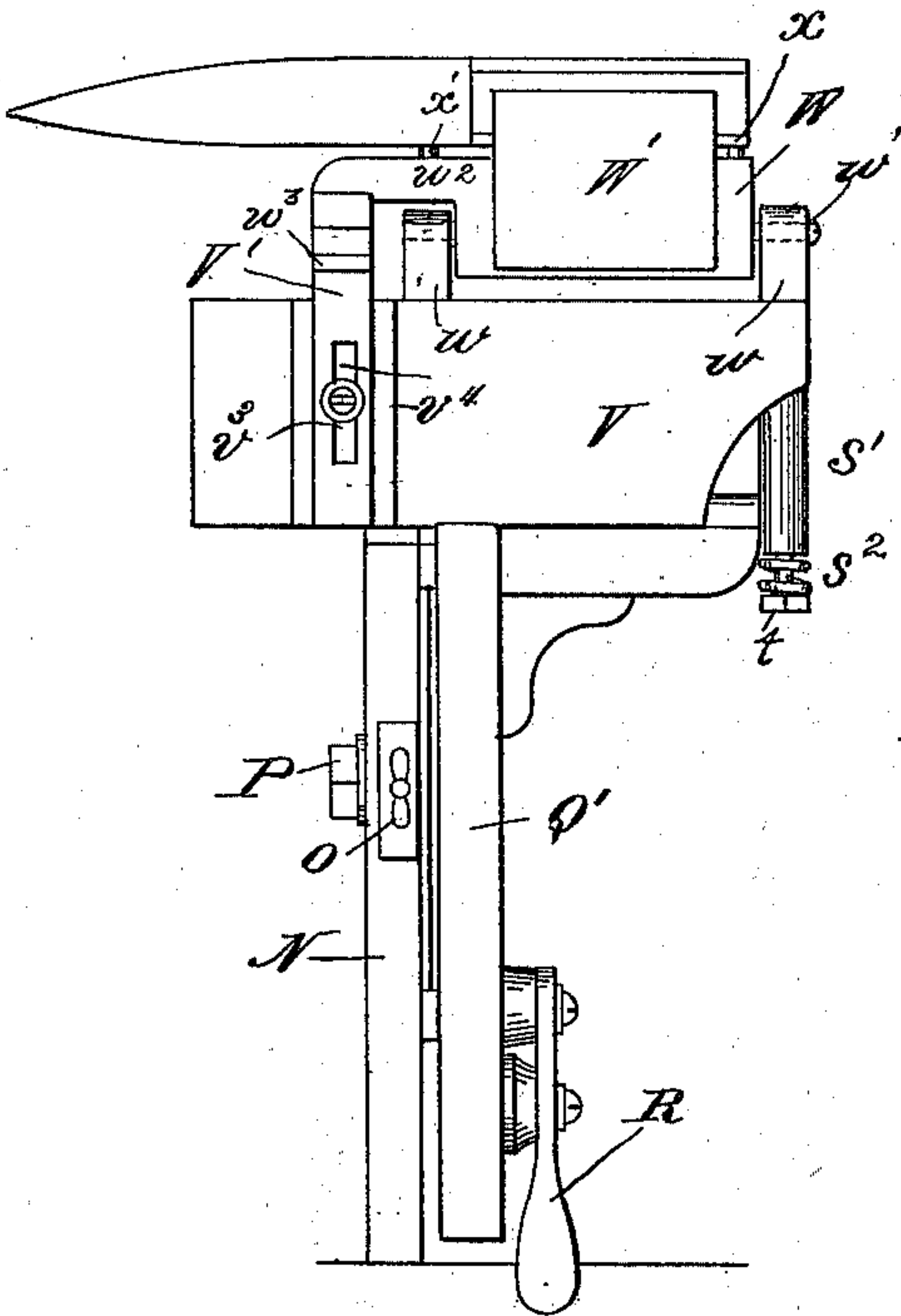


Fig. 4.

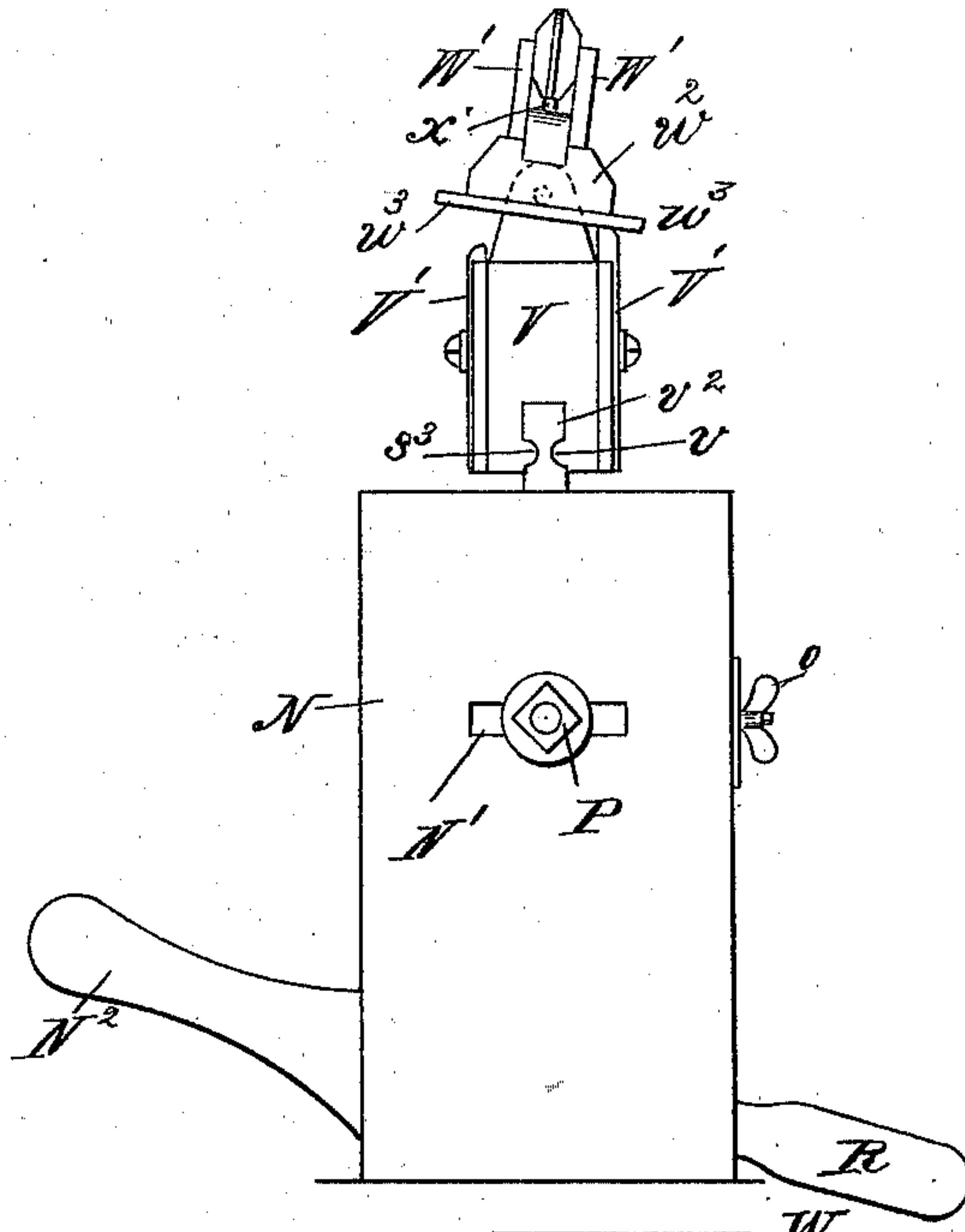


Fig. 5.

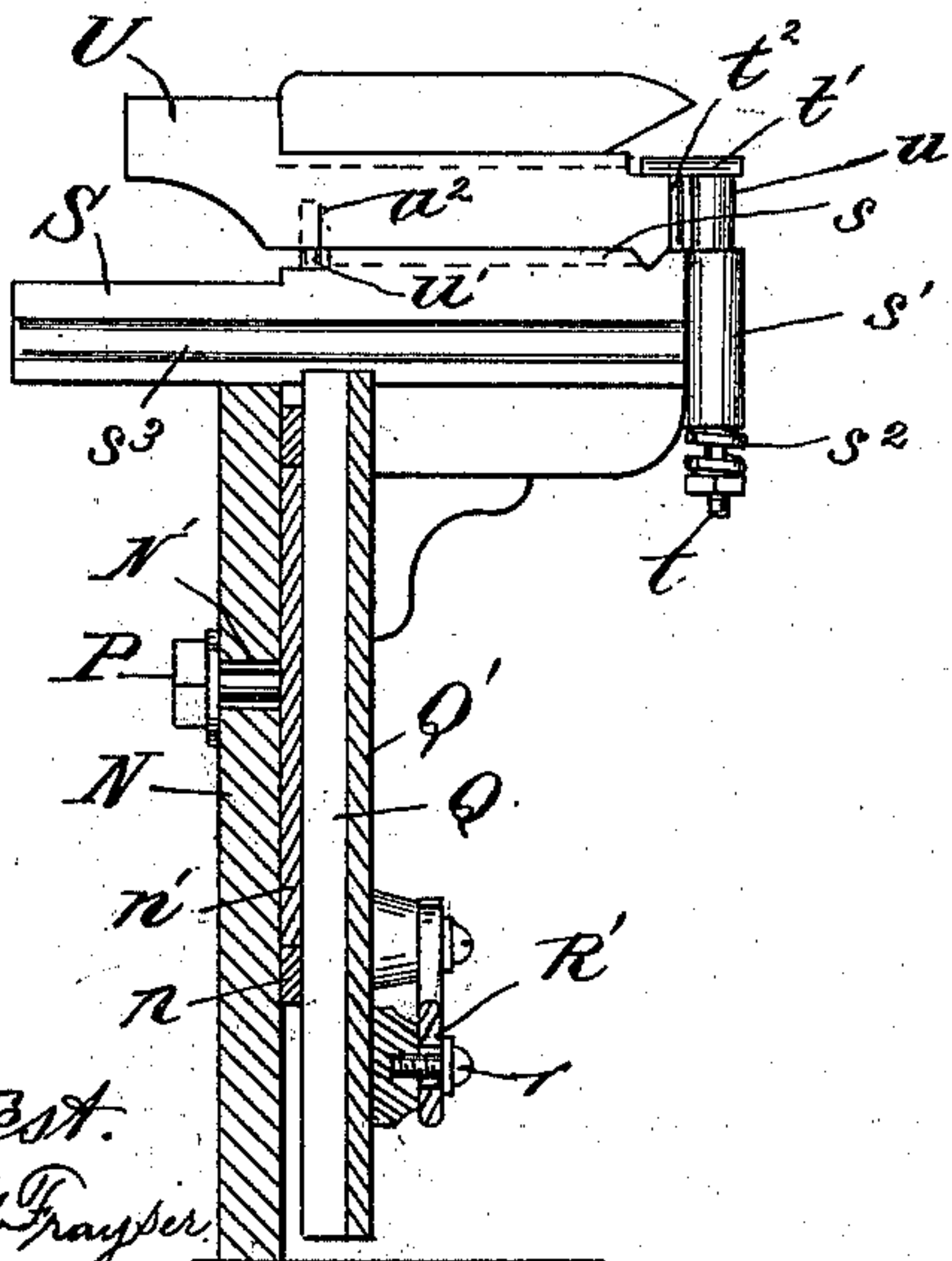
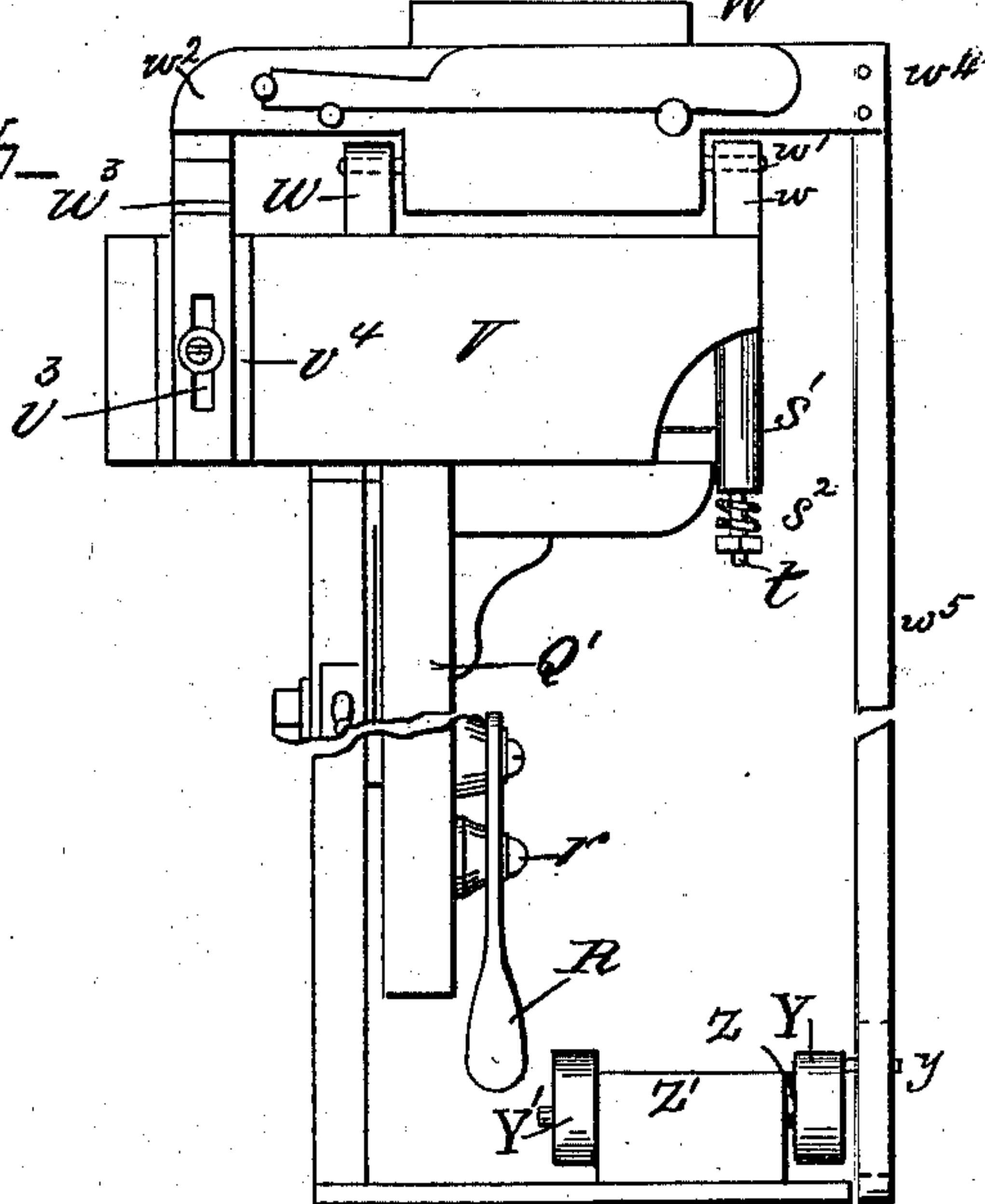


Fig. 6.



Attest.  
M. A. M. Grayber  
R. E. Auld

Inventor.  
Henry A. Axtell  
By E. B. Clark  
Atty.



# UNITED STATES PATENT OFFICE.

HENRY A. AXTELL, OF SHELBURNE FALLS, MASSACHUSETTS, ASSIGNOR OF  
ONE-HALF TO R. N. OAKMAN, JR., OF GREENFIELD, MASSACHUSETTS.

## GRINDING AND FINISHING MACHINE.

SPECIFICATION forming part of Letters Patent No. 560,886, dated May 26, 1896.

Application filed August 25, 1893. Serial No. 484,040. (No model.)

*To all whom it may concern:*

Be it known that I, HENRY A. AXTELL, a citizen of the United States, residing at Shelburne Falls, in the county of Franklin and State of Massachusetts, have invented certain new and useful Improvements in Grinding and Finishing Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to improvements in machines for grinding and finishing the handles and blades of knives and other articles of a similar nature, and has for its objects, first, to so construct the mechanism carrying the grinding-wheels that the latter may be forced toward or away from each other at will, and also at the same time be automatically and rapidly reciprocated along the surface to be ground, polished, or finished; second, to provide holding mechanism for the article to be ground, by means of which said article can be raised or lowered, shifted to right or left, and rocked, so that any required inclination of the surface to be ground or finished may be had. I attain these objects by the peculiar construction and combination of parts, as hereinafter more particularly set forth and described in detail.

In the accompanying drawings, forming part of this specification, Figure 1 represents a rear elevation of the machine, showing the devices embodying my invention, part of the same being shown in dotted lines. Fig. 1<sup>a</sup> represents a detail rear elevation, partly in section, of the lateral slide of the holder and its adjusting-screw. Fig. 2 represents a top plan view of the machine. Fig. 2<sup>a</sup> represents a vertical section on the line *yy*, Fig. 2. Fig. 3 represents a side elevation of the devices for holding and adjusting the article to be ground or finished. Fig. 4 represents a front elevation of the same; and Fig. 5 represents a central vertical section, partly in elevation, of the holder and adjusting devices with a knife-holder attached. Fig. 6 represents a side elevation of the device for holding and adjusting the article to be ground or finished and giving the holder a continuous rocking or oscillating motion.

From the base-plate A rise four standards *a*, which support the framework B, upon which is fixed a cross-tie B', having mounted thereon the journal-boxes *c* and *c'* of the reciprocating shaft *d'*, which forms part of the carriage upon which the grinding and finishing wheels are mounted.

In frame B are pivoted at *e*<sup>5</sup> the rocking bars E, which support the journal-boxes *e* and *e'* of the reciprocating shaft *d*, carrying the grinding or finishing wheels D.

Upon the rear end of the reciprocating shaft *d'* is rigidly mounted the slotted plate F, in the segmental slots *f f'* of which are movably mounted the rear ends of the shafts *d*. Said shafts *d* are held from longitudinal movement in said slots *f* and *f'* by means of collars *d*<sup>2</sup>, shrunk on each of said shafts near its rear end, and the washers *d*<sup>3</sup>, attached by screws to the ends of the shafts. This arrangement will allow the free lateral movement of said shafts in said slots, which is necessary in order to bring the grinding or finishing wheels together.

In brackets *b b'*, secured on frame B, is journaled the shaft *g*, which carries at one end a disk G, having an eccentric-pin, which is connected to reciprocating shaft *d'* by pitman *g'*, which passes through slot *f*<sup>2</sup> in plate F. The other end of said shaft *g* carries a bevel-pinion *g*<sup>2</sup>, which meshes with a similar pinion *h*, carried by a shaft H, the latter being journaled, like shaft *g*, in brackets *h' h*<sup>2</sup> on said frame B. A belt-wheel H' is rigidly attached to the shaft H and connected by a belt *h*<sup>3</sup> with the long pulley I, which is mounted on and turns with the power-shaft *i*, journaled in the standards J of the frame. Another pulley I' is similarly mounted on the opposite side of the machine on the shaft *i'*, journaled in standards J'. A crossed belt *i*<sup>2</sup> connects said pulleys I and I', thus causing them to rotate in opposite directions. Upon each of the shafts *d* is rigidly mounted a belt-wheel *d*<sup>4</sup>. These wheels are rotated in different directions by means of belts I<sup>2</sup> I<sup>3</sup>, which connect them, respectively, to said revolving pulleys I I', and thus the grinding-wheels are caused to rotate toward each other from above downward. The rocking of the bars E is caused by the depression of one end of a pivoted treadle-



bar K, which actuates a vertical rod  $k$ , having one end pivoted in a slot in said bar and the other end slotted, as at  $k^2$ , to receive the slotted ends of two angular levers  $K' K^2$ , connected to said rocking bars E. A pivot-pin passes through the walls of the slot  $k^2$  and through the slots in said angular levers  $K' K^2$ , thus making a working joint at this point. The pressure of the grinding-wheels upon the article being ground is thus brought under the control of the operator. Near the front of frame B and on cross-tie B' is attached a cross-bar L, which is provided at each end L' L<sup>2</sup> with an adjustable stop M. Any suitable or well-known means may be provided for adjusting these stops toward or apart from each other, such as by forming a longitudinal slot in each end L' L<sup>2</sup>, through which slot a screw  $m$  connects the stop M with a nut  $l^2$ , thus enabling the stops M to be moved along the bar L and set in the required location by the nuts  $l^2$ . The stops M can thus be adjusted so as to limit the movement of the rocking bars E by coming into contact with shoulders  $e^2$  of the journal-boxes  $e$ , thus preventing any sudden and deep cut being made in the article being ground by accident or otherwise. The belts connecting the shafts  $d$  and the pulleys I I' must either be of some flexible material or be very loose if made of other material, so that the movement of said shafts toward or from each other and backward and forward longitudinally will not affect their usefulness.

The devices for holding the article to be ground and adjusting the same to the desired position are mounted nearly beneath and midway between the grinding-wheels D upon the base A. A standard N rises vertically from the base and has upon its inner face the guides  $n$ , forming a guideway, in which is arranged the slide  $n'$ , which is capable of lateral movement only. Said movement is caused and limited by a thumb-screw  $o$ , engaging a lug  $n^2$ , which is attached to said slide. The lug  $n^2$  projects from the inner face of the slide  $n'$  into a groove  $n^3$ , cut in the standard N. The thumb-screw, Fig. 1<sup>a</sup>, passes through the front walls of the groove to engage said lug and is held against longitudinal movement by means of a collar  $o'$ , rigidly mounted on said screw near its head. This collar prevents said screw from moving forward, while a plate O, through which said screw is passed, prevents any backward movement because of its position between the head of the screw and said collar. Thus upon turning the screw the slide  $n$  is caused to move either to the right or left, as the case may be. The slide  $n'$  is secured and locked in the guideway formed by the guides  $n$  by means of a bolt P, Fig. 4, attached to said slide and passing through a slot N' of standard N, a nut and washer securing said bolt in position.

One member, Q, of a dovetail slide is rigidly and vertically mounted on said slide  $n'$ . The other member, Q', of the dovetail slide carries the holder S and moves freely up and down

upon said other member, being actuated by a hand-lever R, which is pivoted to an arm N<sup>2</sup> of the standard N. Through a slot R' in said lever R a screw  $r$  passes to engage said member Q' of the dovetail slide, thus giving said lever R pivotal and slotted connection with part Q'. Both lateral and vertical adjustment is thus provided for the holder S.

The holder S is mounted on the top of part Q' at right angles thereto and has formed in its top the groove  $s$ . At the inner end of this groove is a spring-clamp, by means of which the knife on the knife-blade holder is retained in said groove. This clamp consists of the tubular upright  $s'$ , partly hollowed to receive a spiral spring  $s^2$ , through the center of which passes a rod  $t$ , which projects below and above the ends of said tubular upright after passing centrally through it. The lower end of said rod  $t$  is screw-threaded to receive a nut which engages the lower end of said spring, and by the action of the latter the rod continually exerts a downward pull. To the top of said rod is rigidly attached a grooved arm  $t'$ , through which passes a guide-pin  $t^2$ , and around said rod and between said arm  $t'$  and the top of the tubular upright is a sleeve  $u$  for holding said arm  $t'$  the required distance above groove  $s$ , so that a knife-blade holder U may have its inner end held firmly by the groove of said arm  $t'$  while it is resting in said groove  $s$ , its outer end being held by the pins  $u'$ , entering the recess  $u^2$  in holder U. The top of said holder is provided with a vertical longitudinal groove to receive and hold the knife-blade.

If a knife-handle is to be ground, the said handle is placed in groove  $s$  with one end under the spring-clamp and the blade passing between the pins  $u'$ . The holder S is provided on each side with longitudinal grooves  $s^3$ , into which the edges  $v$  of the slotted beveling-holder V fit snugly, as said holder is pushed home with its slot  $v^2$  embracing this part S. The slot  $v^2$  is enlarged at the inner end and its walls partly cut away, so that the spring-clamp will not interfere when the said holder is slid on part S. To the top of holder V are attached lugs or standards  $w$  for the shafts or pivotal pins  $w'$ , supporting the clamp W, the latter being provided with two clamp-plates W', between which the knife-handle is securely sprung. An extension  $w^2$  of said clamp W is provided with lateral stops  $w^3$ , which engage the sliding adjustable stop-bars V', mounted in guideways  $v^4$  on each side of beveling-holder V and held in place by set-screws passing through slots  $v^3$  in said bars and engaging said holder V. A pin  $x$  is mounted in one end of the groove formed by the clamp-plates W' to hold the knife-handle from longitudinal play in that direction, while near the other end of said groove an adjusting-screw  $x'$  is mounted to give the required longitudinal inclination to said knife-handle when it is being ground or finished.



In grinding knife-blades it is desirable to give them a slight rocking or oscillating motion, as is actually done by hand, so as to insure the whole surface being covered by the wheels, and for this purpose I provide the clamp-holder W, Fig. 6, with an extension  $w^4$ , to which is secured a depending lever-arm  $w^5$ , which at its lower end is provided with a slot engaging with a crank-pin  $y$ , set eccentric in the disk Y. The disk Y is secured upon a shaft Z, mounted in a bearing Z', and has secured at its opposite end a belt-pulley Y'. The counter-shaft Z may be arranged upon the machine or detached therefrom, as found most convenient.

In using the continuously rocking or oscillating holders, as shown in Fig. 6, a knife-blade is secured on each side of the clamp W, so that in practice the opposite sides of two blades are ground at the same time. Only a slight rocking or oscillating motion is given to the holder W by the shaft Z and its crank-pin  $y$ . A suitable means, such as a movable crank-pin, may be provided for adjusting the extent of the rocking motion so as to vary it and adjust it to suit the particular requirements in the case.

When a knife-handle is to be secured in clamp-holder W and its edges ground or beveled, the lever-arm  $w^5$  may be detached from the crank-pin and then the holder-clamp adjusted in any desired inclination by means of the adjustable stop-bars V', which are fixed in place by the set-screws hereinbefore described.

The operation of the machine is as follows: If it is desired to grind the sides of a knife-handle, the same is placed in the groove  $s$  of holder S, as described, the blade passing between the pins  $u'$ , or if a knife-handle is to have its edges or corners ground, polished, or finished in bevel form the same is pushed firmly between the clamp-plates W' and its longitudinal inclination adjusted by the screw  $\alpha'$ . The beveling-holder V is then slid on the holder S and the desired inclination in a direction transverse to the axes of the wheels D given to it by means of the adjustable slotted stop-bars V'. By this arrangement any degree of bevel desired may be produced on the edges of the knife-handle.

If a knife-blade is to be ground, the knife-blade holder U is fitted into position, its inner end engaging the spring-clamp and its lower edge resting in the groove  $s$ , while its outer end engages the pins  $u'$ . By means of the dovetail slide and lever R the holder may be raised into the desired proximity to the wheels D and shifted from right to left by means of slide  $n'$  and its actuating devices. The handle or blade now being in position to be ground or finished, the machine is started, and the pulleys I I', revolving in opposite directions, cause the shafts  $d$  by the belt connection therewith to also revolve in opposite directions. The wheels D are thus made to revolve toward each other, as before ex-

plained. Pressure is now exerted on the treadle K, and the wheels D thus brought together until they bear upon the surfaces of the article to be ground. By this means the operator can at will regulate the pressure of the grinding or finishing wheels upon the article being ground or finished. At the same time the wheels D are actuated to reciprocate rapidly along the surface being ground or finished by means of the longitudinal movement of the shafts  $d'$   $d'$  in their journal-boxes, said movement being caused by the reciprocation of the pitman  $g'$ , actuated by the disk G and its eccentric-pin, as before described.

In case it is desired to grind two knife-blades at the same time they are secured in any suitable manner upon the opposite sides of the holder-clamps W' and the adjustable stop-bars V' are shoved down out of reach of the lateral stops  $w^3$ . Then the lever-arm  $w^5$  is engaged with crank-pin  $y$  and the counter-shaft Z set in motion, thereby imparting an oscillating motion to the holder-clamp W. The holding device is now raised by lever R till the blades are brought into proper relation to the revolving wheels D and the oscillating motion of the holder is continued, while the revolving wheels are reciprocated laterally along the length of the blades so that their surfaces may be completely and uniformly covered by the wheels and a smooth regular surface produced.

The wheels D are of course made of material suitable to the requirements, whether they be grinding, whetting, glazing, or buffing. By means of two such grinding-wheels as mine the blade can be ground on both sides at once, and thus save a great deal of labor and trouble, as the grinding is uniform on both sides and quickly brings the blade to an edge or finishes it off, as the case may be.

The blade is first ground with stone or emery wheels to remove all irregularities on its surface—such as scale, &c.—and also to give shape to it. Then much finer wheels of similar material are used to give a fine smooth surface to the blade. Now comes the operation of glazing, for which is used wooden wheels, the faces or peripheries of which are filled with tallow and emery or other abrading material, thus giving a very highly-polished or glazed surface to the blade. Next follows the operation of buffing or coloring the blade, and for this purpose leather-faced wheels are used to give this finishing touch.

For grinding the handles wooden wheels faced with leather and coated with emery are used. The described reciprocating motion of the grinding-wheels along the blade gives a true and level surface, and the danger of cutting ruts or sharp lines across the blade is avoided by the act of continually shifting the grinding-surface. Burning of the wood is also avoided by this rapid reciprocation, as the grinding on one point is not of sufficient duration to cause the same. For different classes of work a different rapidity of these



reciprocations of the grinding-wheel is necessary.

Having described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a grinding and finishing machine, the combination with an elongated holder adapted to support a knife-blade; of grinding or finishing wheels; operating mechanism connecting the wheels to move them simultaneously toward and from the holder, and mechanism for moving them in the direction of their axes, said holder being arranged longitudinally parallel with the axes of the wheels as described.

2. In a grinding or finishing machine, the combination with a holder for the articles to be ground or finished, of grinding or finishing wheels, oscillating supports for said wheels and mechanism connecting said supports whereby the wheels may be quickly moved simultaneously toward and from the holder, as described.

3. In a grinding or finishing machine, the combination of grinding or finishing wheels and means for reciprocating them together simultaneously in the direction of their axes and a pivoted holder adapted to be rocked in a direction at right angles to the axes of the wheels, as described.

4. In a grinding or finishing machine, the combination of grinding or finishing wheels and means for reciprocating them simultaneously in the direction of their axes and a holder and means for raising and lowering it and means for rocking it in a direction at right angles to the axes of the wheels, as described.

5. In a grinding and finishing machine, the combination with a holder capable of verti-

cal and lateral movement, of grinding or finishing wheels, having a lateral reciprocating movement and mechanism for moving them toward or away from each other, substantially as described.

6. In a grinding or finishing machine the combination of grinding or finishing wheels; an oscillating holder capable of rocking in a direction transversely of the axes of the wheels; and mechanism for moving the wheels simultaneously toward and from the holder and together in the direction of their axes, as described.

7. In a grinding or finishing machine, the combination with grinding or finishing wheels, having a lateral reciprocating movement, of devices for moving such wheels in contact with the surfaces to be ground during the reciprocating movement, a holder having lateral and vertical adjusting devices and provided with a spring-clamp for holding the article to be ground, substantially as described.

8. In a grinding or finishing machine, the combination with a pair of grinding or finishing wheels, of a holder having means for adjusting it laterally and for raising and lowering it to set the article to be ground in proper relation to said wheels, substantially as described.

9. In a grinding or finishing machine, the combination with grinding or finishing wheels of a holder, and mechanism for rocking it continuously in a direction transversely to the axes of the wheels, as described.

In testimony whereof I affix my signature in presence of two witnesses.

HENRY A. AXTELL.

Witnesses:

JAMES HALLIGAN,  
CHAS. H. BALL.