Sheet 1 - 3 Sheets

# E. Bernot,

## File-Cutting Machine,

No. 29,236. Patented July 24, 1860.

Fig. 2.

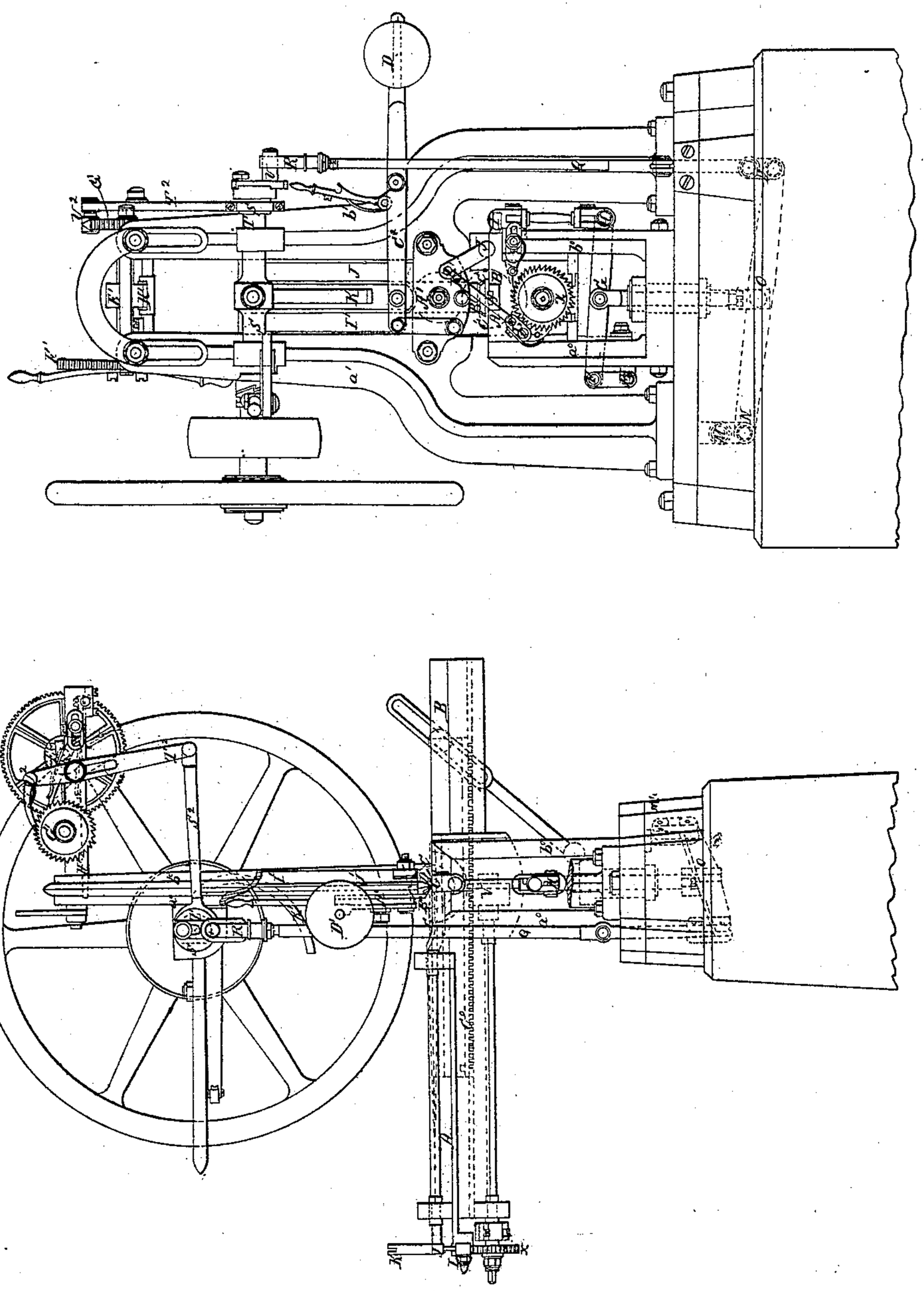

Fig. 1.

Witnesses;

Henry W. Spencer
Geo. H. Sutton

Inventor;

Chime Bernot

Sheet 2-3 Sheets.

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Fig. 2.

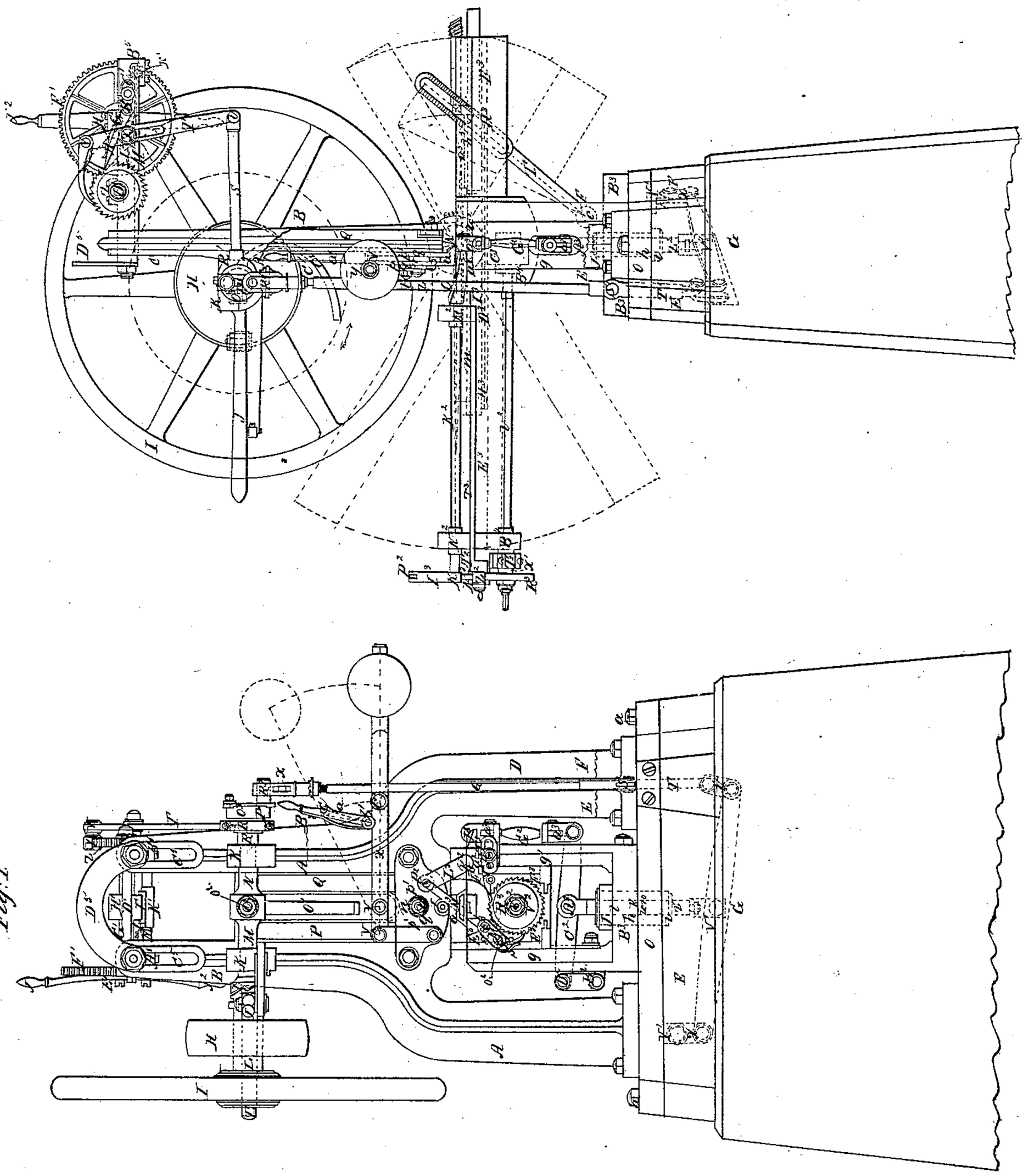

Fig. 1.

Witnesses;

Henry W. Spencer
Geo. Hutton

Inventor;

Etienne Bernot

Sheet 3 - 3 Sheets.

# E. Bernot,

## File-Cutting Machine,

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Fig. 2.

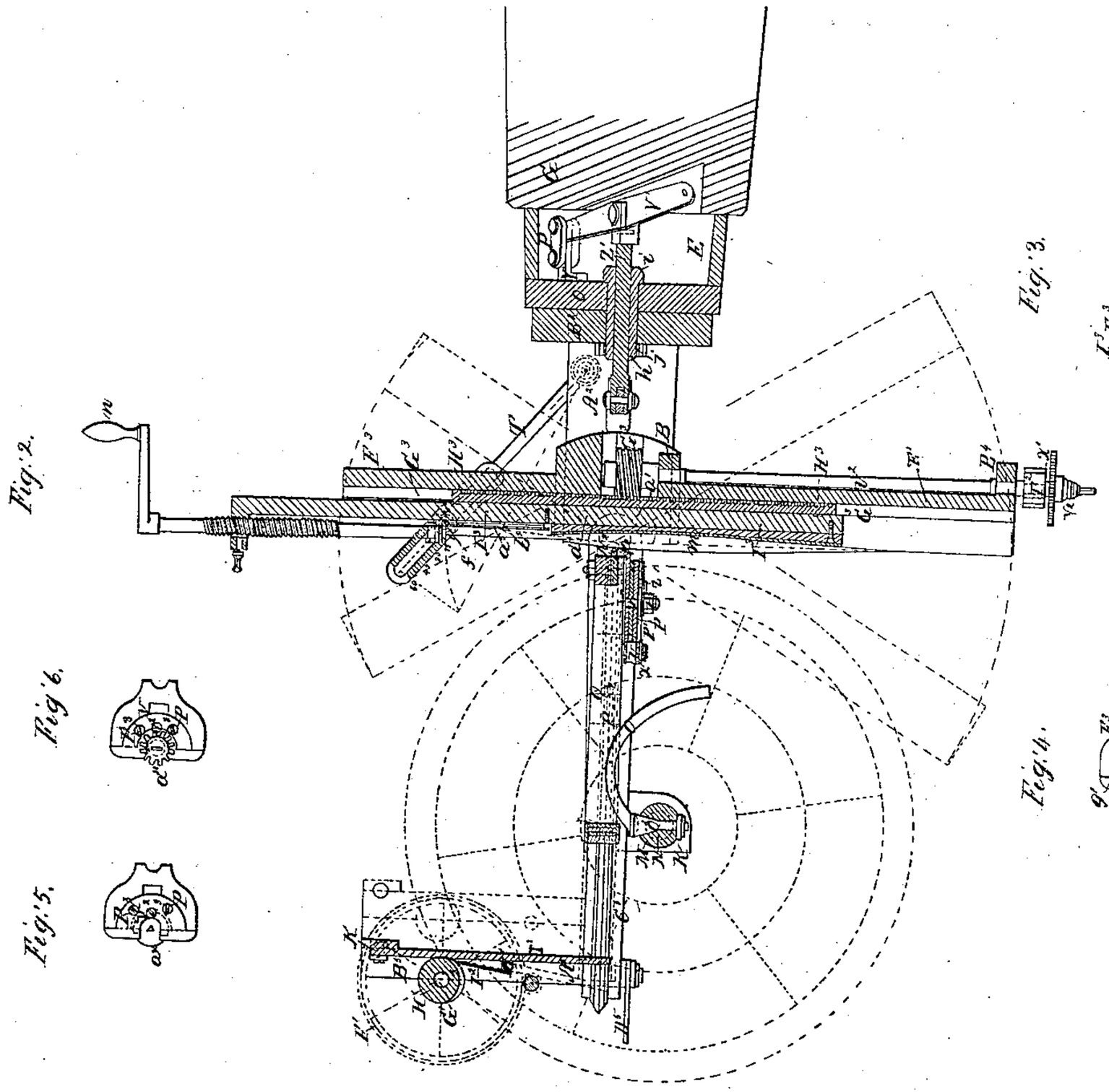

Fig. 3.

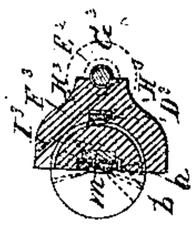

Fig. 6.



Fig. 5.



Fig. 4.

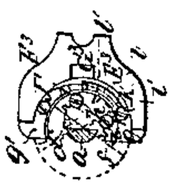

Fig. 1.



Witnesses;

Henry W. Spencer
Geo. Hutton.

Inventor;

Etienne Bernot

# UNITED STATES PATENT OFFICE.

ETIENNE BERNOT, OF PARIS, FRANCE.

## MACHINE FOR CUTTING FILES.

Specification of Letters Patent No. 29,236, dated July 24, 1860.

*To all whom it may concern:*

Be it known that I, ETIENNE BERNOT, of Paris, France, have invented a new and useful Machine for Cutting Files, and do hereby declare the nature of the said invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement thereof, reference being had to the drawings hereunto annexed and to the figures and letters marked thereon.

My invention consists in new mechanical arrangements for the construction of a machine for cutting files.

Drawing I represents a front elevation of the machine (Figure 1). Drawing I, also represents a side elevation of the machine and a section through A B, and E, F, Fig. 1, for showing more clearly the interior of the machine (Fig. 2); Drawing II, plan of the whole machine (Fig. 1); Fig. 2, Drawing II, represents a vertical section through the line X X of the Drawing II (Fig. 1); Fig. 3, Drawing II, is a section through P, O, Fig. 2, Drawing II, and through R, S, Drawing II, (Fig. 1); Fig. 4 represents a front view of the buffer and in the manner in which the half circular file is fixed; Figs. V and 6 also represent the manner of fixing the three sided and rat-tail files.

A, B, C, D, represent a cast-iron frame, upon which the various parts of the machine are set up; E, F, lower part of the frame, serving as foundation to the machine; this part is hollow internally and by its arrangement allows the connecting rod V′ shown by dotted lines, to work vertically, as represented in Drawing I; but chiefly in Fig. 2, Drawing II, which, being a vertical section, shows the working and the manner in which motion is communicated more clearly; G, stone pedestal, by which the whole of the machine is supported. The bolts *a*, *a*, are sealed into the pedestal and run through the iron foundation E F and plate O, uniting them together, so as to form but one piece. H, cast-iron pulley, (the diameter of which may vary,) serving to put in motion the whole of the machine; L′ M N, horizontal shaft, set in motion by pulley H, and mounted on a barrel L, turning around in a socket L′, forming part of the shaft L′ M N and cogging by means of the lever J in J′, thus setting the shaft in motion as herein-before described; I, fly wheel, fixed upon the barrel of the pulley, and serving to regulate the rotative motion of the shaft L′, M N; K, K, plummer blocks forming part of the frame and in which the horizontal shaft L′, M, N, works; O′, cam, mounted upon and fixed to the center $O^2$ of the horizontal shaft by a conical shoulder running through it, and a screw which fastens them together, as shown in Fig. 2, Drawing II. This cam being fixed to the horizontal shaft encounters during the revolution of the latter the ram beam P, G, which slides between two grooves V, cut in the upright of the frame, and gives to it an ascending movement. R, ring, inclosing eccentric R′; during the movement of the horizontal shaft, the ring R, fixed to the rod S, gives to the latter a to and fro movement as shown in Drawing I (Fig. 2), and Drawing II, (Fig. 1). T, balance lever, jointed at the point U, V, and pivoting by means of the axis X. This connecting rod has toward its center a groove which allows it to ascend or descend according to the catch Y. The catch Y at each to and fro movement causes the ratchet wheel Z to turn, by pushing it before it. The stroke of the catch Y is always calculated so as to cause the ratchet wheel Z to advance one cog at each movement. A′, counter catch, for preventing the ratchet wheel Z making a retrograde movement; it is movable on the point B′, and can, by means of the grooved piece B′, C′, which receives it, advance or recede with it, according to the required inclination. This inclination is always regulated by that of the cog of the ratchet wheel, which varies in size according to the degree of fineness to be obtained. In order to prevent the rising of the catches, two springs bear constantly on the points Y of one, and on A′ of the other. D′, small horizontal shaft, set in motion by the ratchet wheel Z; at the extremity of this shaft is a pinion E′, upon which the cog wheel F′ works. This wheel is set upon a horizontal shaft G′, to the middle of which is fixed a pressure eccentric H′; the spokes which serve to form the circumference have been calculated, so as to press continually in its rotation in a proportionate manner upon

a spring I′; it only travels over three-fourths of the circumference, and as this movement has been determined by the length of the file, it therefore follows that each time one of the surfaces of the file has been cut, the wheel F′ returns and imparts to it its motion by means of the two hand levers $J^2$, which form part of the said wheel F′. The handles also serve as a mark for replacing the eccentric at its starting point at each new cutting. I′, main tempered steel spring, fixed by a counter plate and two screws to the center of a movable shaft K′. Another small spring $L^2$, also fixed to the shaft K′, rests upon a stop M′, and serves to prevent the main spring I′ from taking a vertical direction, which owing to the mobility of the shaft K′, to which it is fixed, would otherwise take place. During the action of the machine the eccentric H′ is constantly in contact with the main spring I′. It will be readily understood, bearing in mind the ascending movement which the cam imparts to the beam P, Q, that the beam encounters the main spring each time, and consequently the elastic force of the latter varies according to its contact with the eccentric. The beam P, Q, is provided at its lowest end with a graver or chisel N, which is firmly fixed by a counter plate, which with two bolts running through it, prevent the chisel N acting on the beam itself.

The carriage of the graver should always be perpendicular to the axis of the beam P, Q, and consequently have its edge parallel to the surface of the file to be cut; when once this object is obtained, the file, notwithstanding the irregularities of thickness in all its transverse sections will always present a line of contact parallel to the cutting edge of the graver. It will be seen by the preceding, that as the elastic force of the main spring I′ upon the beam varies in proportion as the eccentric performs its movements, this beam descends with more or less force, and consequently, by means of the graver at its end, cuts the lines upon the file always of an equal depth. The mechanism working the eccentric is arranged that it should exert the strongest pressure upon the middle of the file, where the surface to be cut is the largest, and that the pressure should gradually diminish in advancing toward the extremities and thus produce the cutting of a uniform depth. The movement of the eccentric is regulated by means of the supports $A^5$, $B^5$, upon which it rests. These supports slide in grooves $C^5$, and are fixed by a semicircular piece $D^5$.

The mechanism for setting the file in motion is as follows: $O^3$, shoulder, forming part of the horizontal shaft M, N; in the middle of this shoulder a handle P′ slides, which is fixed by means of a screw bolt when its range is determined.

Q′, main connecting rod, provided with a pulley $R^3$ at its upper part and jointed at its lower part in S′. This connecting rod, set in motion by the handle P′, which works with the horizontal shaft M, N, gives to the rod T′ a to and fro vertical movement.

At the lower part of the rod T′ is a small pulley U′, jointed to its extremities, and which sets in motion a connecting rod V′, suspended at its other extremity to a pulley X, similar in construction to the pulley U′, but which remains fixed while it pivots on the point V′, bolted to the framing of the machine. At the middle of the balance lever V′ rests a vertical rod Z′, $A^3$, jointed at $Z^3$, and which also receives a to and fro vertical movement from the rod T′ by means of the balance lever V′. This rod Z′, $A^2$, slides frictionwise in a barrel provided with a shoulder at its lower part, and tapped at its upper part to receive a round nutted screw which presses it firmly between the plate, herein-before described, and set on the framing of the machine and the buffer carrier $B^3$. At the upper part of the rod Z′, $A^2$ is another balance lever $C^2$, jointed to the left extremity at $D^2$, as shown in Drawing I., provided with a pulley, also jointed at its lower part at $B^2$, and pivoting upon an ear fixed to the buffer carrier $B^3$. The right-hand side of this balance lever communicates to the connecting rod $G^2$, with which it is jointed, an ascending and descending movement which it has received from the rod Z′ $A^2$. The connecting rod $G^2$ can work in any direction, being provided at each of its extremities $a^3$ with universal joints.

The arched arm $J^3$ which is fixed to the upper part of the connecting rod $G^2$, receives from the latter a to and fro movement, which it communicates to the connecting rod $L^3$ which is like the arm $J^3$, forms part of the shaft $K^2$, (as seen in Drawing I., Fig. 2,) working in two plummer blocks $M^2$, $N^2$. The connecting rod $L^3$ being attached to the small pulley $M^3$ by the rod $N^3$, jointed to both at the points $O^3$ and $P^2$, gives to the pulley $M^3$ a to and fro motion and causes the ratchet wheel $R^3$, to advance one cog each time by the pressure of the catch $S^2$, which pushes it successively before it. To prevent the pulley $M^3$ moving too freely, it is attached to a support $T^2$, at the lower part of which is a ring cut in two, and reunited by two claws and two screws; this ring rotates freely upon the shaft $U^2$ which receives a circular movement from the ratchet wheel $R^3$, forming part of it, by the pressure of a nut with cap $V^3$, against one of the shoulders of the shaft $U^2$.

A counter catch $V^2$ serves to prevent the ratchet wheel from making a retrograde

movement; this counter catch can be lengthened or shortened at will by means of the piece $z^2$, which slides in a screw bolt into an iron plate $b^3$ serving as support to the plummer blocks $N^2$ and $M^2$. When the length of the catch is determined it is merely necessary to bear strongly upon the head of the bolt to keep at the same length the catch $V^2$; its length and inclination are always dependent on the fineness of the cogs of the ratchet wheel upon which it is to act. It will be seen, from what has been herein described, that the ratchet wheel $R^3$ gives a circular movement to the shaft $U^2$; this shaft, which works in two plummer blocks $B^4$, $B^4$, is provided at its other extremity with an endless screw $C^3$, which in turning advances or recedes according to the impulse given to it by a rack $D^3$, with which it cogs. The rack $D^3$, as represented in Drawing I. (Fig. 2), and Fig. 2, Drawing II., travels the whole of the length when sliding through a semihollow cylinder $E^3$, $F^3$, provided at its lower extremity with a groove $G^3$, serving as guide to this rack. Toward the extremities of this rack are two stops $H^3$, $H^3$, serving to direct the upper part or buffer $I^3$ that rests upon it. This buffer $I^3$ is of the form of a demi-cylindrical prism, and has toward its extremities two grooves made in it, which slide freely in a transverse direction to the demiprism while held by the stops $H^3$, $H^3$. The demiprism, as shown in Fig. 3, Drawing II., moves in a transverse direction to $E^3$, $F^3$, with which it moves with a gentle friction; it can therefore move freely around $E^3$, $F^3$, and at the upper surface change its position from a horizontal to an inclined position either to the right or left. At the upper part of $I^3$, a groove is formed through the whole of its length, and at the bottom of this groove an iron plate $m$, is let in, the upper surface of which represents exactly the shape of the file which is to be submitted to the action of the machine. Between the file and plate $m$, as well as upon the lateral side of the file, zinc bands are placed, in order that the stroke of the beam P, Q, should not impair the cut lines already produced.

Fig. 3, Drawing II., shows the manner in which the file is fixed upon the buffer. In this figure the grooves made in the buffer are shown in section and receive, as shown in plan Fig. 1, Drawing II., two wedges $a^5$, $b^5$, of which the left one is fixed and the right one movable. This last forms part of a screw with prolonged threads. This screw is supported by a piece of iron fixed to $I^3$ by means of rivets; if therefore, this screw is set in motion by means of its handle $n$, it causes to advance or recede the movable wedge to which it is jointed and which then tightens or slackens the file against which it is applied. The buffer $I^3$ works longitudinally, by means of an endless screw cogging with the rack $D^3$, upon which it rests. It will be readily understood, on referring to Fig. 2, Drawing II., that the motion can also be produced in a transverse direction by means of grooves made toward the extremities of the buffer and sliding freely in the stops $H^3$, $H^3$, of the rack $D^3$. The buffer $I^3$ has on each side of its lateral faces semicircular pieces $a^2$, $a^2$ (shown in black dotted lines,) forming an axis and pivoting in circular grooves hollowed out in the interior of the uprights of the support $B^3$, by which the circular, alternate and vertical movement is given to the buffer carrier, and afterwards to the buffer itself. This movement is combined so as to pass from a horizontal to an oblique direction, and form an angle which can reach 60°, and allows of regulating at will the inclination of the cuttings of the file. When the requisite cutting tool is regulated, the whole mechanism is stopped, to prevent any movement from top to bottom, by means of an iron rod T, moving at its lower part $e$ round a bolt screwed into one of the uprights of the support. At the upper part of this rod is a groove, in which slides a bolt $f$, screwed into the buffer carrier. The lateral faces of the said rod are divided into 60 parts, so as to correspond to the 60° of the angle that the buffer may have to describe. The bolt $f$ then performs the function of slider with the iron rod T, which, by means of the divisions marked thereon, becomes a scale of vertical inclinations; if, therefore the nuts of the two bolts are strongly pressed, the buffer will be prevented from moving in a vertical direction.

It will be seen by the foregoing description that the file, the buffer, its carrier and the support $B^3$ form but one body, which moves in a horizontal plane, and allows the file, to present itself to the graver from right to left for the first cut and from left to right for the second. The support is provided at its lower part with a disk $B^3$, in which the uprights $g$, $g$, already described, are inclosed, and retained by bolts. A fusee $h$ passes through the center of this disk, and acts as a pressure bolt to the plate O, through which it also passes; this fusee $h$ is held by a head $i$ at its lower part and at its upper part by a round nut $j$, pierced with six vertical holes, to receive the key for holding it firm. These several movements are shown in red in Fig. I, drawing II. At the center of the disk $B^3$ at K is a mark which also serves to regulate the cross angular cuttings. This mark, shown by the vertical line K, L, corresponds to a semicircle, divided on each side into 60 degrees beginning at the point K. It will be under-

stood that *o*, beginning at K, the reading of the degrees is either from left to right or vice versa. *p* is a plate, having at its center *q* a groove, shown in black dotted lines; this plate is fixed to the main frame by means of two screw bolts. Behind this plate *p*, is a disk, which has at its center *r*, an axis of the same diameter as the above mentioned groove. This groove is made so as to allow the axes of the counter plate to slide from right to left in it, and to describe in its motion an arc of a circle, of which the point *s*, is the center and which pivots on the point *s*, of the plate, to which it is held by a nut *t*. This movement serves only to regulate the disk, which is fixed to the plate by means of a nut *l*. This disk is shown in Fig. I, Drawing I., in black dotted lines and in Fig. 2 by the letter *p'*, U, dove-tailed guide, sliding freely in the disk *p'*; its movement takes place from top to bottom and from right to left, that is to say, similarly to the disk with which it slides. At the upper part of this guide U, at the point V, a rod is riveted, which acts as an axis, and serves to receive the main lever *x*, arm of the lever jointed at *y*, *z* and *u*. The small arm *y*, *z*, is held at the point *z* to the plate *p* when the apparatus is not in motion. At the extremity of the main arm *x* is fixed a cast-iron ball, which exerts a constant pressure upon the guide U, with which it communicates by means of the rod V, which acts at the same time as a pivot and axis of the main arm *x*, A', small crutch moving at *b'*, serving to receive the arm of the lever *x*, which rests upon it at C' when the latter ceases to bear upon the guide U. This movement takes place every time a new line is cut and is represented colored red in Fig. I, Drawing I. Owing to the peculiar arrangement of this part of the machine, when the guide U is once regulated by the counter plate or disk, in which it slides, it acts as a press and guide at the same time, that is to say, it always forces the file, upon which it rests during the cutting operation, to keep parallel to the graver N', by which the cutting is performed. The flat files are maintained upon the buffer $I^3$ by means of pressure and zinc wedged which embrace three faces of the file submitted to the cutting.

I will now proceed to describe the manner in which the half-round and rats-tail files are fixed upon the buffer $I^3$. For the half-round, see Fig. 4, Drawing II, a zinc plate *d'* is cast, upon which the plane surface of the file (previously cut by the same process as the flat file) rests. The concave part *e'*, which retains one of the convex sides of the file, is molded upon this file. This plate is held on the buffer by two grooves *j'*, *j'*, and is subjected to all the transverse movements given to the buffer. It will be readily understood that if a plummer block *g'*, *g'*, slides in the buffer carrier $E^3$, $F^3$, and is held to the buffer by means of a groove made in the semi-disk *h'* fixed to the vertical face of the buffer by two screws, that the buffer can move transversely, and take with it, the plummer block *g'*, *g'* which is kept with gentle friction by the circular cheek *i'*, *i''*, of the semi-disk *h'*. Upon the plummer block *g'*, *g'*, is a movable catch *j*, held by a spring *k'*. This catch forces itself into the openings *l'*, *l'*, *l'*, made in the cheek of the semi-disk *h'* and serves to hold the file steady during the cutting action.

It will be seen in Fig. 4, Drawing II, that an opening corresponds with the surface of the file to be cut. According to the arrangement shown in that figure, only one half of the file can be cut at a time. For cutting the other half, it suffices to mold another zinc plate in a contrary direction and to operate in the same manner. For cutting the three-faced files and rats-tail form, the arrangement of plummer blocks is the same as for the half-round file, that is to say, the bearing *g'*, *g'*, moves with the buffer only; it is fixed to it by means of two screws $z^3$, $z^3$. Between the internal face and the face of the buffer is a circular gorge, in which a washer $a^3$ about one-third of an inch in thickness, freely moves, and is provided with three equidistant holes, for cutting the three-faced files and for the rats-tail form there are ten holes. A screw $V^2$, running through the plummer block *g'*, *g'*, is inserted into the buffer, and forms a projection in the bottom of the gorge. This screw acts as a support and stop to the washers which successively present their openings to this screw, according as a longitudinal cut is finished. The zinc plates which receive each of the files are previously molded upon them (as for the half-round files), and sink into the buffer by means of grooves made in each side. To prevent the file from moving during the cutting operation, its end is inserted in openings made in the washers; these openings are of the same form as the ends they are to receive. And having now described the nature of my said invention, and the manner of putting the same into execution, I wish it to be understood that I do not confine myself to the precise details of construction herein laid down, as the same may be varied; but

What I claim is,—

1. The peculiar arrangement of the buffer carrier for the manufacture of files, as herein-before described and referred to in Figs. 1 and 2, Drawing I, and Figs. 4, 5, and 6, Drawing II.

2. The combination of a chain, composed of levers and connecting rods, with ordinary

or universal joints, capable of working in all directions, as herein-before described and referred to in Figs. 1 and 2, Drawing I.

3. In the arrangement of a guide set parallel to the graver, as herein-before described and referred to in Figs. 1 and 2, Drawing I, and Fig. 2, Drawing II.

4. In the arrangement of an eccentric, the pressure of which is proportionally exerted upon a spring as herein-before described and referred to in the Figs. 1 and 2, Drawing I, and Figs. 1 and 2, Drawing II.

ETIENNE BERNOT.

Witnesses:

GEO. HUTTON,

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