Sheet 1 - 2 Sheets.

# W. T. Nicholson,

## File-Cutting Machine,

No. 42,216, Patented Apr. 5, 1864.

Fig. 9

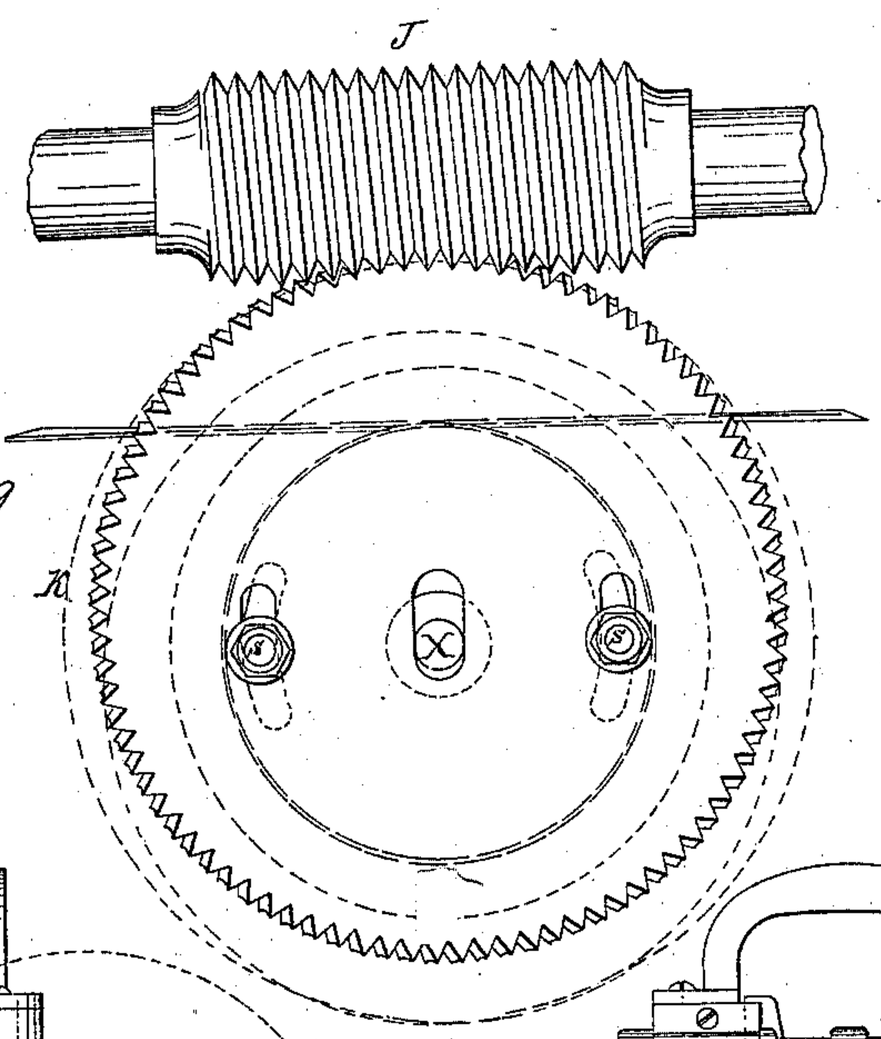


Fig. 2

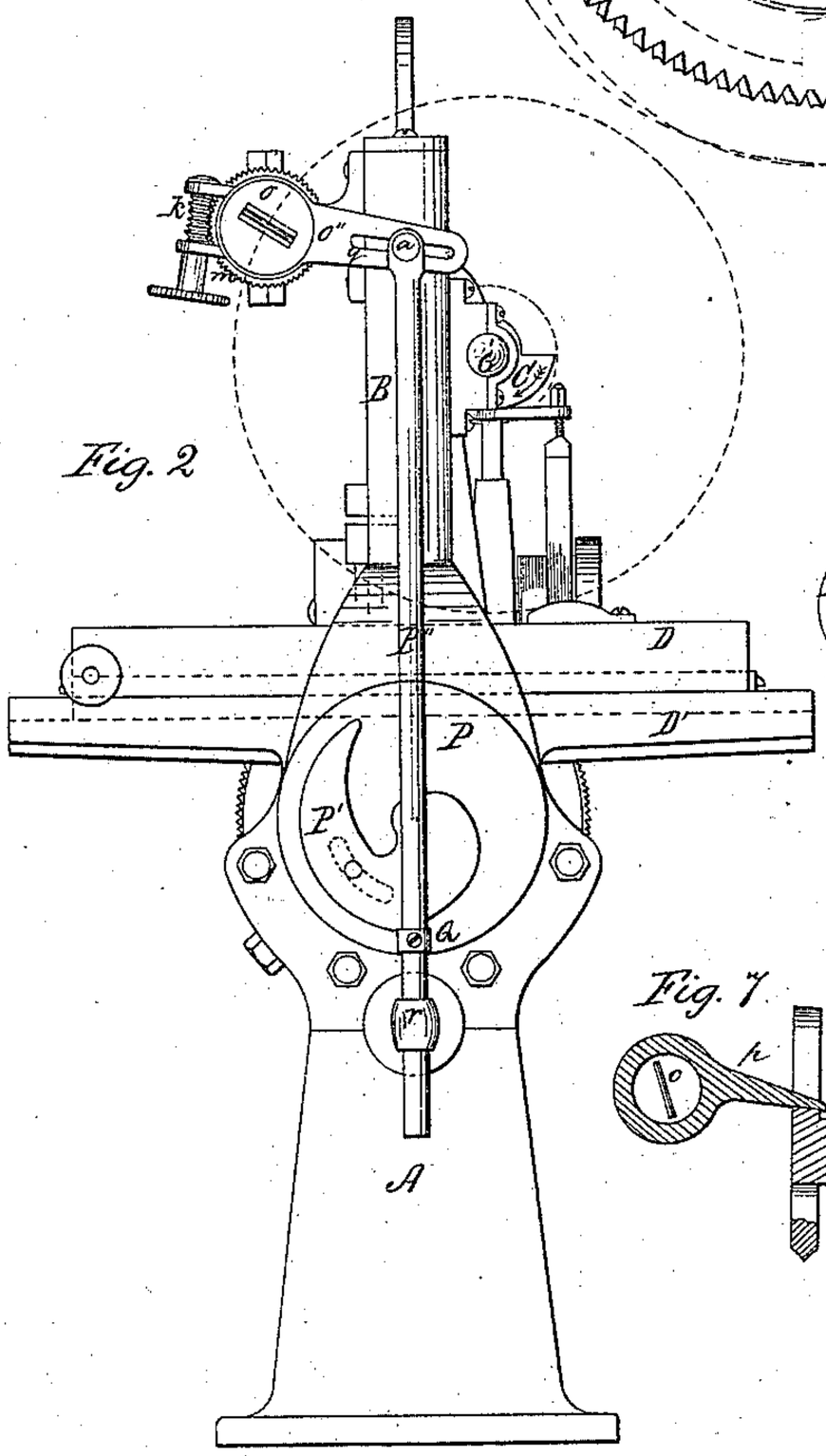


Fig. 1

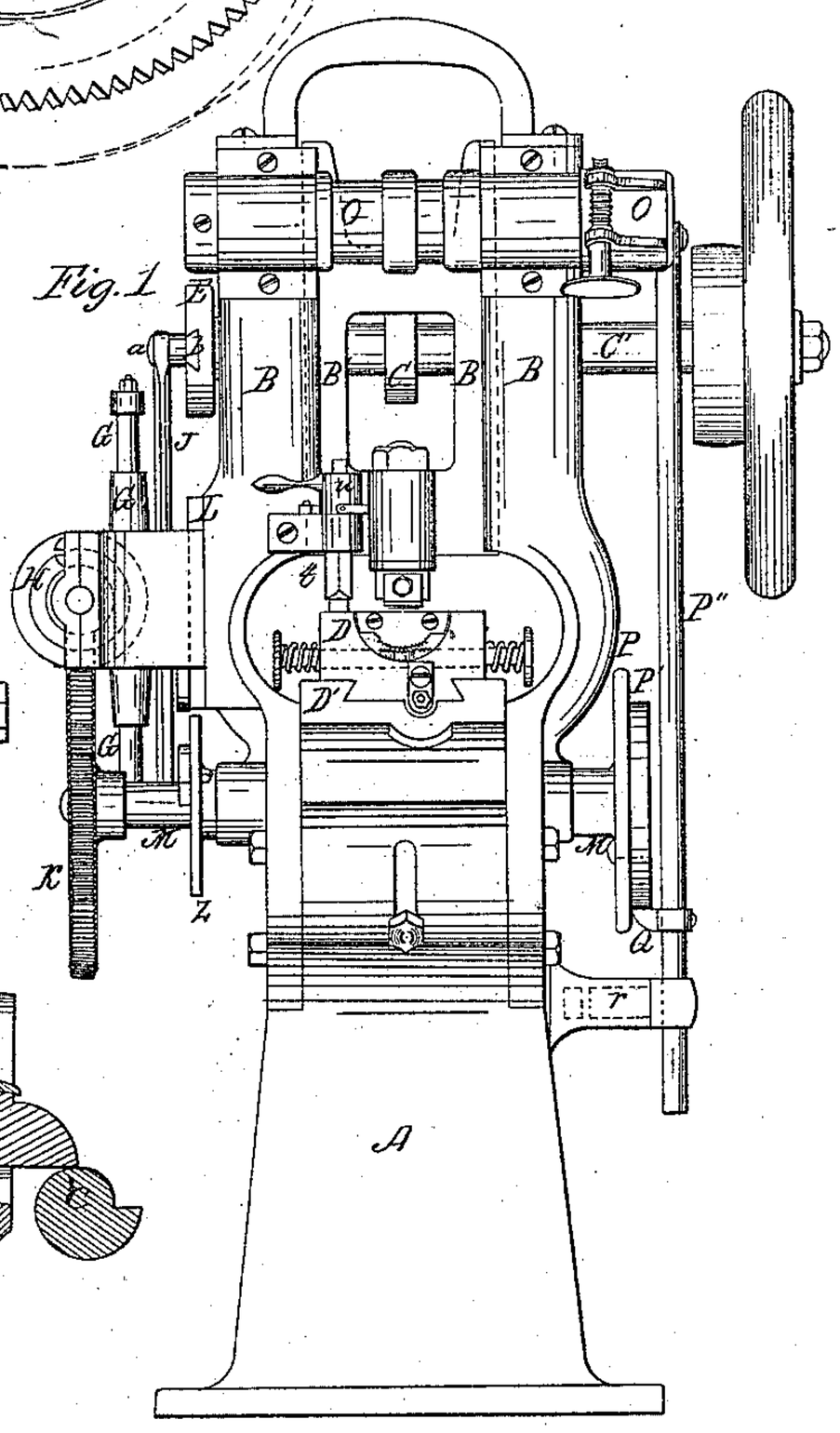


Fig. 7




Witnesses;
Benj. F. Thurston
Byron Sprague

Inventor;
W. T. Nicholson

Sheet 2 - 2 Sheets.

# W. T. Nicholson,

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Fig. 6

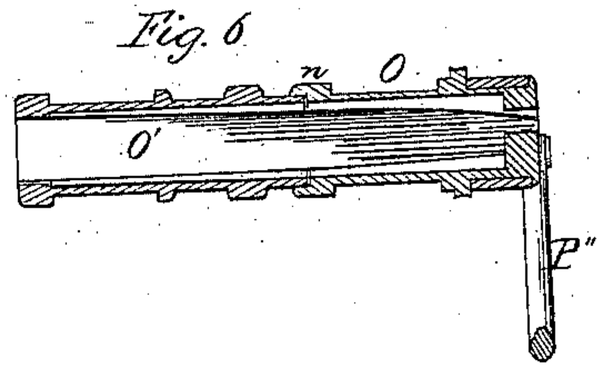


Fig. 8

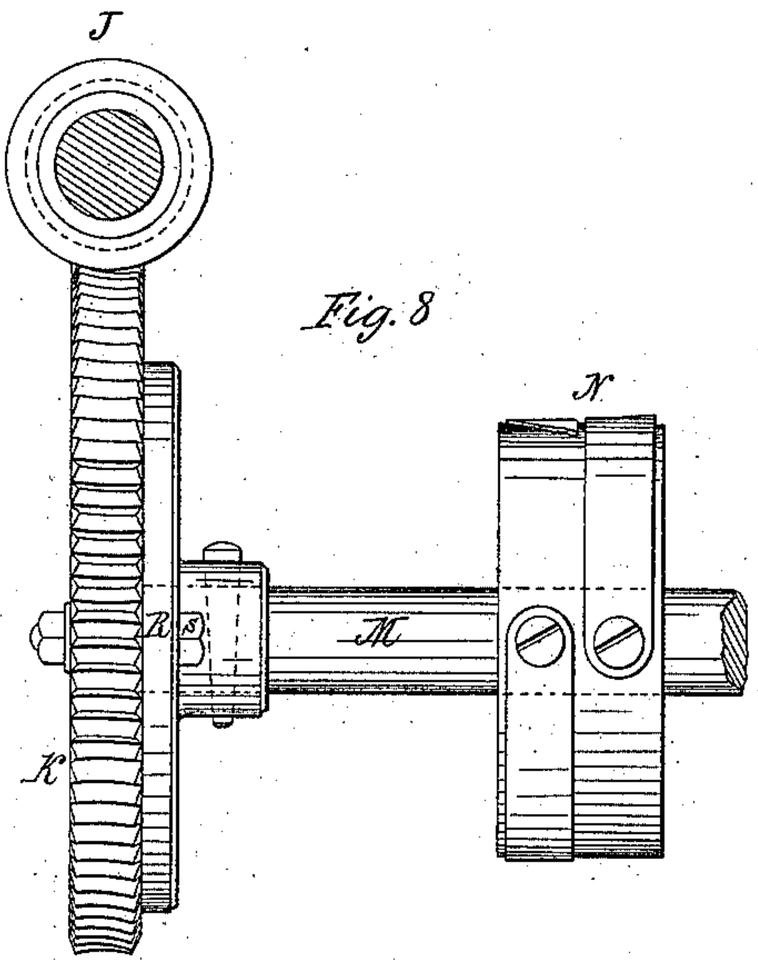


Fig. 3

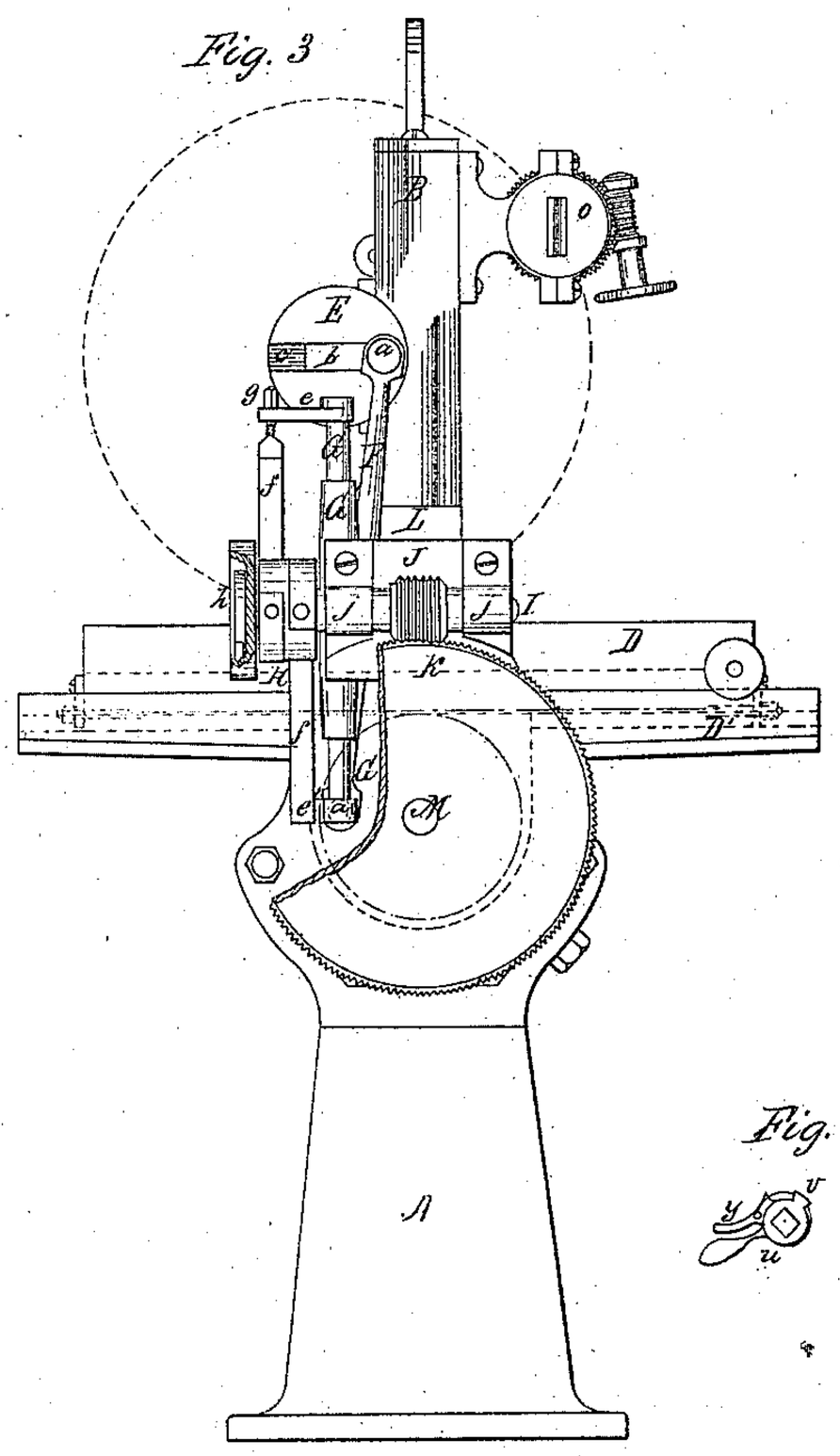


Fig. 4

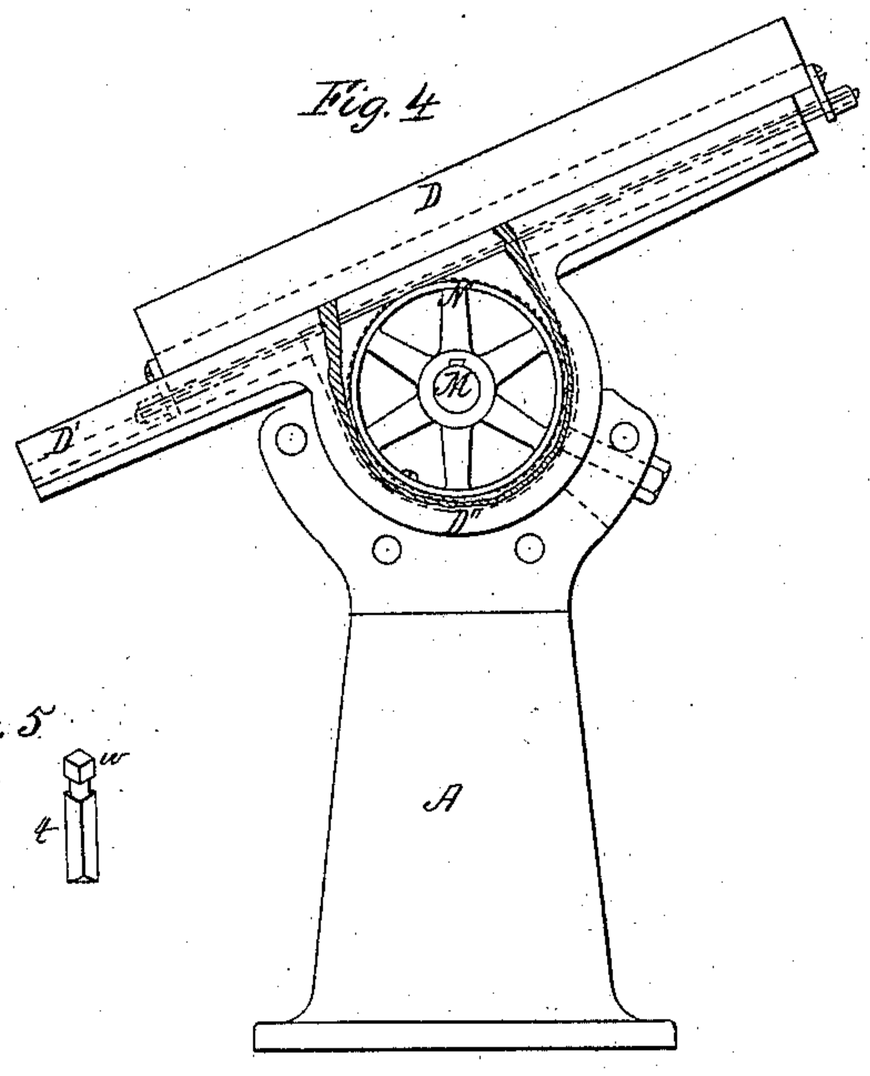


Fig. 5




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# UNITED STATES PATENT OFFICE.

WILLIAM T. NICHOLSON, OF PROVIDENCE, RHODE ISLAND.

## IMPROVEMENT IN FILE-CUTTING MACHINES.

Specification forming part of Letters Patent No. **42,216,** dated April 5, 1864.

*To all whom it may concern:*

Be it known that I, WILLIAM T. NICHOLSON, of the city and county of Providence, in the State of Rhode Island, have invented certain new and useful Improvements in Machines for Cutting Files; and I do hereby declare that the following specification, taken in connection with the drawings making a part of the same, is a full, clear, and exact description thereof.

Figure 1 is a front elevation. Fig. 2 is a side elevation. Fig. 3 is a side elevation with a portion of the feed-wheel removed. Fig. 4 exhibits the means by which the sliding carriage, which carries the file-blank, is moved. Figs. 5, 6, 7, and 8 are detailed parts, to be referred to hereinafter. Fig. 9 is an arrangement of the feed-wheel, so as to produce a variable feed.

Machinery for making files has often been attempted, but has rarely been pratically useful, and in no instance has been capable of producing all the various grades of files as perfectly as the same could be made by hand labor. The obstacles which have stood in the way of success have been various and have arisen from the varying conditions under which the machine must accomplish a uniform work, due, principally, to the irregular form of the blank, the four faces of which during a portion of their length are more or less curved, so that in passing under the cutter the spaces between any two cuts will, with a uniform feed-motion, vary in proportion to the curvature of the face of the blank. Again, as it is necessary to impart to the cutter an impulse which shall be proportioned in intensity to the varying resistance due to the shape of the file-blank, which impulse is obtained from a spring, the tension of which is according to the requirements of the work to be done by the cutter, increased or diminished, it is obvious that unless such a relation subsists between the mechanism for feeding the file under the cutter and the mechanism by which the force of the blow is varied as insures perfect regularity of movement without loss of motion in any of its parts, the successive cuts will be of irregular depth and of unequal distances apart and the work produced consequently imperfect. Furthermore, it is necessary that there should be some means for compensating the force which the spring shall impart to the cutter—as, for instance, in case the maximum force which a certain spring is capable of exerting upon the cutter is just short of that necessary to effect the proper cutting of the blank at its widest part, it will be necessary to substitute another spring of greater power, but this latter spring may exert a force as much too great for the proper execution of the work as the other was too feeble, so that without some means by which the maximum force of each spring can be adjusted independently of the mechanism which varies the intensity of its force between the limits which it possesses a failure to accomplish a useful result would from this cause ensue.

In my invention, while some of the same general principles are involved which have characterized other machines, I have introduced features of construction and methods of arrangement which combine simplicity of structure and accuracy of operation beyond any existing machine of its class with which I am acquainted, and which enable me to overcome the various mechanical difficulties in the way of former machines which I have above referred to.

In the accompanying drawings, A is a pedestal or bed of the machine. B B are guides, between which the frame B′ B′, which carries the cutter, is made to work in a plane perpendicular to the plane of the horizon, and which is actuated by the tappell C on the main shaft C′ in the upward direction, and by its gravity, aided by a spring, presently to be described, in the other direction. The carriage D, upon which the blank to be cut is placed, and which is more particularly described, with its improvements, in other Letters Patent granted to me of even date herewith, travels upon a bed, D′, which can be adjusted obliquely to the plane in which the frame which carries the cutter-chisel travels, and which rests upon the pedestal A, a semi-cylindrical cavity being formed in the latter to receive the corresponding semi-cylindrical portion D″, Fig. 4, which projects from the under side midway between the extremities of the bed. The blank to be cut is supposed to be placed upon the bed of the carriage D directly under the cutter, and to be secured and held down during the cutting operation by any of the methods in use. No special means for this pur-

pose are shown in the drawings, as various contrivances can be employed. The carriage D, with the blank secured to it, is made to travel under the cutter, so as to allow of the formation of the successive teeth, as follows: Upon the extremity of the main shaft C′, opposite to the end at which the power is applied, is placed a disk plate, E, Fig. 3, which is furnished with a wrist-pin, *a*, attached to a slide, *b*, adjustable in a groove, *c*, in the plate. A shackle-bar, F, connects the pin *a* with a similar pin, *d*, attached to the lower end of the perpendicular rod G, which is fitted to work in the guide G′, whereby the revolution of the main shaft C′ imparts a reciprocating motion to the rod, the range of which can be increased or diminished by adjusting the wrist-pin *a* nearer to or farther from the center of the disk-plate E, and, as will presently be seen, thereby vary the rate of speed at which the blank will be moved under the cutter. Projecting from the rod G at each extremity, and at right angles with it, are fixed arms *e e′*, to which, at one of their ends, are attached the steel bands or ribbons *f f*. The other ends of these bands are made fast to the face of the drum, around which each makes a partial turn, the face of the drum being of sufficient width to allow of the bands being arranged side by side and the length of the arm *e* being greater than that of the arm *e′* by at least the width of one of the bands. A nut and screw, *g*, upon the end of one of the bands affords the means for tightening their strain upon the drum, if necessary. It is obvious that the reciprocating motion of the rod G will, by means of the bands, impart a rocking motion to the drum H. The drum H is fitted to turn freely on the shaft I, upon which it is mounted in one direction, but on its side it carries a pawl, (not shown in the drawings,) which, when the drum is turned in the other direction, engages with the teeth of a ratchet-wheel, *h*, upon the end of the shaft I and causes the shaft to be turned. This shaft is mounted in bearings *j j* upon a carriage which can be moved for a short distance upward or downward upon a guide, L, attached to the side of the frame B, and carries a screw, J, the threads of which will engage with the teeth on the periphery of the gear-wheel K, when the carriage which carries the screw is brought down to allow of its being done. The intermittent rotatory motion which the shaft I with its screw J receives through the mechanism above-described causes the gear-wheel K to be turned and with it the shaft M, to which it is keyed, Fig. 1. This shaft passes through the central portion of the semi-cylindrical projection D″, Fig. 4, upon the under side of the bed D′, and carries a drum, N. Two metallic bands or ribbons pass side by side partially around this drum, (as shown by dotted lines and also in Fig. 8,) one end of each band being made fast to the face of the drum and the other end of each connected to the carriage D at its front and rear end by a straining nut and screw. It is clear that as the shaft M is turned one of the bands will be wound upon the drum and the other be at the same time unwound, and the carriage D will be moved along its bed. By this means the blank to be cut is fed under the cutter at any proper rate of speed to produce the distance between the successive cuts desired, inasmuch as the extent to which for each cut the carriage D, which carries the blank, shall be moved is dependent upon the extent to which the screw J is turned, and this again is dependent upon the extent of the arc of vibration of the drum H, which can be regulated at pleasure by the adjustment of the wrist-pin *a* with reference to the center of the disk-plate E. In this connection it should be observed that by the use of metallic band connections between the main shaft and the feeding-gear, and between the feeding-gear and the carriage, which can always be kept taut by the straining-nuts, all backlash or loss of motion will be prevented. It has always been stated that the force of the blow given by the chisel is aided by the action of a spring. This agency is employed in most machines, but in my invention there are some novelties of application, which are as follows:

O is a rocking-shaft, Figs. 1, 2, and 7 which works in journals attached to the uprights I B of the frame. O′ (shown in blue) is a flat piece of spring-steel which is placed in a longitudinal mortise extending through the axis of the shaft. Several of these mortises may be made, or one alone may be had of sufficient capacity to allow of the insertion of several springs. This shaft is made in two parts which are connected together by a slip-joint *n*, as shown in Fig. 6, so that one portion can turn upon the other. Upon the end of the shaft on the opposite side of the machine from the toothed gear-feeding wheel is placed, so that it can turn thereon, an arm, O″, which, by means of the screw *k*, mounted in bracket upon the head of the arm working into the teeth of a toothed wheel, *m*, keyed fast to the shaft, can be adjusted in its position upon the shaft, and when the end of the arm O″ is connected with other mechanism, presently to be described, so as to resist the action of the screw *k*, the spring O′ will be torsionally strained and an increased impulse proportioned to the increased tension of the spring be given to the arm *p*, which acts upon the sliding frame which carries the cutter-chisel.

The mechanism for giving an increased blow to the chisel when it is to act upon the wider portion of the blank, where the resistance is greater than at the parts where the blank is narrower, is as follows: Upon the shaft M, but upon the side of the machine opposite to that where the wheel K is located is placed a disk-plate, P, upon the face of which is a cam, P′, which can be adjusted to any position upon the plate by means of clamp-screws. The rod P″ has its upper end connected with the arm O″ by a pin, which can be adjusted as desired to any position in

the slot *q* in said arm. The lower portion of the rod P″ passes through a guide, *r*, projecting from the pedestal of the machine. A foot, Q, which is adjustable on the rod P″, is so placed as to bear against the face of the cam P′, and is held in position by a set-screw. The disk-plate P, being on the same shaft as the feed-wheel K, turns with it, and consequently the cam P′ is rotated also. The acting face of the cam will necessarily as it revolves bear down the rod P″, which will carry down the arm O″ and increase the torsional strain upon the spring O′, and by adjusting the cam P′ so that this effect will be produced during the length of time that the wider portions of the blank are being cut, the force of the blow which the chisel will give when released from the tappet C, Fig. 1, will be greater when by the action of the face of the cam the tension of the spring is less. This arrangement of the spring described, in view of the purposes to be accomplished, is of importance from the fact that a small extent of movement of the arm O″ will greatly increase the power and activity of the spring, while the slotted arm O″, from the variation in the leverage to twist the spring which it admits of, enables me with the capacity already explained for the introduction of more than one spring into the shaft O to obtain just the degree of power required to effect the requisite depth of cut, so that a compensation for any excess of force which the spring or springs would otherwise exert is readily obtained. In this connection another feature of my invention should properly be explained, which is exhibited in Fig. 9, which consists in a means for imparting a variable-feed motion to the file-blank. The majority of files are made nearly flat from the shank to about the middle, and then commence to taper toward the point with a gradual curve. In all hand-cut files the lands are made wider near the middle of the file than at the ends, but in a machine-cut file, which is fed with a uniform speed, the lands will be widest where the curve of the face of the file is greatest, leaving the lands near the central part narrower than toward the point. To make the machine-cut file in this respect like those made by hand, I have so constructed the feed-wheel K that it can be set eccentrically upon its shaft M by means of clamp-screws *s s*, which attach the wheel to the disk-plate R on the shaft. The screw J, which actuates the feed-wheel with the carriage on which it is hung, as already explained, can rise and fall upon the slide L, Fig. 1, so that in revolving the feed-wheel K it can readily be aided by the band connections to accommodate itself to to the eccentricity of the latter. It is apparent that the greater the distance between the axis X, Fig. 9, of the feed-wheel and its periphery at the points acted upon by the screw the less will be the extent to which the file-blank will be fed along, and vice versa, and by so adjusting the feed-wheel that the more rapid rate of feed shall occur while the central portion of the file is being cut, it is apparent that the result to be desired will be accomplished.

The last feature of the invention described in this patent consists in a means of arresting the action of the cutter after any previously-determined portion of the blank has been cut for the purpose of diminishing the degree of attention required on the part of the operator, and to enable one person to attend upon a number of machines at the same time.

The arrangement of devices is shown in Fig. 1. A bar, *t*, (also Fig. 5,) is fitted to slide in a guide attached to one of the uprights B of the frame of the machine. This bar is a prism of several sides with the exception of a small portion near the upper end, which is cylindrical. A collar, *u*, to which a handle is attached, and which has also a projection, *v*, surrounds the upper part of the prism *w*, it having a mortise through it to admit the prism. Upon the carriage D is placed an inclined plane which is adjustable to any position on the bed. As soon as the foot of the bar *t* commences in the progress of the carriage beneath it to ascend the face of the inclined plane, the cylindrical portion of the bar which is then below the mortise in the collar will begin to be varied until it occupies the place in the collar which was before filled by the prism, when the collar is free to yield to the influence of the spring *y*, Fig. 5, and turn far enough to hinge the projecting ear *v* under the frame B′, which carries the chisel and supports it. At the same time the worm-screw J, with its carriage, is raised to stop the feed by the direct action of a cam, Z, Fig. 1, on the shaft W, located beneath it, or by the action of a weighted lever the long arm of which rides upon the face of a cam whose face at that point in its revolution has been cut away to allow the lever to fall and cause the short arm to raise the same and its carriage above the teeth of the feed-wheel.

I do not limit myself to the precise construction and arrangement of the several parts, as described, but mean to cover all mere formal variations, accomplishing the same mode of operation so far as relates to my invention by equivalent means.

What is claimed as my invention, and is desired to be secured by Letters Patent, is—

1. The method, substantially as described, of imparting motion to the feeding mechanism in a file-cutting machine by the combination of a pawl-and-ratchet gear, or its equivalent, with the bands *f f*, operated by the revolution of the main shaft in the manner substantially as specified.

2. The combination of the feeding mechanism and the movable carriage upon which the blank is held during the cutting operation in a file-cutting machine by the means substantially as described, for the purposes specified.

3. Imparting a variable rate of motion to

the carriage upon which the blank is held by the method and on the principle substantially as described, for the purposes specified.

4. The combination of a spring or springs, O′, which can be torsionally strained, as shown, with the mechanism for varying the tension of the same, substantially as described, for the purposes specified.

5. The combination of a spring or springs, O′, which can be torsionally strained, as shown, with the mechanism consisting of the slotted arm O″, and the worm-gear *k m*, or the equivalent of the same, for adjusting the tension of the spring or springs within limits which will best give the proper degree of impulse to the cutting-chisel, substantially as described.

6. The combination of a spring or springs, O′, which can be torsionally strained, as shown, with the carriage B′ B′, or other device which carries the cutting-chisel, substantially as described.

7. The method of arresting the action of the cutting-chisel at any previously-determined point in the progress of the blank under the cutter by the combination of a spring-stop, Fig. 5, substantially as described, with an adjustable inclined plane upon the movable carriage, as herein specified.

W. T. NICHOLSON.

Witnesses:

BENJ. F. THURSTON,

BYRON SPRAGUE.