May 1, 1923.

1,453,765

A. OCTAVE

AUTOMATIC MACHINE FOR GRINDING THE SAW BLADES WITH REVOLVING GRINDING WHEELS

Filed March 30, 1921

6 Sheets-Sheet 1

Fig. 1

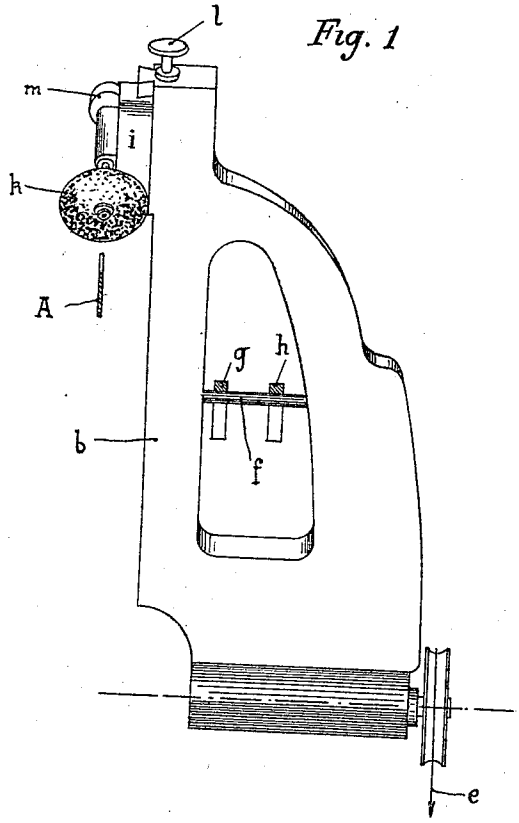
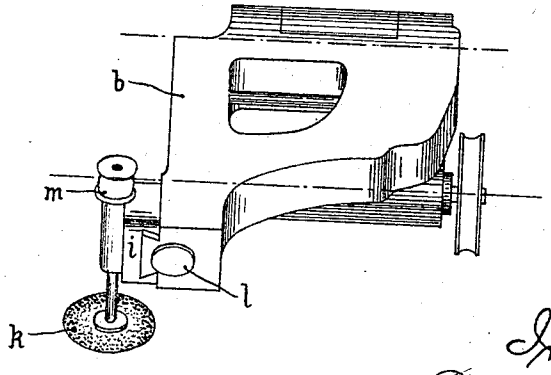


Fig. 3.



Inventor
Anatole Octave.
By Henry Orth & Co
Atty.

May 1, 1923.

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AUTOMATIC MACHINE FOR GRINDING THE SAW BLADES WITH REVOLVING GRINDING WHEELS

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6 Sheets-Sheet 2

Fig. 2

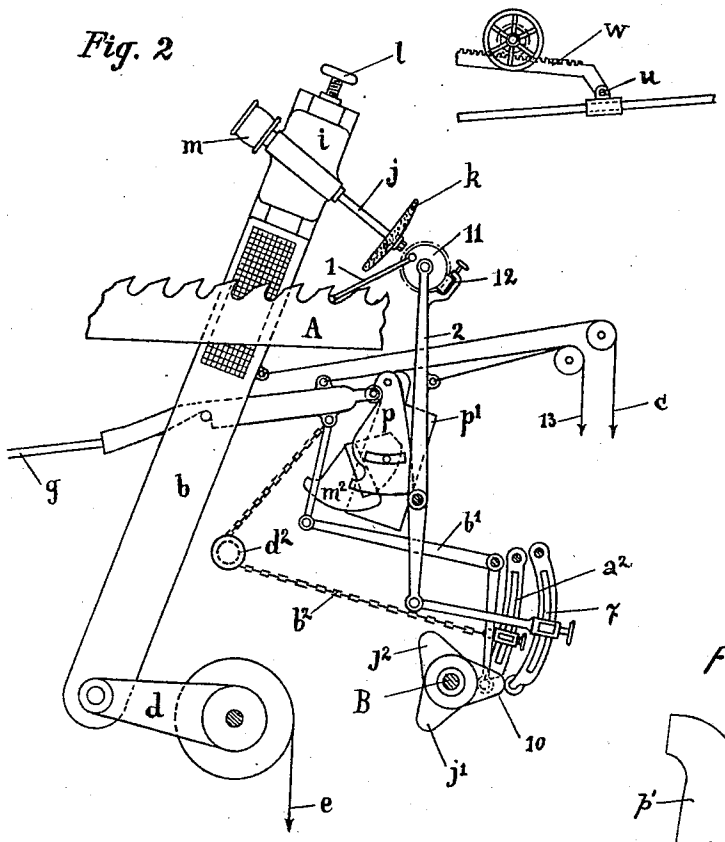


FIG 7a

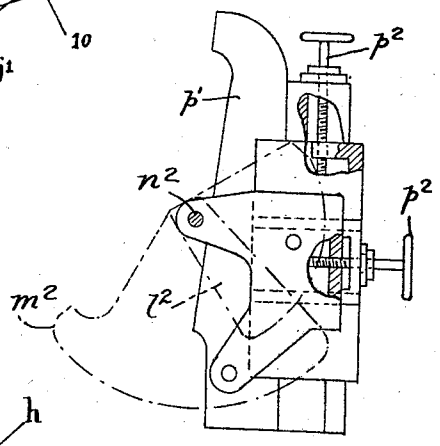
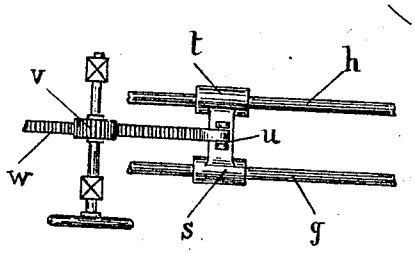


Fig. 8



Inventor
Anatole Octave.
By Henry Orth & Co. Atty

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AUTOMATIC MACHINE FOR GRINDING THE SAW BLADES WITH REVOLVING GRINDING WHEELS

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Fig. 4

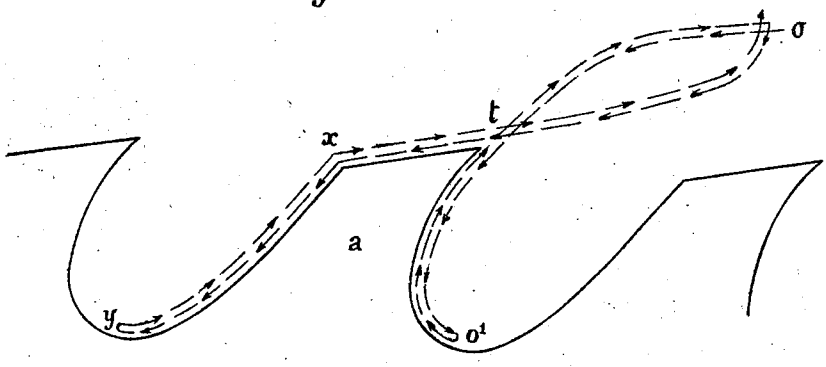


Fig. 9

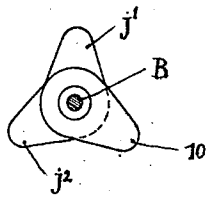
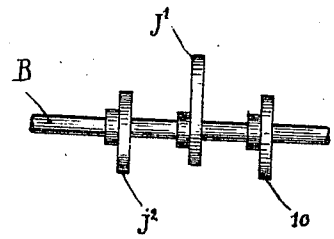


Fig. 10



Inventor
Anatole Octave.
By [signature]
Atty.

May 1, 1923.

1,453,765

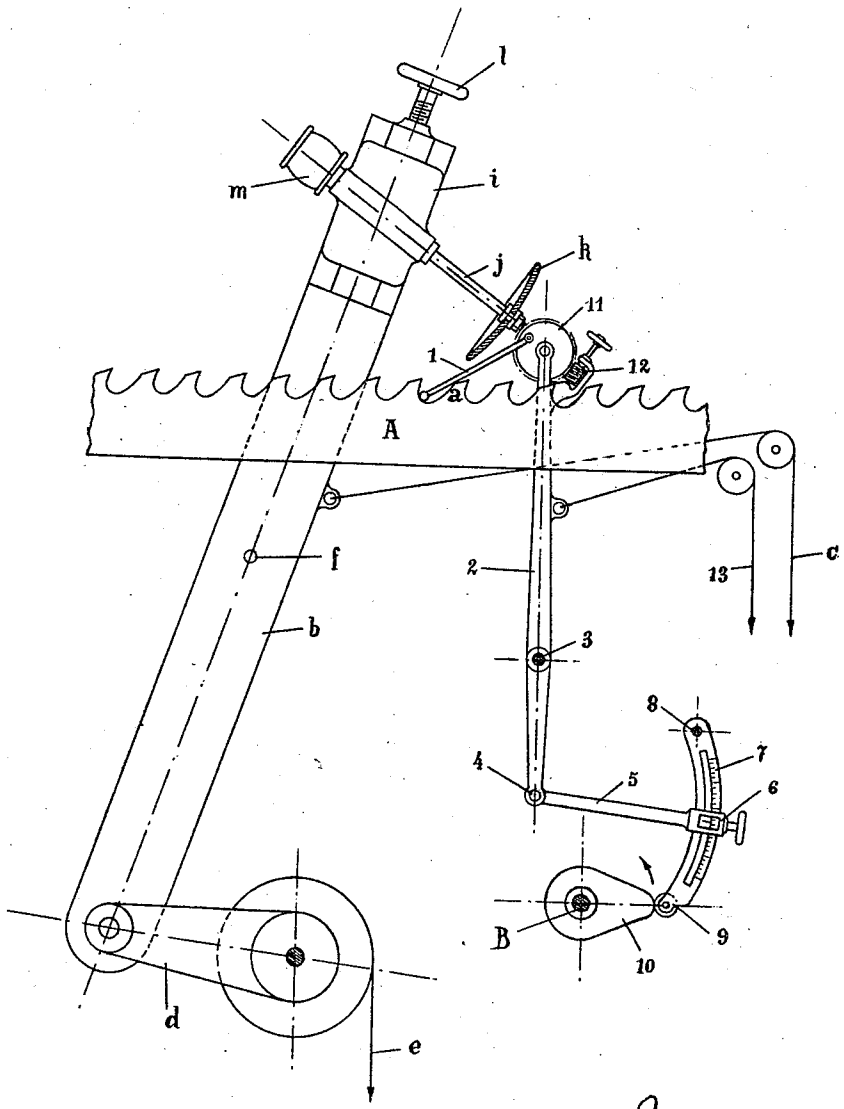
A. OCTAVE

AUTOMATIC MACHINE FOR GRINDING THE SAW BLADES WITH REVOLVING GRINDING WHEELS

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6 Sheets-Sheet 4

Fig. 5



Inventor
Anatole Octave
By Henry Orth & Co
Atty.

May 1, 1923.

A. OCTAVE

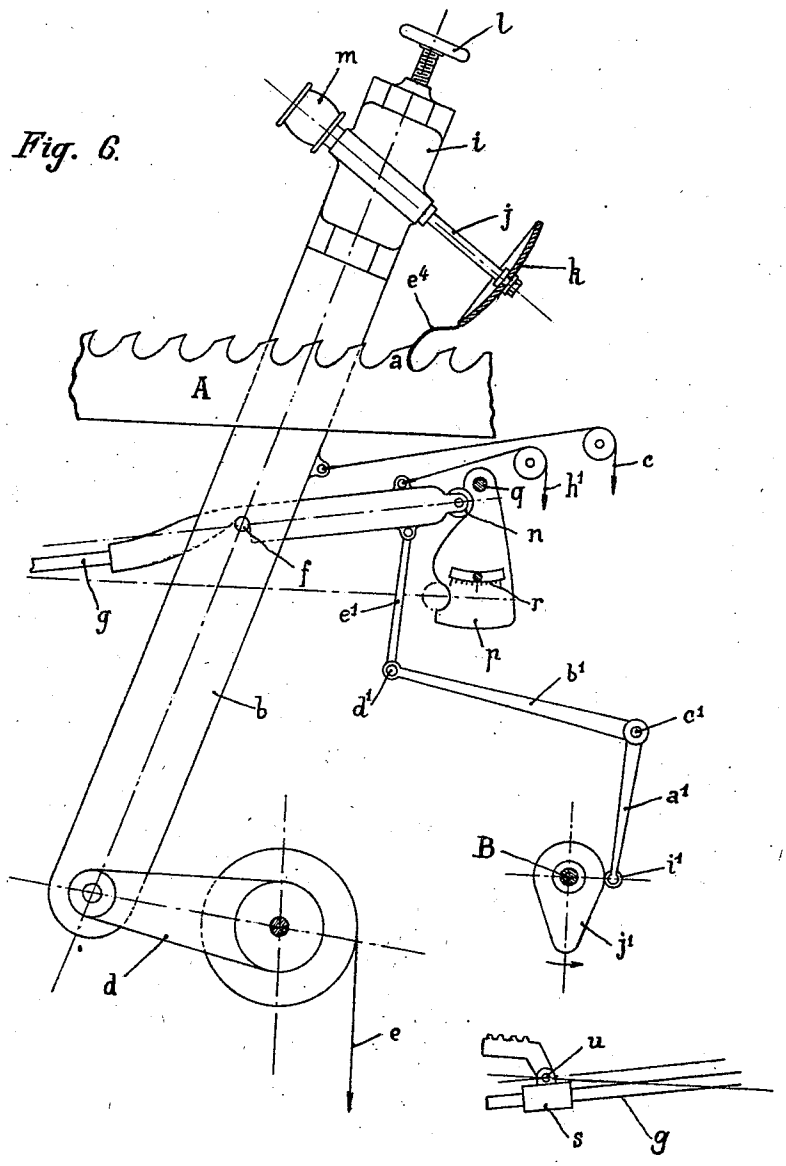
1,453,765

AUTOMATIC MACHINE FOR GRINDING THE SAW BLADES WITH REVOLVING GRINDING WHEELS

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Fig. 6.



Inventor
Anatole Octave.
By Cameron & Kerr
Atty.

May 1, 1923.

A. OCTAVE

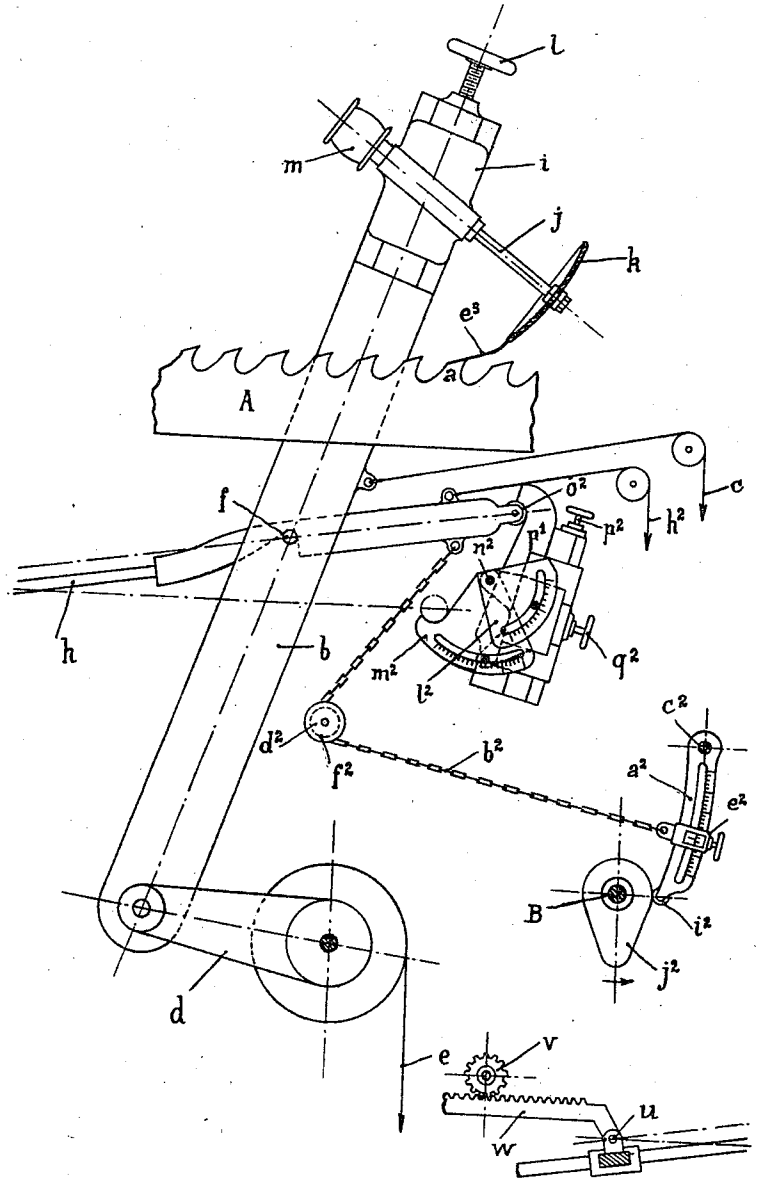
1,453,765

AUTOMATIC MACHINE FOR GRINDING THE SAW BLADES WITH REVOLVING GRINDING WHEELS

Filed March 30, 1921

6 Sheets-Sheet 6

Fig. 7



Inventor.
Anatole Octave
By Henry Orth & Co
Atty

Patented May 1, 1923. 1,453,765

UNITED STATES PATENT OFFICE.

ANATOLE OCTAVE, OF HERBLAY, FRANCE.

AUTOMATIC MACHINE FOR GRINDING THE SAW BLADES WITH REVOLVING GRINDING WHEELS.

Application filed March 30, 1921. Serial No. 456,980.

To all whom it may concern:

Be it known that I, ANATOLE OCTAVE, a citizen of the Republic of France, residing in Herblay, Seine-et-Oise, France, have invented certain new and useful Improvements in Automatic Machines for Grinding the Saw Blades with Revolving Grinding Wheels, for which I have applied in France, January 13, 1920, No, 508,396; 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, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

This invention has for its object an automatic machine for grinding the saw-blades with revolving emery wheels, of which the essential features are the following:

(*a*) The form of the tooth is independent of the form of the wheel (or disk), that is to say, a suitable adjustment allows the grinding, by the same wheel, without altering its profile, of a series of saw-blades, the teeth of which would have different profiles;

(*b*) The machine grinds the upperside and the underside, of the same tooth, without displacing the saw-blade.

These conditions are not satisfied in the saw-grinding machines hithereto known, and in which it is first necessary to profile the wheel (or disk) before sharpening the saw, according to the teeth of the saw to be ground, and, second such a wheel does not grind the underside and the upperside of the same tooth without necessitating a displacement of the saw-blade.

In order to attain these conditions, the displacement or automatic movement of the wheel-carrying frame for the grinding of the underside and the upperside of the same tooth of the saw, is obtained by means of two separate and independent rods, one end of each of which follows a former (or jig) the forms of which are adjustable—while the other end of the rod slides freely in a sleeve oscillating on a point, the position of which is adjusted with reference to the dimensions and the desired form of the teeth.

Besides these features, the machine of the invention comprises a special device for feeding or advancing the tooth to be ground or sharpened, and another device for automatically and instantaneously taking up the back lash or play or clearance of all the parts or elements, this being obtained by suitable counterweights.

In the accompanying drawings, given by way of example:

Figs. 1, 2 and 3 show diagrammatically a side view, a front view and a plan-view of the essential parts of a machine according to the invention.

Fig. 4 shows, to a larger scale, the path followed by the grinding or sharpening wheel, for the grinding of the underside and of the upperside of the same tooth without displacing the saw-blade.

Fig. 5 shows the mechanism for feeding the tooth which is to be ground.

Fig. 6 shows the mechanism which becomes operative for grinding the underside of the tooth.

Fig. 7 shows the mechanism which becomes operative for grinding the upperside of the tooth the underside of which has just been ground.

Fig. 7ª is an enlarged detail view, partly in section, of an adjusting mechanism shown in Fig. 7.

Fig. 8 is a detail plan-view, showing the sliding mounting of the ends of the independent levers which alternately displace the frame of the grinding-wheel.

Fig. 9 is a front view of the 3 cams shaft controlling respectively the feeding of the tooth which is to be ground, the grinding or sharpening of the underside of the tooth and the grinding of the upperside of the same tooth.

Fig. 10 is a side view of Fig. 9.

The machine which is the object of this invention is based on the following principle, which will be explained with regard to Fig. 4.

The to-and-fro path $o\ o^1\ o$ (diagrammatically shown by the arrows, Fig. 4) is the one followed by the wheel—during its work of grinding the underside of the tooth; the curvature of said line $o\ o^1\ o$ may be more or less pronounced or intensified according to necessity, by means of an adjusting device (displacement of the oscillating center of the levers). The position of the point o^1 at the bottom of the tooth a is invariable (or unchangeable) whatever

may be the pitch or space apart of the teeth, their dimensions and their forms, and the height of the saw-knife, too; o^1 is the point of maximum downward movement of the wheel which comes close to the upperside of the gripping jaws of the apparatus holding the saw-blade during the work.

The to-and-fro line $o\ t\ x\ y$ (as indicated by the arrows, Fig. 4) is the stroke or path followed by the wheel during its movement of grinding the upperside of the tooth a.

From this figure, it will be understood that the wheel will work on the whole path $o^1\ t\ x\ y$. By varying the position of the line $t\ x$ with regard to the bottom of the tooth, that is to say with regard to the ideal line $o^1\ y$, it will be possible to grind or sharpen teeth having different heights (by modifying the shape of the corresponding former); moreover, the point o^1 being fixed, if the distance between the latter point and the point y is modified, this will enable the sharpening of teeth having different interdental spaces (by varying the extent of the stroke of the lever, which corresponds to the grinding of the upper side of the tooth). It will thus be understood that:

(a) The length of the stroke of the end of the lever, which is in contact with the former for the grinding of the underside of the tooth, is always the same;

(b) The length of the stroke of the end of the lever which controls the displacement of the frame carrying the wheel for the grinding of the upperside of the same tooth, is variable according to the distance (or space) and the height of the teeth.

It is the same for the lever controlling the pressure pitman or pusher of the saw, that is to say the device feeding the tooth which is to be sharpened; said pitman must always bring to the point o^1 the bottom of the pushed tooth, that is to say to the point of maximum down-stroke of the wheel; the stroke of the pitman will thus be variable according to the interdental spaces.

Referring to the drawing, the machine for sharpening saw-blades comprises a frame b carrying the wheel and poised by a counterweight c. This frame oscillates on the end of a lever d which is itself poised by another counterweight e; the frame is heavy in order to absorb and avoid any vibration during the work. The counterweights c, e yieldingly poise the frame carrying the wheel, and also always maintain or support the latter at its upper position.

In the frame b is provided, at its upper part, a pin or trunnion f, with which engages the lever g (which causes the displacement of the frame b for grinding the underside of the tooth) and the rod h (which causes the displacement of the frame b for grinding the upperside of the same tooth).

At the upper end, the frame b carries an adjustable saddle or slide i, which serves as support, for the shaft j, of the wheel k. The adjustment is made by means of the small hand-wheel l; this adjustment in height has for its object to compensate the wear of the wheel and to adjust the engagement of the latter at the bottom of the tooth.

In known manner, the shaft j has a pulley m serving to rotate the grinding-wheel; moreover, the grinding-wheel may be electrically driven.

Referring to Fig. 5, which shows diagrammatically the feeding device of the tooth which is to be ground, said device comprises a pawl 1 mounted at the end of a lever 2 oscillating at 3, and whose other end 4 is pivoted on a link 5; this link has its end 6 movable and adjustable in position along a graduated sector 7 whose center is the point 4, and pivoted at 8; the end 9 of the sector 7 is moved by a cam 10. It will be understood that, according to the position of the end 6 along the sector 7, the extent of the stroke of the lever 2 will be modified. By bringing said end 6 nearer to the pivot-point 8, the extent of the stroke of the lever 2, and consequently that of the pusher 1, will be decreased, and this corresponds to a small space of the teeth of the saw; in the case of a saw with teeth having larger spaces between them, it will be necessary to move the end 6 of the lever 5 nearer to the point 9. The pawl or pusher designated by the numeral 1 is pivoted on a small wheel 11 carried on the end of the lever 2, and that may be moved by means of the worm-wheel 12, so as so change or modify slightly the feeding or forward motion of the saw in order that the latter be touched by the grinding-wheel with an amount exactly sufficient for a good sharpening.

The lever 2 is also yieldingly poised by a counter-weight 13 which tends to move the pusher 1 again backwards; the saw A being in the position shown in Figs. 5 and 6, the grinding of the underside of the tooth will take place. For this purpose, the lever g which seizes the pin f of the frame b carrying the wheel, is terminated by a roller n which rolls along a former p; the latter may be fixed or pivoted at q and adjustable in position by means of a graduated sector r. The other end of the lever, which has the form of a bar or rod, slides freely in a sleeve s which is solid with a sleeve t in which slides the end, forming a bar, of the lever h. The double sleeve $s\ t$ can pivot on the point u and thus forms the common axis of oscillation of the levers $g\ h$. The position of this axis u is adjustable, for instance by means of a pinion v (Fig. 8), meshing with a rack w, the end of which carries the axis u of oscillation on which pivot the double sleeve $s\ t$.

The motion of the lever g is obtained by a non-adjustable levers control device, comprising a bell-crank lever a^1 b^1 pivoted at c^1, the end d^1 of the lever b^1 being pivoted on a small rod e^1, the other end of which is pivoted on the lever g. The lever a^1 carries at its end a roller i^1 which contacts with a cam j^1 mounted on the shaft B which also carries the aforesaid cam 10. Finally, the lever g is poised by a counterweight h^1.

The position of the pivot-point u is indicated by a cone or centre-punch on a graduated rule. The dimensions of the teeth and their hook determine the position of said point u. The nearer the centre of oscillation will be to the trunnion f, the smaller is the tooth which also will be more hooked; the farther it will be, the greater will be the tooth which also will be less hooked; in short, it will more nearly approach the form of the former p.

The position of said pivot-point u thus determines the type of teeth that is to be obtained, in combination with the position of the contact-former (former p for the lever g, and former p^1 for the lever h, as will be explained hereafter).

As will be understood, the rod g is actuated by the pivoted bell-crank a^1 b^1 c^1, which is not especially adjustable; the stroke of the lever is thus always the same, whatever may be the dimensions of the teeth desired, said dimensions being determined by the position of the pivot-point u. When the cam j^1 is turned one-third of revolution, the grinding-wheel k has followed the to-and-fro path shown at e^4 (Fig. 6), or at o t o^1 t o (Fig. 4).

The rod h which causes the motion of the frame b of the wheel for the grinding of the upperside of the tooth—the underside of which has been previously ground is exactly similar to the lever g, and is placed beside the latter; said lever acts on the same pin f of the frame b and carries at its end a roller o^2 which rolls on the former p^1, the form of which may be varied according to the height of the saw-tooth, and the inclination of the upperside and the back of the tooth, as will be hereafter explained. The rod h, which is under the action of a counterweight h^2, is moved by means of a chain b^2 turning around the fixed pulley d^2, and the end e^2 of which may be moved along a graduated sector a^2, which has for its center the point f^2 and which pivots at c^2. The end of the sector a^2, opposed to c^2, carries a roller i^2 which contacts with a cam j^2 mounted on the shaft B which already carried the cams 10 and j^1, the angular displacement of said three cams 10, j^1 and j^2, one with respect to the others, may be 120°. Referring to Fig. 9, contrarily to what takes place for the stroke of the lever g, the length of the stroke of the end o^2 of the lever h is variable according to the space of the teeth of the saw which is to be ground, and consequently according to the length of the upper side of the teeth to be ground; this variable stroke is obtained by moving the attaching-point e^2 along the graduated sector a^2. The nearer said point e^2 will be to the center of oscillation c^2, the smaller will be the stroke of the end o^2 of the lever h; that is to say, in case of saws with teeth slightly spaced, the point e^2 will be brought near the point c^2 and inversely, with teeth largely spaced, the point e^2 will be brought nearer to the end i^2 of the graduated sector a^2. The former, upon which rolls the roller o^2 of the lever h, comprises a fixed part p^1 (Fig. 7) on which is mounted a group of two sectors l^2 m^2 provided with graduations and pivoted at n^2 one with respect to the other; said group of two sectors l^2 m^2 may be moved upwards by a small screw p^2, and this allows the adjusting of the engagement of the grinding-wheel on the upper side of the tooth; in fact, the greater the sector l^2 will be lifted, the sooner the wheel contacts with the tooth which is to be ground.

Moreover, the group of two sectors l^2 m^2 may be moved transversely with respect to the fixed part p^1 by means of the small hand-wheel q^2, so as to allow the adjusting in accordance with the length of the upper-side of the tooth. Finally, by pivoting or turning the sectors l^2 m^2 one with respect to the other, it is possible to vary the inclinations corresponding to the upperside of the tooth (sector l^2) and to the back of the tooth (sector m^2) unto a straight line. As observed, in Fig. 7, when the roller o^2 rolls upon the sector m^2, the frame b and with it the wheel k will move so as to grind the back of the tooth. By varying the inclination of the sector m^2, one varies the inclination of the back of the tooth. The same is true for the sector l^2 upon which the roller o^2 is caused to roll, this affecting the movement of the frame b and the corresponding wheel k above the tooth. When the faces of the sectors m^2 and l^2 cooperating with the roller o^2 are in line with each other, or upon a straight line, the wheel k moves in a straight line, and the back and top of the tooth are also in line with each other, which corresponds to the grinding of saw teeth of triangular shape.

With this in view, the grinding of the saw is as follows: the pusher pushes the tooth a which is to be ground, exactly in its position, and moves back in order to seize a new tooth; this forward and backward motion of the pusher is obtained by means of the cam 10 acting through the oscillating sector 7 and through the lever 5 acting on the lever 2 pivoted at 3 (Fig. 5); when the shaft B has turned a third of a revolution, the cam j^1 causes the motion

of the roller i^1, and consequently that of the bell-crank a' b' c' controlling the grinding of the underside of the tooth. The rod g being moved downwards, drives the frame b of the wheel, and said wheel goes down along the path e^4 (Fig. 6) corresponding to the path o t o^1 (Fig. 4), grinds the underside of the tooth and goes up again to its position shown in Fig. 6. During this time the rod h has not moved, because it has been maintained by the counterweight h^2.

The to and fro motion of the wheel for the grinding of the underside of the tooth has taken place during a third of revolution of the shaft B; at the beginning of the third third of revolution, the cam j^2 acts, through the sector a^2 and the chain b^2, on the lever h. At the moment when the cam j^1 ceases to act upon the lever a^1, the cam j^2 begins to cause the pivoting of the sector a^2 whereby the lever h is lowered, and the roller o^2 of said lever will follow the outline p^1 in the downward direction. This motion corresponds to what is indicated in Fig. 4, by the arrows o t x y which are directed from right to left in Fig. 4.

During its motion, the rod h drives the frame and the grinding-wheel follows the path e^3 (Fig. 7) corresponding to the path o t x y (Fig. 4); then the grinding wheel comes again to its upper position (Fig. 7). During the latter motion, the lever g has not moved, being maintained by the counterweight h^1.

At the end of the complete revolution of the shaft B, all the mechanisms have come again at their initial position, and the cycle of the operations begins again, that is to say, the pusher 1 pushes then a new tooth, the upper and underside of which will be successively ground, as has been heretofore explained.

By means of the action of the counterweights, and particularly of the counterweights c e acting on the frame of the wheel, the force or effort to transmit takes place only during the down motion of the frame; said down motion being effected, the frame goes up again of itself, owing to the action of said counterweights. This disposition allows to dispense with slides, and also the clearances in the different motions; this gives an absolutely perfect grinding.

It is the same for the control rods g and h of the frame and of the lever of the pusher 1, which come at their initial positions, due to the action of the counterweights h^1 h^2 and 13, which act upon them.

The adjustment of the machine for a series of teeth necessitates the following operations:

(1.) The adjustment of the stroke of the pusher 1, according to the space of the teeth. For this purpose, the cone or center 6 is moved along the graduated sector 7, until it comes opposite the division corresponding to the distance or space of the teeth, indicated in millimeters.

(2.) The adjustment of the underside of teeth according to the height of the tooth and the hook. For this purpose, moving the pivot point u of the levers g h by bringing said center to the division corresponding to the height of the tooth in millimeters, then, if necessary, inclining more or less the former p according to the hook or the engagement of the tooth which is to be ground.

(3.) For the upperside of tooth, adjusting the stroke of the lever h according to the space of the teeth by moving the part e^2 along the graduation of the sector a^2, until it comes opposite the division corresponding in millimeters to the space of the teeth of the saw to be ground; then modifying the former p^1 according to the height of the tooth, and also according to the form of the upperside (line t x Fig. 4) and of the back (line x y Fig. 4) of the teeth to be ground; these adjustments are easy, owing to the graduated sectors.

This being done, adjusting the engagement of the grinding wheel in the bottom of the tooth, by bringing it down by means of the hand-wheel l, then adjusting more or less the pusher 1 by means of the worm-wheel 12, until the underside of the tooth is exactly touched by the grinding wheel to desired extent. During this adjustment, the shaft B is manually turned.

In order to adjust the engagement of the grinding wheel on the upper side of the teeth, it is sufficient to act on the knob or screw p^2 until said grinding wheel touches slightly the upperside of the tooth, the underside of which has been previously ground.

It is to be noted that the frame carrying the grinding wheel, is hollow, and that it is provided with a device for sucking the dust produced.

Obviously the hereinbefore described device may be modified without departing from the spirit of the invention and from a fair interpretation of the appended claims.

What I claim is:

1. A machine for automatically sharpening saws, which comprises a movable frame, a grinding wheel thereon, means to move said frame and wheel to cause the wheel to follow and grind the under side of a saw tooth, means to then move said frame and wheel to cause the latter to follow the contour of and grind the other side of said tooth and its end, and means to thereafter step the saw one tooth preparatory to grinding the next tooth, whereby said grinding is effected without shaping the grinding wheel to the contour to be ground.

2. A machine for automatically sharpening saws, which comprises a movable frame, a grinding wheel adjustably mounted in said frame, adjustable means to move said frame and wheel to cause the wheel to follow the contour of and grind the underside of a saw tooth, adjustable means to then move said frame and wheel to follow the contour of and grind the other side of said tooth and its end, and adjustable means to thereafter step the saw one tooth preparatory to grinding the next tooth.

3. A machine for automatically sharpening saws, which comprises a frame, a grinding wheel mounted thereon, an oscillating counterbalanced lever on which said frame is pivoted, two pivoted, independently slidable operating rods detachably engaging said frame, mechanism to actuate one of said rods to move said frame and cause said wheel to grind the underside of a saw tooth; mechanism to actuate the other rod to then move said frame and cause said wheel to grind the other side of said tooth and its end; and adjustable stepping mechanism to step the saw one tooth.

4. A machine for sharpening saws, which comprises a frame, a grinding wheel adjustably mounted thereon, a counterbalanced lever on which said frame is movably supported, two pivoted slidable actuating rods having detachable operative engagement with said frame, cam actuated operating mechanism for independently operating said rods, and a former against which one of said rods travels to move said frame and cause the wheel to grind the underside of a saw tooth, and a second former against which the other rod thereafter travels to cause the grinding of the other side of said tooth and its end.

5. In a saw sharpenning mechanism, the combination with a frame and a grinding wheel caried thereby; of a pivoted and slidable rod having operating engagement with said frame, a former against which said rod travels, yielding means to hold the rod in contact with said former and cam-operated mechanism for causing said rod to traverse said former.

6. In a saw sharpening mechanism, the combination with a frame, a grinding wheel carried thereby and a counter-balanced lever on which said frame is pivotally supported; of a pivoted and slidable rod, yielding means to hold said rod in operating connection with said frame, a former, yielding means to hold said rod in operative engagement with said former, and cam-operated mechanism to cause said rod to traverse the former.

7. In a saw sharpening mechanism, the combination with a frame, a grinding wheel carried thereby and a counter-balanced lever on which said frame is pivotally supported; of a pivoted and slidable rod, yielding means to hold said rod in operative connection with said frame, a former, yielding means to hold said rod in operative engagement with said former, cam-operated mechanism to cause said rod to traverse the former, means to move the pivot point of said rod to and from said frame and means to adjust the former for variation in contour of the portion of a saw-tooth to be ground.

8. In a saw-sharpening machine, the combination with a frame a counter-balanced lever on which said frame is supported and a grinding disc adjustably mounted in said frame; of a saw-stepping mechanism comprising a pivoted lever, an adjustable wheel at one end thereof, a tooth-engaging pawl pivoted to said wheel, a pivoted sector, a link connecting the other end of said lever and sector, and adjustable on said sector, and a cam for operating said sector.

In testimony that I claim the foregoing as my invention, I have signed my name.

ANATOLE OCTAVE.