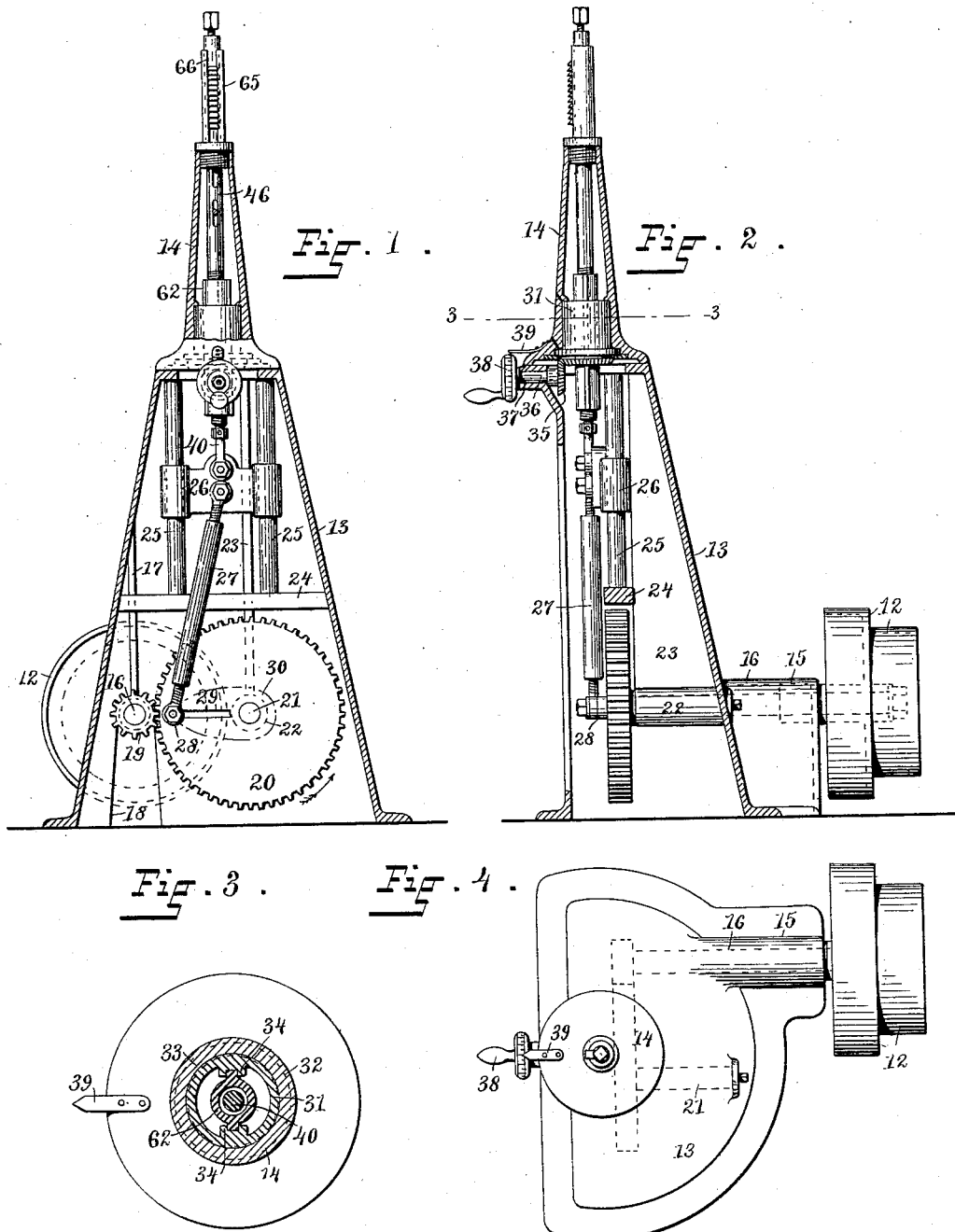


J. S. WATERMAN.

KEY SEAT MILLING MACHINE.

No. 347,539.

Patented Aug. 17, 1886.



WITNESSES:

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INVENTOR:

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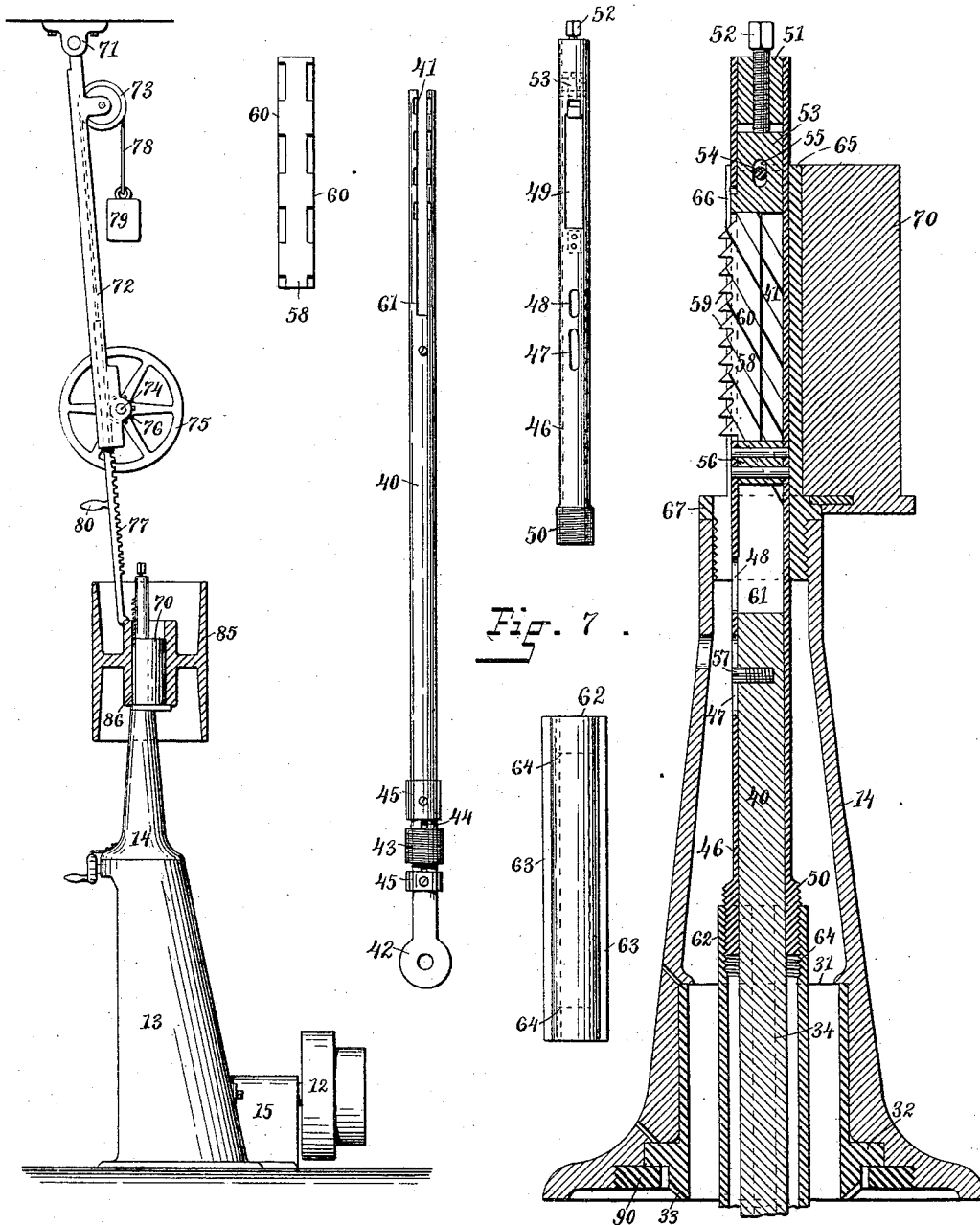
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Fig. 10.   Fig. 9.   Fig. 8.   Fig. 6.   Fig. 5.



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# UNITED STATES PATENT OFFICE.

JOHN S. WATERMAN, OF ITHACA, NEW YORK.

## KEY-SEAT-MILLING MACHINE.

SPECIFICATION forming part of Letters Patent No. 347,539, dated August 17, 1886.

Application filed May 27, 1886. Serial No. 203,369. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN S. WATERMAN, of Ithaca, in the county of Tompkins and State of New York, have invented certain new and useful Improvements in Key-Seat-Milling Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to the class of machines designed for cutting or milling seats or beds in shafts and the center holes of wheels, gears, and the like. The metallic wedges or keys are forced in the seats to secure the wheel or gear firmly upon the shaft.

My invention especially relates to this class of machines in which reciprocating cutters having a rectilinear line of motion are employed.

The objects of my invention are to provide a positive-acting cutter-feeding device whereby the cutter is firmly and unyieldingly presented to the metal being milled, and to provide a cutter which is fed out and in at each reciprocation of the cutter-bar, and to provide means for gradually setting the feeding limit of the cutter, and to provide other novel features, hereinafter described and claimed.

To these ends my invention consists in the new constructions and arrangements of the several parts of the machine, as hereinafter fully described and claimed.

In the accompanying drawings, Figure 1 represents a front elevation of my improved machine, with the supporting-stand in section. Fig. 2 represents a side elevation of Fig. 1, with the supporting-stand in section. Fig. 3 represents an enlarged sectional view of the upper portion of the machine, taken on line 3 3, Fig. 2. Fig. 4 represents a top plan view of Fig. 2. Fig. 5 represents an enlarged central longitudinal sectional view of a portion of my machine with the lower half of the machine removed and the cutter-bar and its surrounding tube broken off. Figs. 6, 7, and 8 represent elevations, on one-half the scale of Fig. 5, of the casing, the tube, and the cutter-bar, respectively. Fig. 9 represents a rear view of the cutter shown in Fig. 5. Fig. 10 represents a diminished side view of my complete machine arranged in operation upon a wheel, shown in section.

In the said drawings like numbers designate corresponding parts throughout.

Referring to the drawings, the supporting-stand consists of the hollow column 13, with a flat suitable base-plate, and of the superposed hollow conical stand 14. Upon the base of column 13 is an upright body, 15, in which is journaled the shaft 16, carrying the conical or stepped power-pulley 12. The bearing of shaft 16, lying within column 13, is braced by a supporting-web, 17, running from above the bearing to the side of the column. The opening 18 extends under the length of body 15. On the inner end of shaft 16 is keyed a gear-wheel, 19, in mesh with cog 20, keyed upon the inner end of shaft 21, journaled in a bearing, 22, also provided with a supporting-web, 23. The cross-beam 24 supports the lower ends of the vertical guide-rods 25, having their upper ends set in the upper part of column 13, and upon which slides the cross-head 26. The pitman 27 is connected at the upper end with cross-head 26 by means of a pivot-joint, and the lower end is loosely fastened to the wrist-pin 28, which slides freely in the radial slot 29, formed in the body of cog-wheel 20. Obviously, when the cog-wheel 20 is revolved in the direction of the arrow, the wrist-pin 28 will constantly shift its bearing in slot 29, and at each revolution of said wheel the wrist-pin will describe the path of the ellipse 30. By virtue of this construction the downward stroke of the reciprocating pitman 27 and the connected cross-head 26 will be about half the speed of the return upward stroke, and at each revolution of the cog-wheel 20 they will repeat this same variable stroke of reciprocation.

The stand 14, resting upon the upper end of column 13, contains the guiding and adjusting means for the cutter and adjuncts, and also contains the work bed or table to hold the work.

The box or cylinder 31 is provided near the lower end with a radial annular flange, 32, and has the bevel-gear 33 on its lower edge. This box 31 is set vertically in the lower end of stand 14 by means of the collar 90, screwed therein, and the box is arranged to turn freely in its position, as shown in Fig. 5. On the interior sides of box 31 are disposed the opposite longitudinal guides 34. The bevel-

gear 35, in mesh with gear 33, is keyed upon the inner end of shaft 36, journaled in the bearing 37, and having at the outer end the fixed hand-wheel 38, the periphery of which is graduated with notches, which are passed under the index-finger 39, set on stand 14, when the hand-wheel revolves. The turning of the hand-wheel 38 revolves with diminished speed the connected box 31.

The cutter-bar 40 (shown enlarged in Figs. 5 and 8) consists of a rod forked at the upper end, the branches or arms of the fork having flat parallel inner faces provided with the ways or grooves 41, which lie opposite and are inclined at about forty-five degrees to the major axis of the cutter-bar 40. The lower end of the cylindrical cutter-bar is provided with a flat perforated head, 42, above which is disposed the sleeve 43, having an external screw-thread and sliding upon the bar 40 by means of a spline working in slot 44 on the bar. This sleeve slides on the bar, but cannot turn thereon, and its travel is limited by the stops 45.

The casing 46 is a cylindrical hollow body, provided with cheek-slots 47 and 48 and the opening 49, and having the lower end constructed with a screw-thread, 50. The upper end of the casing 46 contains the plug 51, through the center of which works the screw 52, the lower end of which takes against the slide 53, working within the casing on pin 54, by means of a slot, 55. The slide 53 is arranged about the upper end of opening 49, near the lower end of which is set a fixed block, 56.

The cutter or milling-tool 58 is a flat straight body having one narrow edge provided with cutter-teeth 59, and the broad sides provided with the ribs or tongues 60, which are arranged obliquely to the line of length of the cutter. The broad sides are parallel, and the ribs have the same angle of inclination as the grooves in the fork 61 of the cutter-bar. The cutter-bar is shown in Figs. 5 and 9 as on double the scale as the parts in Figs. 6, 7, and 8 are drawn on. The casing 46 is set down over the upper end of the cutter-bar 40, so that the block 56 takes in the fork 61 and the slide 53 works in the upper end thereof. The cutter 58 is set down through opening 49 in casing 46, and the ribs 60 thereon are adjusted to slide in the ways 41, so that the cutter is set in position. The screw 57 is set through check-slot 47 in the casing into the body of the cutter-bar 40, and limits the traverse of said parts on each other. The tube 62 is cylindrical, and has arranged oppositely upon the sides the longitudinal flanges 63. The interior of tube 62 is screw-threaded at the ends, as at 64, the one end with a right-hand screw-thread and the other with a left. This tube is placed down over the cutter-bar 40 before the casing 46 is adjusted, and its lower end is screwed onto a corresponding screw-thread on sleeve 43. When the casing 46 is placed in position, its lower end, 50, is screwed

into the upper end of tube 62 in a corresponding screw-thread, 64. By virtue of this construction the tube 62 may be turned to force the casing 46 upwardly, or the cutter-bar 40 may be forced up through said casing by virtue of the sliding sleeve 43. The cutter 58 is set in position by resting with its lower end on block 56, and the slide 53 moved down so as to barely clear the upper end of the cutter, and the cutter is thereby permitted to slide sideways or in a line at right angles to its line of length, but is prevented from self-movement longitudinally. The cylinder 65, provided with a slit, 66, and a collar, 67, is screwed into the upper end of stand 14, and has a bore of uniform diameter to receive the casing 46.

The several parts—the cutter, cutter-bar, and tube and casing—being put together as described, are set down in the stand 14, and the tube 62 is passed into the box 31, so that its flanges 63 take into the guides 34. The cylinder 65 is then placed in position, and the head 42 of the cutter-bar is fastened by means of a pivot-joint to the reciprocating cross-head 26. The hand-wheel 38 may be turned to revolve the box 31 and the conjoined tube 62, so that the connected casing 46 will be slid upward on the cutter-bar, and the cutter 58 will thereby be forced and slid outwardly in its tongue-and-groove bearings, and will be extended so that its cutter-teeth 59 will project out beyond the casing and the cylinder 65. This adjustment may be made to any degree by simply turning the hand-wheel 38 and feeding the cutter outward. Now, if the casing remain stationary and the cutter-bar 40 be drawn downwardly in it, the grooves 41 will be moved downward accordingly, and the cutter 58, bearing with its lower end on block 56, will be fed inwardly on a line normal to the line of movement of bar 40. This latter inward feed motion is secured by virtue of the sliding sleeve 43, since when the casing 46 is forced upward the sleeve moves upward against its upper stop, 45, and when the bar 40 is forced upward the sleeve 43 and tube 62 and the connected casing 46 remain stationary, and accordingly the cutter is fed inwardly on a line normal to the line of motion of the bar. The cutter-bar 40 is reciprocated vertically in an evident manner by means of the motion given to the cross-head by the actuating means before described, and the cutter is fed out and in on a line normal to the line of motion of the cutter-bar.

The form 70 is arranged upon the upper end of stand 14, as shown, and is used to hold the work to be milled by setting the wheel or pulley down over the form by means of the center hole or eye, as shown in Fig. 10. The size of the form 70 may be varied to accommodate different-sized work.

In Fig. 10 is shown the holding device combined with my key-seat-milling machine. This device consists of the hanger 71, secured to any suitable object above the machine. The arm 72 is pivoted to hanger 71, and near the up-

per end is disposed a loose pulley, 73. At the lower end of arm 72 is arranged a bearing for the shaft 74, upon which are keyed the hand-wheel 75 and the pinion-wheel 76. The rack-bar 77 is set in the arm 71, and is in mesh with the pinion-wheel 76, which serves to run the bar up or down in an obvious manner by turning the hand-wheel 75. The upper end of the rack-bar 77 is arranged with a cord, 78, and weight 79, which afford a balance device for the rack-bar. The end of the rack-bar is notched, and it is also provided with a handle, 80, near its center.

The operation of my milling-machine is as follows: The cutter 58 is set at the inner limit of feed, and the pitman 27 is arranged at the highest point of an upward stroke. The wheel 85 has its central eye set down over the form 70. The lower notched end of rack-bar 77 is brought into position and placed with the notch on the hub of the wheel 85, and the hand-wheel 75 is turned to put sufficient binding-pressure on said wheel, and is firmly held in this position by means of the ratchet and pinion 76. In this position the hand-wheel 38 is turned to a suitable adjustment, in order to present the cutter-teeth 59 of cutter 58 to the interior surface of the eye of the wheel 85. The machine is then operated by the power-pulley 12, and in an obvious manner the cutter is borne on a slow downward stroke, with its teeth slightly embedded in the metal of the wheel 85, whereby a chip of metal is cut off an area equal to the width of the teeth and the length of the eye of the wheel. The operation of the machine now carries the cutter-bar quickly upward, whereby the cutter is fed inwardly, by virtue of the sliding sleeve 43, as described, and the cutter is raised to the starting-point, when the regulating hand-wheel is turned forward the same way to the proper degree and the cutter is carried on the downward stroke, whereby another chip of the metal is cut off in the same way. This operation is repeated until the key seat or bed 86 of wheel 85 is cut to the proper depth, when the wheel is removed. The cutter shown cuts a straight channel, because its teeth are alike and even and cut in a vertical plane. A cutter may, however, be used with the cutter-teeth formed differently—*i. e.*, with the plane of their tip ends inclined to the line of feed, so that a tapering key-seat may be readily cut.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In combination, a cutter provided with ribs or tongues disposed obliquely to the line of feed, a cutter-bar provided with ways or grooves conforming and corresponding to said ribs, said ribs working in said ways, means for setting and holding said cutter against longitudinal self-movement, means for moving said cutter-bar, whereby said cutter may be fed out and in on a line of motion normal to the line of movement of said cutter-bar.

2. In combination, a cutter having a straight body and provided with upon the sides

oblique to the line of feed, a forked cutter-bar provided upon the inner faces of said forks with oblique ways conforming and corresponding to said ribs, said cutter situated in said fork and the ribs working in the ways, a casing surrounding said cutter-bar and sliding thereon and provided with an opening for said cutter, said cutter set and held by a device fixed within said casing and lying partially in said fork, means for independently moving said cutter-bar and casing longitudinally, whereby said cutter may be fed out and in on a line of motion normal to the line of movement of said bar and casing.

3. In combination, a cutter-bar carrying a cutter, an externally-screw-threaded sleeve sliding but not turning on said cutter-bar, a casing having an opening for the cutter and surrounding said cutter-bar and sliding thereon, and provided with means for setting and holding said cutter, the lower end of said casing provided with an external screw-thread, a tube having at the ends interior reversed screw-threads, said tube engaging by one of said ends the screw-thread upon the casing, and the other end engaging the screw-thread upon said sleeve, whereby said cutter may be fed out and in on a line of motion normal to the line of movement of said cutter-bar.

4. In combination, a cutter-bar provided with a cutter, an externally-screw-threaded sleeve sliding but not turning on said bar, said sleeve located near the lower end of said bar and having a limited traverse thereon, a casing having an opening for said cutter and surrounding said bar at the upper end and sliding thereon, an external screw-thread upon the lower end of said casing, a tube having internal reverse screw-threads, one of which engages the screw-thread on said sleeve and the other the screw-thread on said casing, said tube provided with lateral longitudinal flanges, a box surrounding said tube and provided with interior longitudinal guides engaging with said flanges, a bevel-gear fixed upon said box, a bevel-gear in mesh with the gear on said box, an axle provided with a graduated hand-wheel controlling said second gear, means for reciprocating said cutter-bar, whereby said cutter may be fed out and in on a line normal to the line of movement of the cutter-bar.

5. In combination, a straight flat cutter provided with tongues disposed obliquely to the line of feed, a cutter-bar having at the upper end two parallel arms, the opposite faces of said arms provided with grooves having the same angle of inclination as said tongues and conforming thereto, said cutter working between said arms in the tongue-and-groove bearings, an externally-screw-threaded sleeve surrounding said cutter-bar near the lower end, a spline on said sleeve working in a slot on said bar, a pair of stops, one at each end of said slot, a casing provided with an opening for said cutter and with a check-slot, a slide provided with an operating-screw and

working in the upper end of said casing above  
 said opening, a fixed block within said casing,  
 below said opening, and taking in between the  
 arms of said cutter-bar, the lower end of said  
 5 casing provided with an external screw-thread,  
 a tube provided with internal reverse screw-  
 threads at the ends and having external lat-  
 eral flanges extending longitudinally, a box  
 10 surrounding said tube and provided with in-  
 ternal longitudinal guides engaging said  
 flanges, a bevel-gear upon the lower end of  
 said box, a supporting-stand, substantially as  
 described, for holding said parts, as described,  
 means for reciprocating said cutter-bar, where-  
 15 by said cutter may be fed out and in on a line  
 normal to the line of movement of said bar.

6. In combination, the supporting-stand,  
 substantially as described, provided with a  
 work-table having a cylindrical form, a worked  
 20 wheel placed over said form, a holding device  
 consisting of a hanger provided with a swing-  
 ing arm, a rack-bar disposed in the length of  
 said arm, a hand-wheel provided with a shaft  
 and a ratchet and pinion, said pinion engag-  
 25 ing said rack-bar, the lower end of said bar  
 notched and engaging said worked wheel,  
 substantially as described.

7. In combination, a hollow stand, a cylin-  
 drical box journaled in said stand and pro-

vided with internal longitudinal guides, a bev- 30  
 el-gear upon one end of said box, a bevel-gear  
 mounted on a shaft and in mesh with the gear  
 on said box, a graduated hand-wheel provided  
 with an index-finger and fixed upon said  
 shaft, whereby said graduated wheel may be 35  
 adjustably rotated to adjust the revolution of  
 said box, substantially as described.

8. In combination, the cutter 58, provided  
 with ribs 60, the cutter-bar 40, provided with  
 the fork 61, having the grooves 41, and pro- 40  
 vided with the sliding sleeve 43 and stops 45,  
 the casing 46, provided with opening 49 and  
 slots 47 and 48 and screw-thread 50, and con-  
 taining the slide 53 and block 56, the tube 62,  
 provided with flanges 63 and screw-threads 45  
 64, all substantially as described.

9. In combination, the supporting-column  
 13, the cross-beam carrying the vertical guides  
 25, the cross-head 26, sliding on said guides,  
 the pitman 27, connected with said cross-head, 50  
 the cog-wheel 20, provided with slot 29, and a  
 sliding wrist-pin, 28, connected with said pit-  
 man, substantially as described.

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Witnesses:

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