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SAW TOOTH GRINDING MACHINE

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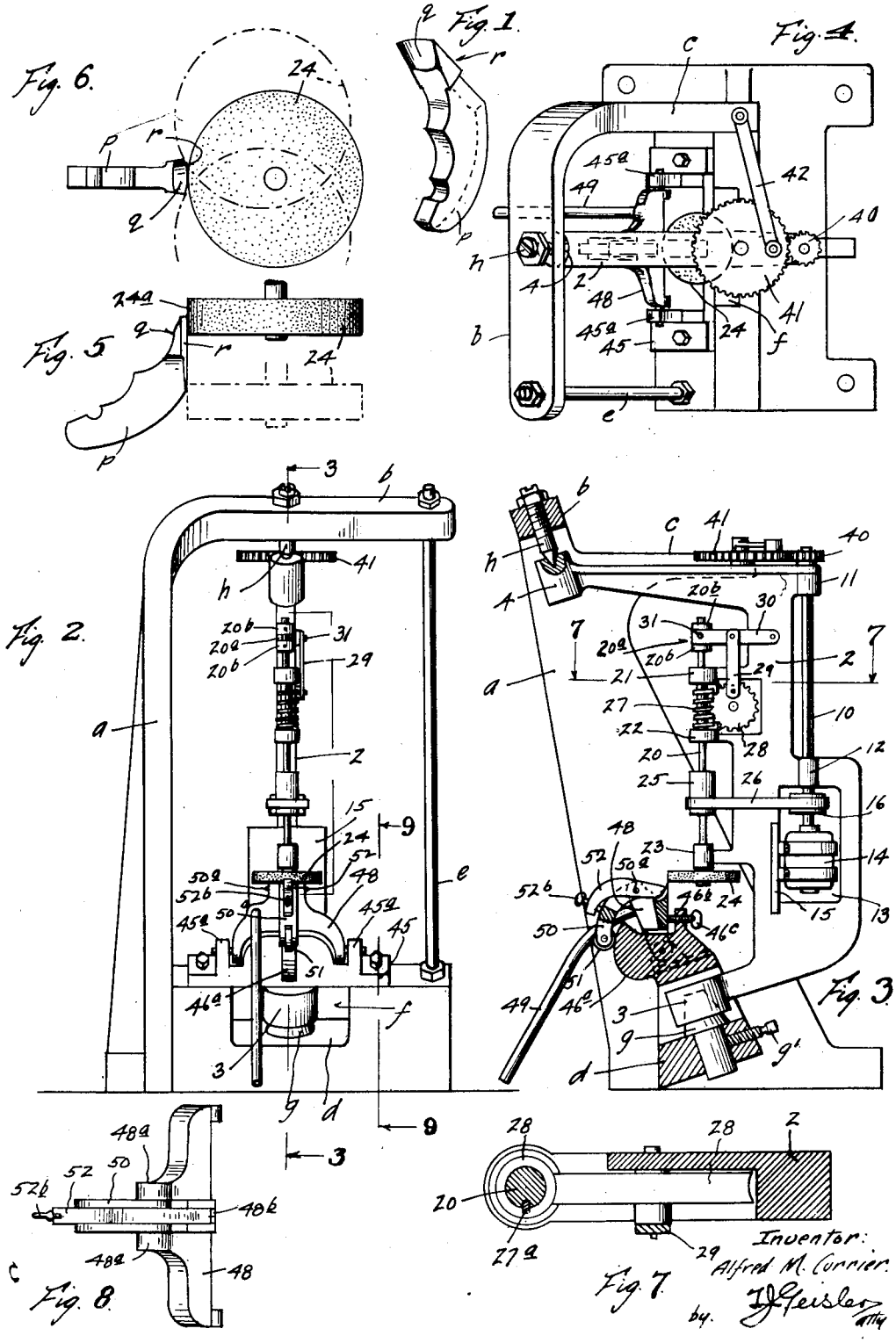

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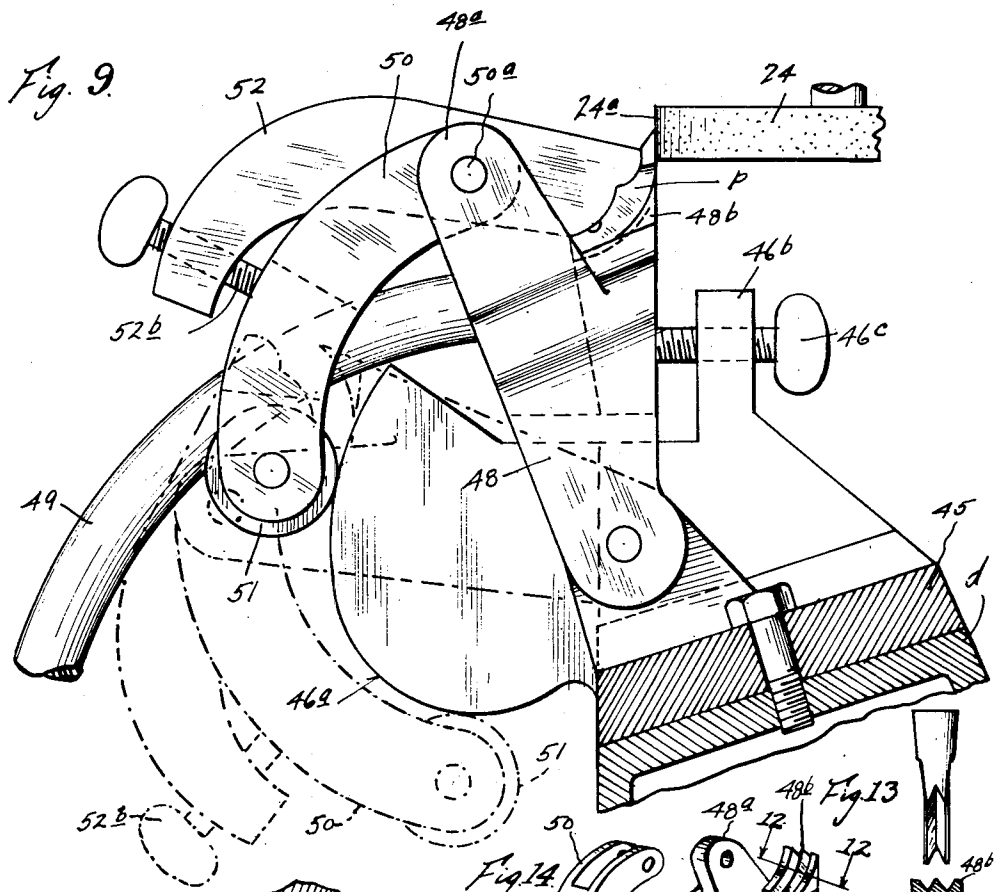

Fig. 10

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UNITED STATES PATENT OFFICE.

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SAW-TOOTH-GRINDING MACHINE.

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My invention relates to the removable teeth of circular saws, and especially to the hollow ground type of these saw-teeth and improved grinding machines therefor.

My improvement has for its purpose the producing of an improved hollow ground tooth.

The hollow ground saw-tooth now commonly in use has a flat or plane faced back, forming square edges with the sides of the tooth, the point of the tooth is beveled, and its inner or front face, is concaved so as to obtain sharp cutting edges at the sides of the tooth; the hollow face of the tooth describes a section of the lateral surface of a geometric cylinder whose axis lies in the longitudinal plane of the body of the saw-tooth but it is inclined towards and intersects the plane of the back of the saw-tooth. Hence, the intersection of said curved surfaces tends to be on a curved line at the point of the tooth, and to produce projecting points or horns of relatively thin portions of metal, soon broken down in service. This is especially the case since the cutting edges of saw teeth are commonly formed wider than their shanks in order to cut a kerf providing sufficient clearance for the saw.

One of the principal objects of my invention is to produce a hollow ground saw-tooth not having the said objectionable thin projecting points or horns at the corners of the cutting edges of the tooth.

Another object of my invention is to provide a simple, but efficient machine for grinding my said improved saw-tooth and with such phase of my invention, this application is particularly concerned.

In this connection a further and particular object of my invention is to provide a machine adapted so to grind the saw-tooth that when the grinding operation is completed the saw-tooth will represent a conic section taken along the axis of a cone with the base of the cone representing the cutting edge of the tooth.

My improved hollow ground saw-tooth and my grinding machine therefor are hereinafter described in detail with reference to the accompanying drawings.

In the drawings:

Fig. 1 shows a perspective view of the hollow ground saw-tooth to be ground;

Fig. 2 shows a front elevation of my grinding machine, adapted for grinding the convex backs of saw-teeth to conic sections and illustrates a saw-tooth clamped in place therein;

Fig. 3 shows a side elevation, partly in a section taken on the line 3—3 of Fig. 2, of my grinding machine, and illustrates the details of construction;

Fig. 4 shows a top plan view of my grinding machine;

Fig. 5 shows a fragmentary diagrammatic side view of the saw-tooth and grinder wheel, and illustrates their relative position, and by broken lines the longitudinal movement given to the grinder wheel in the operation of my machine;

Fig. 6 shows a similar view looking down on the saw-tooth and grinder wheel, and illustrates by broken lines the lateral movement given to the grinder wheel in the operation of my machine;

Fig. 7 shows a section taken on the line 7—7 of Fig. 3, looking in the direction of the arrows and illustrates further details of construction;

Fig. 8 shows a top plan view on a reduced scale of the saddle and clamping mechanism mounted thereon shown in Fig. 9;

Fig. 9 shows an enlarged section taken on the line 9—9 of Fig. 2, and illustrates the details of construction of the clamping mechanism of my machine for holding the saw-tooth in position;

Fig. 10 shows an enlarged fragmentary perspective view of the base of my grinding machine, and illustrates further details of its construction;

Fig. 11 shows in a reduced scale a perspective view partly in section of the saddle pivoted on the base of my machine as shown in Fig. 9, and on which the saw-tooth is clamped, and held in position for grinding;

Fig. 12 shows a section taken on the line 12—12 of Fig. 11;

Fig. 13 shows a rear elevation of the saw-tooth and illustrates the convex back and the formation of the shank;

Fig. 14 shows a perspective view on a reduced scale of the cam-arm shown in Fig. 9; and

Fig. 15 shows a similar perspective view of the clamping-arm shown in Fig. 9.

The saw-tooth comprises a shank p, a concave face q and a convex back r, and the intersection of the curved surfaces of the front and back form a more or less straight line which lies in the plane of the intersection of the curved surfaces.

My grinding machine adapted for grinding such teeth comprises an upright casting or post *a* curved at the top so as to form a horizontal arm *b*, and provided with another horizontal arm *c* projecting at right angles, to the arm *b* from just below the curved portion of the casting *a*.

A horizontal oblong base *d* is fixed at one end adjacent the bottom of the casting *a* and is arranged at an acute angle with the horizontal line of the bottom of the base, and is supported at its other end by a rod *e* bolted in the arm *b*, Fig. 2.

A recess *f* is centrally located in the base *d* and within said recess is provided a cone-shaped bearing pin *g*, perpendicular with said base and held in place by a set screw *g'*.

On the arm *b*, adjacent the curved portion of the casting *a* is provided a similar bearing pin *h*, arranged to be in alinement with a line perpendicular to said base through the bearing pin *g*.

A frame 2 is provided to be mounted at each end 3 and 4, on the bearing pins *g* and *h*, respectively, and is so formed that the main portion of the frame 2 will be held vertically.

A vertical shaft 10 is mounted in a journal 11 and 12 on the frame 2 and extends into a recess 13 formed in the frame in which is provided an electric motor 14 or other driving means bolted on a plate 15 fixed to the frame.

The shaft 10 is integral with the shaft of the motor 14 and is provided adjacent the motor with a pulley 16.

On the opposite side of the frame 2 another vertical shaft 20 is journaled at 21, 22 and 23 and is provided on its lower end with a cylindrical grinding wheel 24, and with a wide pulley 25 in horizontal alinement with the pulley 16 over which a belt 26 is arranged.

Between the journals 21 and 22 of the shaft 20 is provided a worm 27, mounted on the shaft 20 by a key 27^a, which allows the shaft to move longitudinally in the worm while rotating with it.

Adjacent the worm 27 and meshing with it, is provided a worm gear 28, and a link 29 is pivoted eccentrically on the worm gear 28 and pivotally connected to an arm 30 pivoted on the frame.

The other end of the arm 30 is provided with a pin 31, which engages a peripheral groove 20^a formed by two spaced collars 20^b fixed to the upper end of the shaft 20, and by this construction the shaft will rotate independently of the arm 30, but will be raised and lowered by each rotation of the gear 28, lifting the arm 30 by means of the link 29.

To the upper end of the shaft 10 is fixed a pinion gear 40 which meshes with a gear 41 and a rod 42 is eccentrically pivoted at one end to said gear, and at the other end to the arm *c* of the casting *a*.

A plate 45 is arranged over the recess *f* in the base *d* and is provided with spaced upstanding lugs 45^a and between the lugs is formed an upstanding portion 46, Figs. 9 and 10, one side of which is extended to form a spiral cam-surface 46^a, and on the opposite side of the portion 46 is provided another upstanding lug 46^b in which a set screw 46^c is threaded.

A saddle 48 is rotatably journaled at each end in the lugs 45^a by means of suitable pins, and is provided with an operating handle 49, and with two spaced upstanding lugs 48^a in which a cam-lever 50, forked at each end is pivoted at one end by a pin 50^a between the said lugs. The portion of the saddle between the lugs is cut away as at 48^b and formed to receive the back of the shank of the saw-tooth which is commonly formed with a V-shaped groove, Figs. 11, 12 and 13.

The other end of the cam-lever 50 is provided with a roller 51 which bears against the cam-surface 46^a of the portion 46 of the plate 45. An overlapping curved clamping lever 52 is pivoted on the pin 50^a between the forked end of the cam-lever 50, and is provided with a set screw 52^b at one end, bearing against the cam arm 50 and its other end is shaped so as to conform to the inner side of the shank of a saw-tooth, Fig. 1, 9 and 15, and thus is adapted to hold a saw-tooth firmly clamped against the portion 48^b, when the saddle is raised, and when the saddle is rotated by the lever 49, the roller of the cam-arm 50 moves over the spiral cam 46^a, and raises the clamping arm 52, which releases the saw-tooth so it may be lifted out, and another inserted.

The set screws 46^c and 52^b provide adjustment of the clamping means to different sizes of saw-teeth.

The saw-tooth is clamped in place with the back of the saw-tooth held vertically against the cylindrical face 24^a of the grinding wheel 24, Figs. 5, 6 and 9.

The method of grinding the backs of hollow ground saw-teeth convex and the operation of my grinding machine is as follows:

Since all saw-teeth are commonly formed with the cutting edges wider than the shank of the tooth in order that the teeth will cut a kerf enough wider than the saw to provide sufficient clearance for the saw, I grind the backs of my saw-teeth convex in such a manner as to maintain the curvature of the back of the saw-tooth, relatively with the decreasing thickness of the shank, that is, in a conic section, the base of which is the cutting edge of the saw tooth.

The saw-tooth is clamped in place in my saw grinder as heretofore described and the motor 14 will drive the shaft 20 and the grinding wheel 24. The worm 27, mounted on the shaft 20, and a key 27^a drives the worm gear 28 which transmits a vertical movement to the arm 30, through the link 29, and the

arm 30, being connected to the upper end of the shaft 20 by a pin 31, raises and lowers the said shaft, imparting a longitudinal movement to the grinding wheel as it works on the saw-tooth.

At the same time, the pinion gear 40 drives the gear 41 on which is eccentrically pivoted the rod 42 which is pivoted to the arm *c* of the casting *a*, and by this construction the frame 2 is given a horizontal reciprocating movement, describing segments of a circle.

And by the combined horizontal and vertical movements of the grinding wheel and since the shaft 20 is arranged at an angle to the axis of rotation of the frame 2, the grinding wheel at the point at which it works on the saw-tooth will describe segments of an increasing smaller circle as it moves downward towards the vertex of the angle formed by the shaft 20 and the axis of rotation of the frame 2.

By this construction, I grind the backs of hollow ground saw-teeth, to conic sections without interfering with the width of the cutting edge of the saw-tooth and at the same time eliminating the thin corners or horns formed on the type of hollow ground teeth, in present use, that is, I grind my improved saw-tooth so that the cutting edge is more or less a straight line formed by two curved concentric surfaces intersecting in a plane touching the cutting edge of the saw-tooth.

I claim:

1. A saw-tooth grinding machine, comprising a frame, a bracket pivoted therein, a motor, means connected with the motor for swinging said bracket laterally, a shaft journaled in said bracket and driven by said motor, a grinding-wheel carried by said shaft, means for moving the said shaft relatively lineally, and means for clamping a saw-tooth on the frame positioned relatively to the grinding-wheel.

2. A saw-tooth grinding machine, comprising a frame, a bracket pivoted therein on an oblique axis, a motor, means connected with the motor for swinging said bracket laterally, a shaft journaled in said bracket and driven by said motor, a grinding-wheel carried by said shaft, means for moving the said shaft relatively lineally, and means for clamping a saw-tooth on the frame positioned relatively to the grinding-wheel.

3. A saw-tooth grinding machine, comprising a frame, a bracket pivoted therein on an oblique axis, a motor, means connected with the motor for swinging said bracket laterally, a shaft journaled in said bracket and driven by said motor, a grinding-wheel carried by said shaft, a worm mounted relatively slidable on said shaft, a worm gear journaled in the bracket, meshing with said worm, and a rocker-arm pivoted on the bracket and connected at one end with said shaft, and a link connecting the worm gear with said rocker arm whereby the said shaft is reciprocated vertically.

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