(No Model.) 4 Sheets—Sheet 1.

J. ROBISON.

MACHINE FOR SAWING METAL.

No. 423,278. Patented Mar. 11, 1890.

FIG. 1.

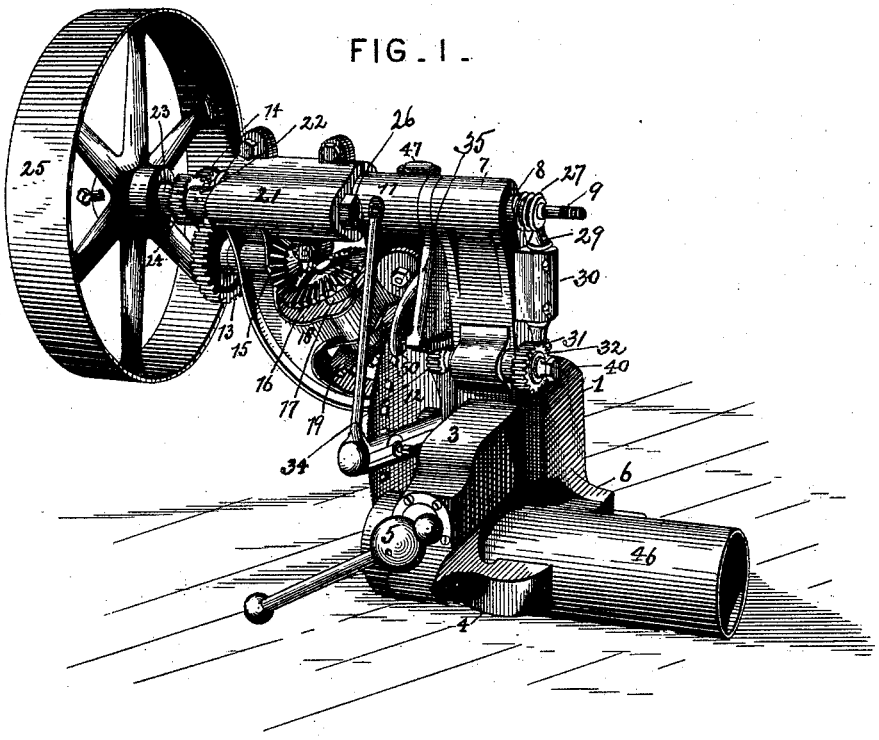
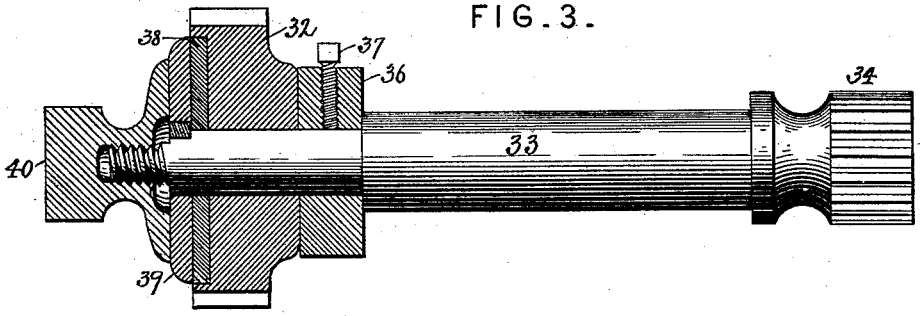


FIG. 3.



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(No Model.) 4 Sheets—Sheet 2.

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FIG. 2.

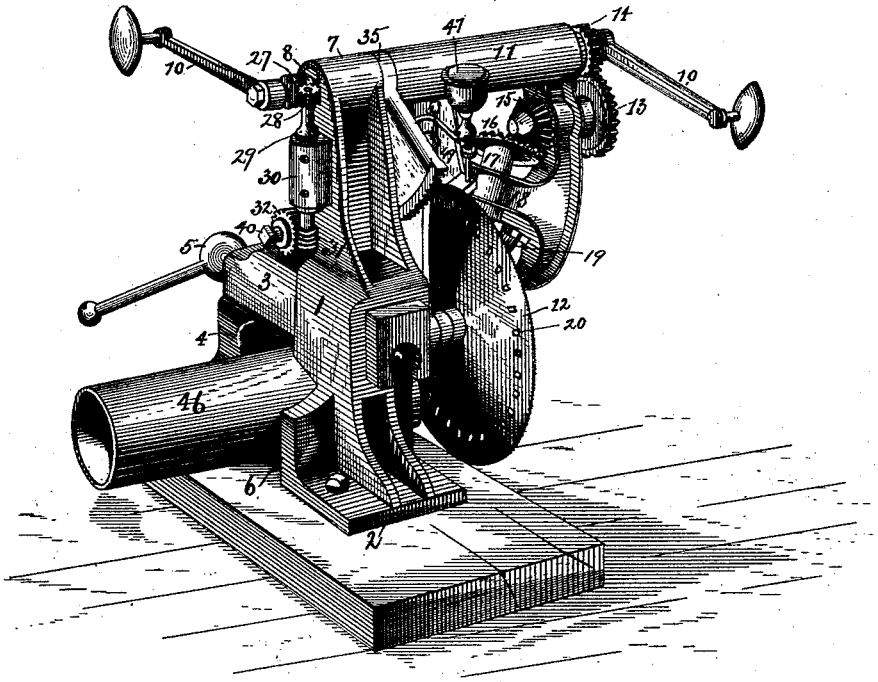


FIG. 4.

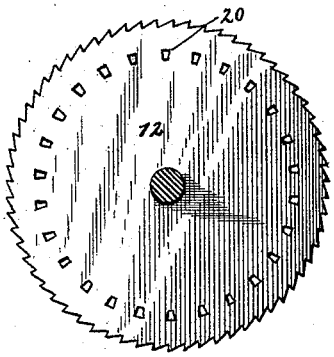
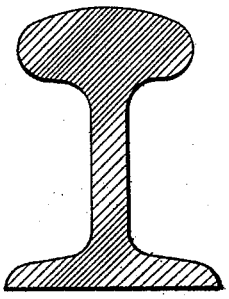


FIG. 5.



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(No Model.) 4 Sheets—Sheet 3.

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MACHINE FOR SAWING METAL.

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Fig. 6.

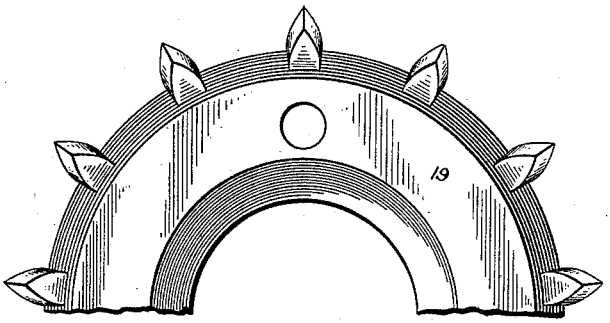
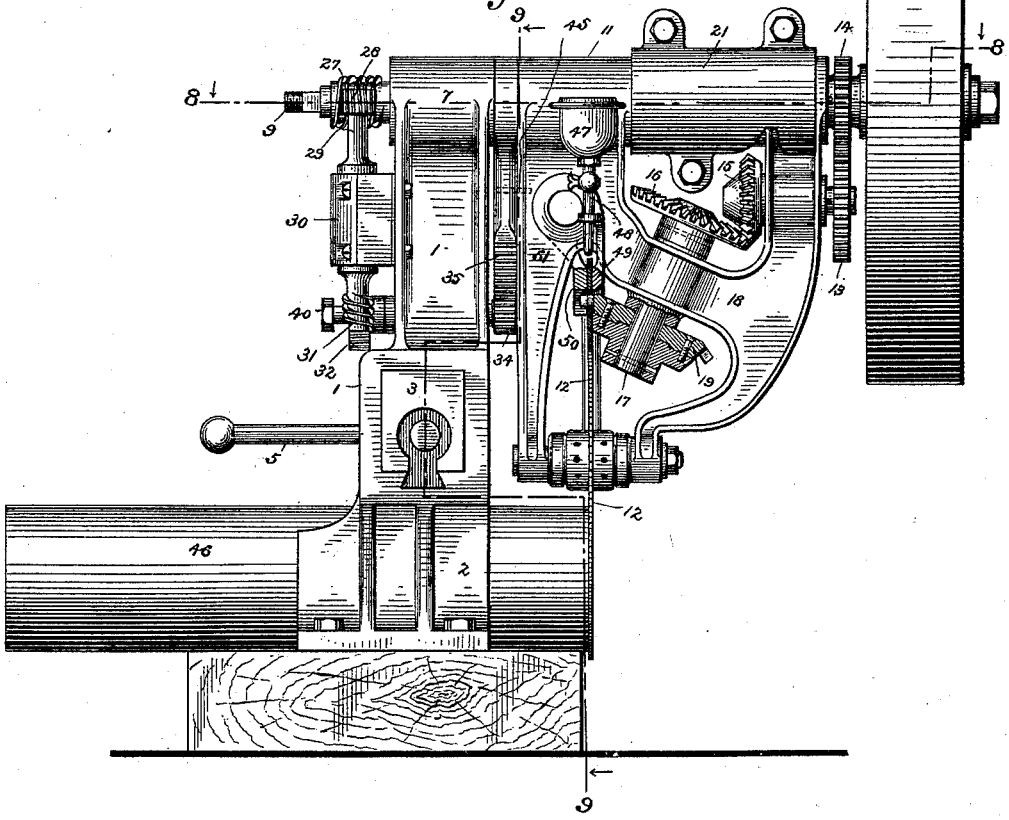


Fig. 7.



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(No Model.) 4 Sheets—Sheet 4.

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MACHINE FOR SAWING METAL.

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Fig. 8.

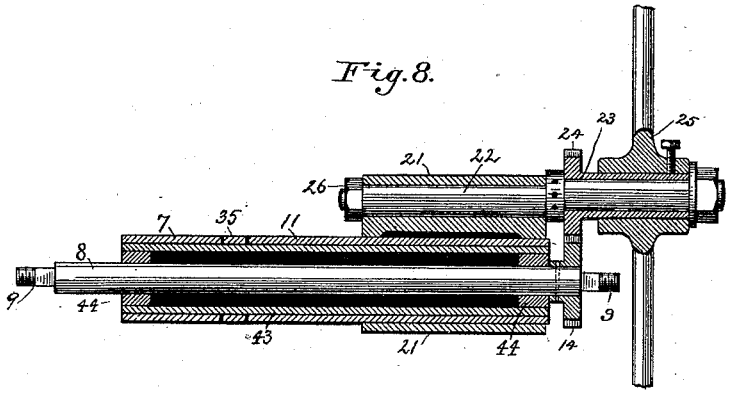
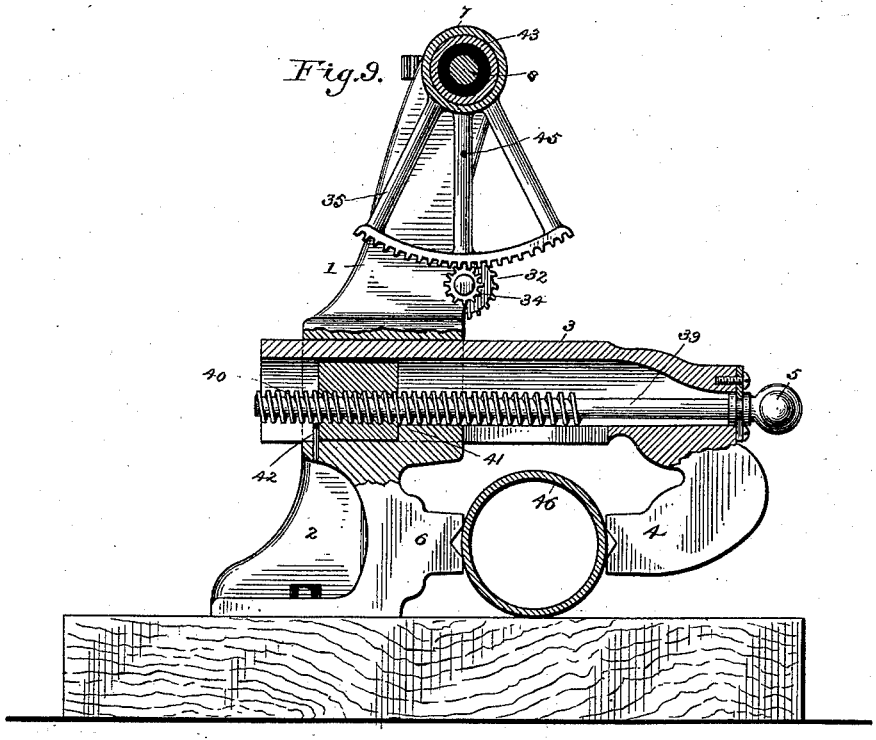


Fig. 9.



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UNITED STATES PATENT OFFICE.

JOSEPH ROBISON, OF GREENBUSH, ASSIGNOR TO ROBERT J. PRATT, OF GREENBUSH HEIGHTS, NEW YORK.

MACHINE FOR SAWING METAL.

SPECIFICATION forming part of Letters Patent No. 423,278, dated March 11, 1890.

Application filed September 11, 1889. Serial No. 323,592. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH ROBISON, a citizen of the United States, residing at Greenbush, in the county of Rennselaer and State of New York, have invented certain new and useful Improvements in Machines for Sawing Metal; and I do hereby declare the following to be a full, clear, and exactdescription of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to certain new and useful improvements in machines for sawing railway-rails, metal bars, pipes, and the like.

The machine, as illustrated in the drawings, is of that general type wherein the saw which performs the cutting operation is provided near its periphery with a series of holes or apertures equidistant from each other and from the center of rotation, so as to receive and intermesh with the driving-teeth of cog-gearing driven from a suitable source of power.

In such machines as heretofore constructed the holes or apertures referred to have been elliptical or otherwise symmetrical in contour, and the cog-teeth entering the ellipses have been of corresponding regularity and located in a plane at right angles to the saw-blade. This construction is attended with the disadvantage that the entire strain of the sawing operation is practically thrown upon a single tooth and at a single point of the saw, and, further, that the power exerted is not in the line of greatest resistance, but at an angle thereto—considerations which weaken the machine and lessen its effective action for a given power exerted. To obviate these defects, I have made the sides of the saw-blade apertures radial to the center of the saw and the intermeshing cog-teeth involute and have inclined the axis of the cog-wheel shaft, so as to make it point to the center of rotation, thereby distributing the strain upon the teeth and saw and fully utilizing the transmitted power. Incident to these changes I have also simplified the power-transmitting gearing and have strengthened and made more compact the main frame-work, besides adapting the machine to be readily transformed either into a power-machine for shop-work or a hand-machine for outside uses.

In the class of machines to which my invention belongs the saw-blade is mounted in a movable or swinging frame connected by intermediate gearing with the power-shaft, so that said frame and saw-blade may be swung or fed forward toward the work as the cutting operation continues. The feed mechanism has heretofore been so arranged as to make the feed constant and uniform for a given number of revolutions of the power-shaft, the saw-blade when cutting material of varying thickness (as, for instance, a railway-rail) being compelled to cut with the same rapidity through the thickest portion as through the thinnest portion thereof. As a given source of power to be used most economically should be drawn upon uniformly, these disproportionate demands upon it are of great disadvantage. If the machine be driven by hand, the operator becomes unduly fatigued in making the deepest part of the cut, the feed being too fast, while on the other hand the work required in making the lighter parts of the cut is not sufficient to employ his full powers, and the feed at that time is consequently too slow. Where the machine is driven from an artificial source of power, it is of course evident that the feed cannot at any time exceed in rapidity that admissible in making the deepest part of the cut, and that in making the lighter cuts the machine is not working up to its full capabilities.

My invention is designed to obviate the disadvantages referred to by employing feed mechanism of such construction as to compensate automatically for the varying thickness of the material operated upon, so that with a given source of power the saw will be fed forward at a rate strictly proportionate to the work to be performed, the arrangement being such that the feed mechanism, set for a normal rate of progression appropriate to the lesser depths of cut, will permit sufficient slip as the saw reaches the deeper parts to enable it to pass through the latter more slowly and to again automatically resume the normal speed thereafter.

My invention further relates to an im-

proved construction of gripping-jaws at the base of the main frame-work, whereby the material to be cut may be held in place, or if itself stationary may support the machine in position.

In the accompanying drawings, Figure 1 represents, in perspective, my machine as adapted to operate by power. Fig. 2 represents, also in perspective, a view of the machine without the power attachment and adapted to be operated by hand. Fig. 3 represents, in side elevation and partial section, an enlarged view of the feed mechanism. Fig. 4 represents, in elevation, the improved form of the apertures whereby the saw is driven; and Fig. 5 represents, substantially graphically, the relative rate of feed in cutting, with the machine as shown, through a railway-rail. Fig. 6 represents, on a larger scale, a bottom plan view of a portion of the saw-operating cog-wheel. Fig. 7 represents a side elevation of the entire machine. Fig. 8 represents a section taken on a plane indicated by the line 8 8 of Fig. 7, and Fig. 9 represents a section taken on a plane indicated by the line 9 9 of Fig. 7.

Similar numerals of reference indicate similar parts throughout the several views.

The main frame of the machine consists of a stout standard or pedestal 1 of cast-iron, suitably strengthened by ribs, as shown, and having a basal portion 2, provided with screw-holes, whereby the machine may be set up for shop use. At its middle portion the pedestal is cast hollow for the reception of the body portion 3 of a movable jaw 4, adapted to be operated by the vise-screw 39 and lever 5, so as to clamp the object to be sawed between it and a fixed jaw formed by the shoulder 6 integral with the pedestal. The vise-screw 39 passes through an internally-screw-threaded block 40, held in place within the hollowed-out portion of the pedestal in any convenient manner—for instance, by the shoulder 41 and pin 42. By means of this arrangement the machine can grip pieces of metal of various shapes and sizes, or may be clamped to a stationary object—such as a track-rail or pipe-line—so as to be sustained thereby while cutting through the same.

In the upper portion 7 of the pedestal is mounted an arbor or shaft 8, extending outwardly on both sides of the pedestal and terminating in screw-threaded ends, as 9, Figs. 1, 7, and 8, for the reception of the removable operating-handles 10, Fig. 2.

Upon a stationary sleeve 43, which contains the bearings 44 for the shaft 8, is mounted loosely a hollow sleeve 11, forming an oscillatory bearing for the swinging frame which supports the saw 12. In the outer portion of the swinging frame is mounted a revoluble gudgeon, upon which are fixed the straight gear 13, intermeshing with a like gear 14, fixed upon the shaft 8, and a bevel-gear 15. The latter intermeshes with a crown-gear 16, fixed to the upper end of a shaft 17, supported in bearings in a cross-piece 18, forming a part of the swinging saw-frame.

At the lower extremity of the shaft 17 is fixed the cog-wheel 19, having involute teeth intermeshing with apertures or holes 20 near the periphery of the saw 12, which is mounted to revolve freely in the swinging frame, as shown. It will be noted that the axis of the shaft 17 is in a direction pointing toward the center of rotation of the saw, and that the sides of the teeth 20 are likewise radial thereto. This arrangement and construction, in connection with the involute form of the teeth of the driving-cog 19, enables the power to be applied to the driving of the saw with the greatest advantage and with the minimum strain upon the material of the saw, while the resistant strength of the teeth is greatly increased by their shape and the manner in which they enter the apertures 20.

In Figs. 1, 7, and 9 I have illustrated a simple and efficacious way of adapting the hand-machine (shown in Fig. 2) to be driven by power. In carrying out this part of my invention I employ a two-part clip 21, provided with ears or lugs, as shown, whereby it may be bolted and clamped firmly upon the hollow sleeve 11, forming a part of the swinging frame. Within the clip is contained a stud 22, upon which is mounted loosely a sleeve 23, bearing the pulley 25, adapted to be fixed thereon, and the gear 24. The stud is eccentric, as shown, so that by turning said stud in its bearings within the clip the gear 24 may be made to mesh accurately with the gear 14 upon the driving-shaft 8, whereupon the stud is clamped against rotation by means of the end nut 26. (See Fig. 8.)

I will now describe the means whereby the saw is fed forward toward the work as the depth of the cut increases. Upon the inner end of the driving-shaft 8 is fixed the worm 27, meshing with a worm-gear 28, fixed upon the upper end of a vertical shaft 29, mounted in a bearing 30, attached to the side of the main casting 1. A worm 31 is formed on the lower end of the shaft 29 and meshes with a worm-gear 32, mounted loosely upon a horizontal shaft 33, revolving in bearings attached to the main casting and having at its opposite end a pinion 34, meshing with a quadrant 35, fastened to the swinging saw-frame by a pin 45, or otherwise. As shown more fully in Fig. 3, the loosely-mounted worm-gear 32 abuts against a collar 36, fixed upon the shaft 33 by the pin 37. The worm-gear 32 has also a circular recess on its outer face, within which circular recess fits a friction-disk 38, of leather, rubber, or other material. A metallic washer 39 is feathered upon the shaft 33, and outside of the washer is mounted upon the threaded end of the shaft a nut 40, which by being screwed up can be made to exert a greater or less pressure against the washer 39 and (through the friction-disk 38) against the worm-gear 32.

In Figs. 1, 2, 7, and 9 of the drawings the

vise-like base of the machine is shown as clamping a pipe 46.

The operation of this part of my invention is as follows: The driving-shaft 8 during the revolution of the saw 12 will transmit motion to the loose worm-gear 32 through the intermediacy of the worm 27, worm-gear 28, and worm 31. Driving-connection between the worm-gear 32 and the shaft 33 is established wholly by the friction devices at the end of said shaft. The nut 40 is screwed up, so as to exert pressure against the washer 39 and friction-disk 38, and consequently against the worm-gear 32, thereby establishing driving-connection between the pinion 32 and its shaft. The degree of this pressure can manifestly be regulated at the will of the operator. It is in general such that when the saw is making the lesser depths of cut the resistance offered by the material to its forward feed and to the revolution of the shaft 33 shall not be sufficient to affect the frictional connection between it and the worm-gear 32, so that for the said lesser cuts the swinging frame and saw will be fed forward toward the work at the normal speed due to the ratio of the gearing between the worm 27 and the segment 35. When, however, the saw enters the deeper portions of the cut, the shaft 33 meets with resistance, and the frictional connection not being sufficient to overcome this resistance, the worm-gear 32 will slip, thereby temporarily interrupting the revolution of the shaft 33. Consequently the forward feed of the swinging frame and its saw will be proportionately interrupted, although the saw's revolution remains constant. The saw will therefore progress more slowly through the deeper portions of the cut.

In Fig. 5 is roughly illustrated the manner in which the saw when hung in a swinging frame will cut through a railway-rail of the ordinary kind. The distances between the sectional lines in said figure indicate, respectively, the rapidity of feed of the saw in passing through the varying thicknesses of the cut, beginning at the upper left-hand corner of the head of the rail. It will be noted that in the beginning the feed is normal, but decreases as the distance through which the saw cuts increases, until the head is cut through. In passing through the web of the rail the feed becomes once more normal, decreasing again at the rail-foot, and once more increasing at the basal flanges.

A suitable cup 47, having a dependent tube 48, provided with a regulating-cock, as shown, may be employed to supply oil to the saw's periphery. It may conveniently be connected to one of two cheek-pieces 49 50, which serve the purpose of guiding the saw at the point where it passes the cog-wheel 19, so that it may not be deflected by the movement of the cog. These cheek-pieces are respectively on opposite sides of the periphery of the saw, and are fastened to the swinging frame by means of a bolt, as indicated at 51.

Having thus described my invention, what I claim is—

1. In a sawing-machine, the combination, with the saw having peripheral openings, of a cog-wheel meshing with said openings, the axis of the cog-wheel shaft being directed to the center of the saw and inclined to its plane, substantially as described.

2. In a sawing-machine, the combination, with the saw having peripheral openings, of a cog-wheel meshing with said openings, the teeth of said cog-wheel being involute, and the axis of the cog-wheel shaft being directed to the center of the saw and inclined to its plane, substantially as described.

3. In a sawing-machine, the combination, with the saw having peripheral openings, of a cog-wheel meshing with said openings, the teeth of said cog-wheel being involute, substantially as described.

4. In a sawing-machine, the combination, with the saw having peripheral openings whose sides are radial to the center of the saw, of a cog-wheel meshing with said openings, the teeth of said cog-wheel being involute, substantially as described.

5. In a sawing-machine, the combination, with the saw having peripheral openings whose sides are radial to the center of the saw, of a cog-wheel meshing with said openings, the teeth of said cog-wheel being involute, and the axis of the cog-wheel shaft being directed to the center of the saw and inclined to its plane, substantially as described.

6. In a sawing-machine, the combination, with the saw having peripheral openings and supported in a swinging-frame, of a cog-wheel meshing with said openings, the axis of the cog-wheel shaft being directed to the center of the saw and inclined to its plane, a crown-wheel upon the inner end of the said shaft, and a bevel-gear meshing with the crown-wheel and geared to the driving-shaft of the machine, substantially as described.

7. In a sawing-machine, the combination, with the main frame and the driving-shaft mounted in bearings therein, of the swinging saw-frame provided with a hollow sleeve portion mounted upon the driving-shaft, a clip adapted to be clamped to said hollow sleeve portion and containing a stud, a driving-pulley and cog mounted to revolve upon the stud, and a cog mounted upon the driving-shaft and meshing with the pulley-cog, substantially as described.

8. In a sawing-machine, the combination, with the main frame and the driving-shaft mounted in bearings therein, of the swinging saw-frame provided with a hollow sleeve portion mounted upon the driving-shaft, a clip adapted to be clamped to said hollow sleeve portion and containing a stud adjustable within the clip, a driving-pulley and cog mounted to revolve upon the stud, but eccentric thereto, and a cog mounted upon the driving-shaft and meshing with the pulley-cog, substantially as described.

9. In a sawing-machine, the combination, with the saw, of power-transmitting gearing for rotating the saw, a movable frame within which the saw is mounted, a feed-shaft geared to the saw-frame, a gear mounted loosely upon said feed-shaft and meshing with the power-transmitting gearing, and a friction-grip for making frictional connection between the feed-shaft and said gear, substantially as described.

10. In a sawing-machine, the combination, with the saw, of power-transmitting gearing for rotating the saw, a movable frame within which the saw is mounted, a feed-shaft geared to the saw-frame, a gear 32, mounted loosely upon the feed-shaft and meshing with the power-transmitting gearing, an adjustable nut 40, mounted upon the end of the feed-shaft, and friction-disks between said nut and gear, substantially as described.

11. In a sawing-machine, the combination, with the saw, of power-transmitting gearing for rotating the saw, a swinging frame within which the saw is mounted, a rack connected to said swinging frame, a feed-shaft having a fixed pinion meshing with the rack, and gearing connecting the feed-shaft with the power-transmitting mechanism, substantially as described.

12. In a sawing-machine, the combination, with the saw, of power-transmitting gearing for rotating the saw, a swinging frame within which the saw is mounted, a rack connected to said swinging frame, a feed-shaft having a fixed pinion meshing with the rack, and friction-gearing connecting the feed-shaft with the power-transmitting gearing, substantially as described.

13. In a sawing-machine, the combination, with the saw, of the driving-shaft 8, gearing to rotate the saw therefrom, a worm 27 at the end of the driving-shaft, a vertical shaft 29, having the gear 28, meshing with said worm, and having the worm 31, a feed-shaft 33, having the loose gear 32, meshing with the worm 31, and having the nut 40, and friction-disks 38 39, and the movable frame within which the saw is mounted, said frame being connected to the rack 35, geared to the feed-shaft, substantially as described.

14. As a new article of manufacture, a saw having peripheral openings whose sides are radial to the center of the saw, substantially as described.

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

JOSEPH ROBISON.

Witnesses:
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LEWIS F. ALRUTZ.