(No Model.) 3 Sheets—Sheet 1.

F. H. RICHARDS.

REAMER RELIEVING MACHINE.

No. 336,068. Patented Feb. 9, 1886.

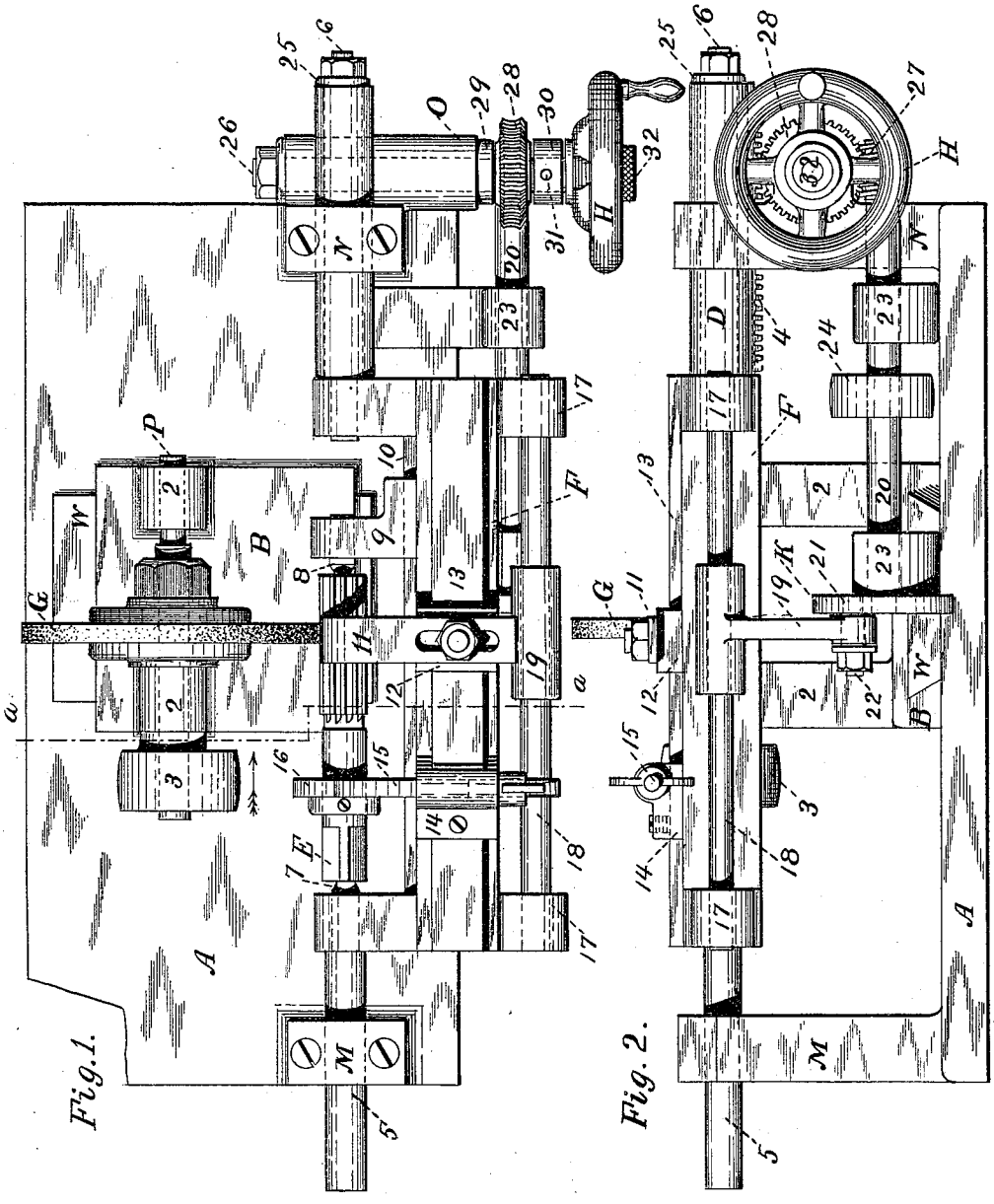

Fig. 1.

Fig. 2.

Witnesses;

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(No Model.) 3 Sheets—Sheet 2.

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Fig. 3.

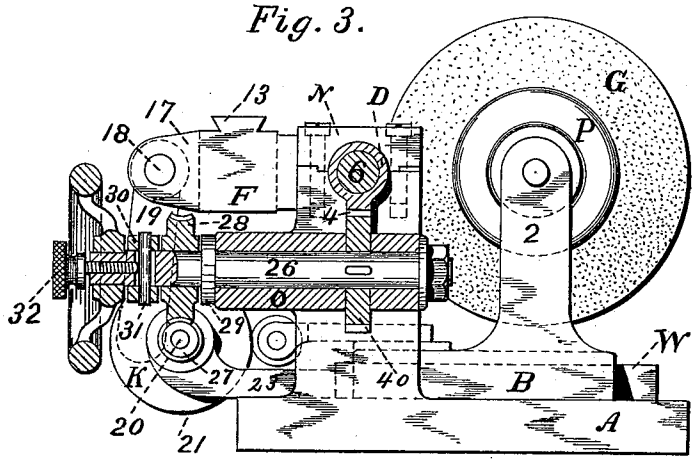


Fig. 4.

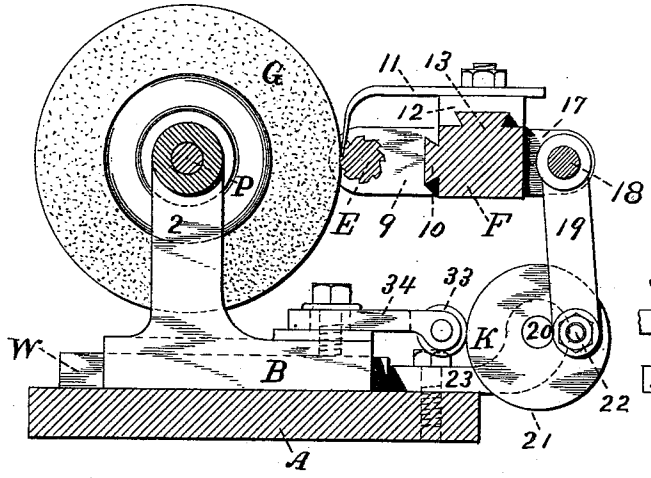
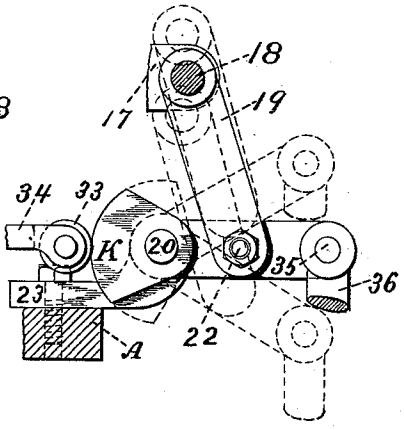


Fig. 5.



Witnesses;

C. O. Palmer.

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(No Model.) 3 Sheets—Sheet 3.

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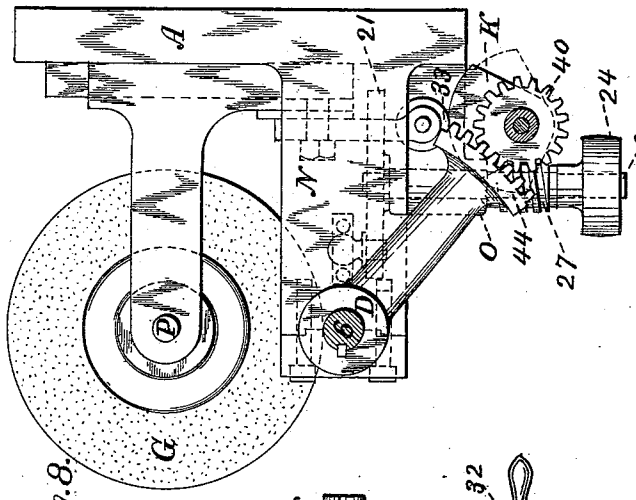

Fig. 8.

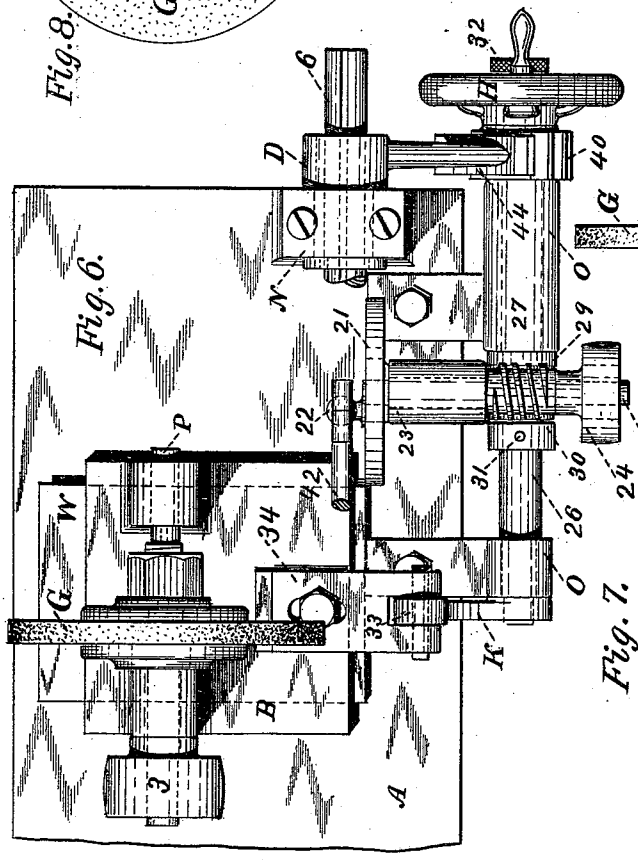

Fig. 6.

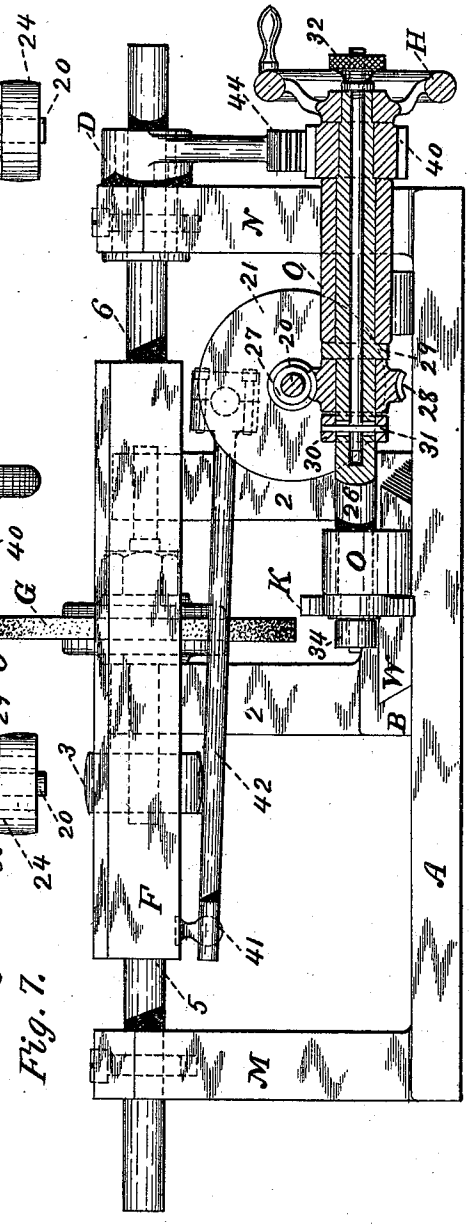

Fig. 7.

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UNITED STATES PATENT OFFICE.

FRANCIS H. RICHARDS, OF SPRINGFIELD, MASSACHUSETTS, ASSIGNOR TO THE PRATT & WHITNEY COMPANY, OF HARTFORD, CONNECTICUT.

REAMER-RELIEVING MACHINE.

SPECIFICATION forming part of Letters Patent No. 336,068, dated February 9, 1886.

Application filed January 31, 1885. Serial No. 154,581. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS H. RICHARDS, a citizen of the United States, residing at Springfield, in the county of Hampden and State of Massachusetts, have invented certain new and useful Improvements in Reamer-Relieving Machines, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

My invention relates to machines for relieving the cutting-edges of reamers, or those of other similar tools, either before or after hardening, by means of any suitable grinding devices. It has for its object to furnish such a machine which shall be adapted to relieve the cutting-edges of a tool by reducing each "land," or surface between the grooves of the same, to a shape conforming to a pattern that constitutes a part of said machine.

For the attainment of this object my invention consists in certain combinations of mechanism, which are hereinafter first described in connection with the drawings, and afterward pointed out in the claims.

Figure 1 is a top view of a machine embodying my invention. Fig. 2 is a front elevation of the same machine. Fig. 3 is an elevation of that end of said machine which is at the right hand in Figs. 1 and 2, some parts of the feeding mechanism being shown in section. Fig. 4 is a vertical transverse section in line *a a*, Fig. 1. Fig. 5 illustrates a modification of some of the parts shown in Fig. 4. Fig. 6 is a partial top view of the same machine, showing how the relative arrangement of the oscillating and feeding mechanisms may be reversed. Fig. 7 is a front elevation of the machine partially shown in Fig. 6, some parts of the feeding mechanism being shown sectioned. Fig. 8 is an end elevation of the machine as seen from the right hand in Fig. 6, wheel H being removed and other parts not shown.

Similar characters designate the same parts in all the figures.

In the drawings, Figs. 1 to 4, A designates a suitable bed-plate, having means for supporting the operative parts of the machine.

B is a carriage, which is arranged to slide crosswise to the bed-plate on ways W, formed on that plate. Said carriage has bearings 2, for supporting a spindle, P, for driving the grinding-wheel G. A pulley, 3, is fixed to said spindle for communicating rotary motion to said wheel.

M and N designate, respectively, two elevated bearings fixed on the bed-plate. One of these bearings (in this case N) is furnished with a tubular slide, D, which is provided with rack-teeth 4, whereby it may be slid in said bearing.

F is an oscillating reamer-holding fixture, having two journals, 5 and 6, which are, respectively, supported in bearing M and tube D. This is provided with a center, 7, for supporting one end of reamer E, the other end of which is supported by a similar center, 8, fixed in a head, 9, which is adapted to be adjustably fixed, according to the length of the reamer, on a way, 10, formed on said fixture. It should be noted that these two centers 7 and 8 should be in alignment with the axes of journals 5 and 6, which journals should be in perfect alignment with each other.

The reamer is secured in proper position in the fixture by means of a stop, 11, fixed to block 12, which block is adjustably fixed on a way, 13, formed on the fixture, and by means of a tension device consisting of block 14, tension-rod 15, and ratchet-wheel 16. These several parts are the same, substantially, in construction and operation as the similar parts shown and described in United States Patent No. 308,669, dated December 2, 1884, to which reference may be had. Other suitable devices may be employed instead of these for holding the reamer in position in the fixture, if it be thought preferable.

The fixture is provided with means for connecting it to a mechanism for imparting thereto a rotary reciprocating movement. This means consists of two lugs, 17, and a rod, 18, supported by said lugs, and a connecting-rod, 19, connected to said rod, or of some equivalent device.

The "reciprocating mechanism," as I prefer to call it, for imparting the reciprocating movement to the fixture, consists, essentially, of a shaft, 20, provided with means (as disk

21) for holding a crank-pin, 22, which works in the lower end of connecting-rod 19. Shaft 20 is supported by any suitable bearings, as 23, secured to the bed-plate, and it is rotated by some convenient means—as, for instance, pulley 24.

For feeding the fixture along in its bearings while it is reciprocating, a feeding mechanism is placed intermediate to shaft 20 and tubular slide D, said slide being held onto journal 6 by a nut and washer at 25, in the usual manner. Bearing N has attached thereto another bearing, O, supporting a shaft, 26, which carries a gear, 40, meshing with teeth 4 on said slide D. Shaft 20 has a worm, 27, fixed thereon, which meshes with a worm-wheel, 28, loosely fitted on shaft 26, which shaft has a fixed collar, 29, next to said worm-wheel. On the same shaft 26, and next to the worm-wheel, is placed a sliding collar, 30, which has a pin, 31, passing through a slot in the shaft, as shown in Fig. 3. A knurled-headed screw, 32, is provided to press against said pin and force the sliding collar against the worm-wheel, thereby clamping this wheel against collar 29, and thus completing the connection between shaft 20 and slide D aforesaid. By loosening screw 32 the worm-wheel is released, when shaft 20 may revolve without feeding the fixture. A hand-wheel, H, is fixed on shaft 26, for the purpose of sliding the fixture in either direction by hand. As this is done, rod 18 slides through the upper end of connecting-rod 19.

K designates a cam, which bears against a part of carriage B, for the purpose of imparting to it a slight reciprocating or relief movement, corresponding in time to that of the fixture. As shown in the figures, said part of the carriage is a cam-roll, 33, carried in a piece, 34, adjustably attached to said carriage. A spring or weight (not shown) is provided for moving the carriage toward the cam.

In the figures thus far particularly described cam K is the same part of the machine as disk 21; but this is not a necessary condition. They may be made separate, if desired, as hereinafter more fully explained. In practice the periphery of cam K should approximate somewhat closely to a circle, for the reason that, as a rule, only a small amount of relief is given to the cutting-edges of the reamer. The proper methods for the making of said cam will be understood by mechanics familiar with machinery in which forms are reproduced from a model or pattern, so that a particular description of the same is here unnecessary.

In Fig. 5 I have shown how shaft 20 may be arranged to have a rotary reciprocating instead of a revolving movement. As here shown, rod 19 is connected to pin 22, fixed in a lever, 35, this lever being oscillated by a connecting-rod, 36, driven by some device that is not shown.

In Figs. 6, 7, and 8 I have shown how the arrangement of the fixture-reciprocating and the fixture-feeding mechanisms may be substantially reversed, so that the fixture shall be reciprocated longitudinally and fed about its axis. As here shown, pin 41 is substituted for rod 18, and rod 42 for rod 19; tube D is splined to journal 6, and is made to turn instead of slide in bearing N, and provided with a segment, 44, instead of the rack-teeth 4, and cam K is placed on shaft 26, instead of 20, and is made separate from disk 21. Otherwise what is shown does not differ materially from the same parts which have been described in the preceding figures. By comparing these three figures and their reference-characters with the first four figures, bearing in mind the substitutions and changes above noted, this modification of the machine will be apparent without a more particular description.

The operation of my improved reamer-relieving machine is as follows: The reamer to be relieved is placed and adjusted in the fixture in the same manner as described in the aforesaid Letters Patent No. 308,699, substantially as shown in the drawings. The reciprocating mechanism is adjusted to reciprocate the fixture through the required distance, either longitudinally or about its axis, according to the arrangement of the machine, so as to present the whole length or width of the reamer-tooth, as the case may be, to the action of wheel G, the cam K being so formed and set as to impart to carriage B a slight movement toward and from said reamer, corresponding to the amount of relief to be given said tooth. The grinding-wheel and the reciprocating mechanism being now put in operation by belts on pulleys 3 and 24, and part 34 on carriage B being so adjusted as to bring wheel G against the reamer-tooth, the feeding mechanism is next put in operation by tightening screw 32, and the fixture slowly moved to gradually present every point of the tooth to the action of the wheel. During this time the motion of the cam moves the wheel or allows it to be moved to give the required shape to said tooth. On finishing that tooth the screw 32 is loosened, and the fixture returned to its first position, ready for the next operation, and so on indefinitely.

Having thus described my invention, I claim—

1. The combination of a suitable frame-work, an oscillating tool-holding fixture, a carriage having a reciprocating motion toward and from said fixture, and carrying thereon a grinding device, a cam for imparting the relief movement to said carriage, and mechanism, substantially as described, for operating said cam, and for reciprocating said fixture, substantially as set forth.

2. The combination of a suitable frame-work, a carriage having thereon a grinding device, an oscillating tool-holding fixture having a longitudinal and a rotary reciprocating movement, a cam or pattern for imparting the relief movement to said grinding device, and

mechanism, substantially as described, for operating said cam, and for reciprocating and for feeding said fixture, substantially as set forth.

3. In a reamer-relieving machine, the combination of a supporting frame-work, fixture F, having journal 6, slide D, shaft 20, connecting mechanism, substantially as described, between said shaft and said fixture, and feed mechanism between said shaft and slide D, substantially as set forth.

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Witnesses:
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