J. L. KUNZ.

MACHINE FOR CUTTING KEY SEATS IN SHAFTING.

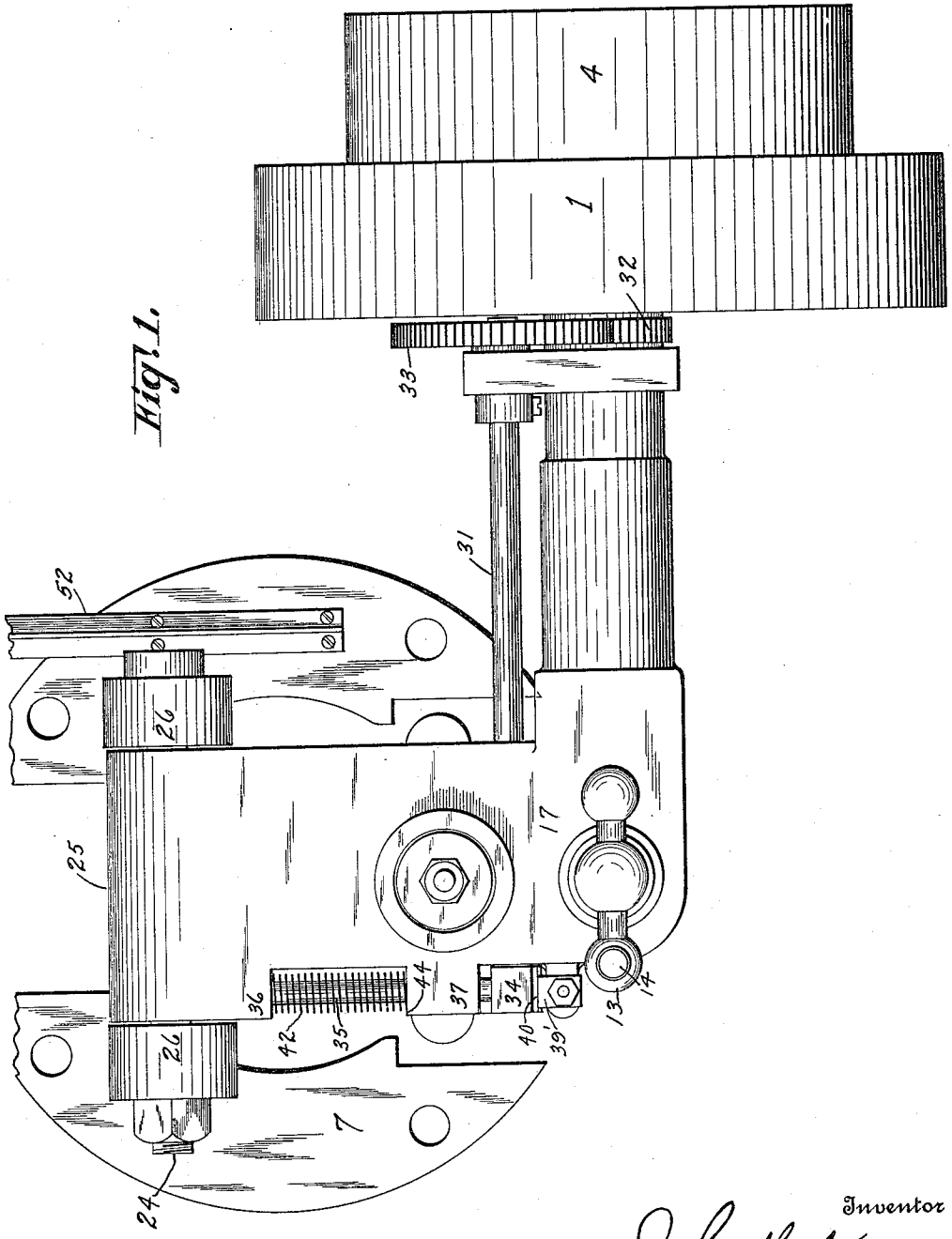
APPLICATION FILED MAR. 24, 1913.

1,151,020.

Patented Aug. 24, 1915.

4 SHEETS—SHEET 1.

Fig. 1.



Witnesses

F. A. Otto

H. C. Van Nyn

Inventor

John L. Kunz

By Erwin & Rhulen

Attorneys

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

J. L. KUNZ.

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4 SHEETS—SHEET 2.

Fig. 2.

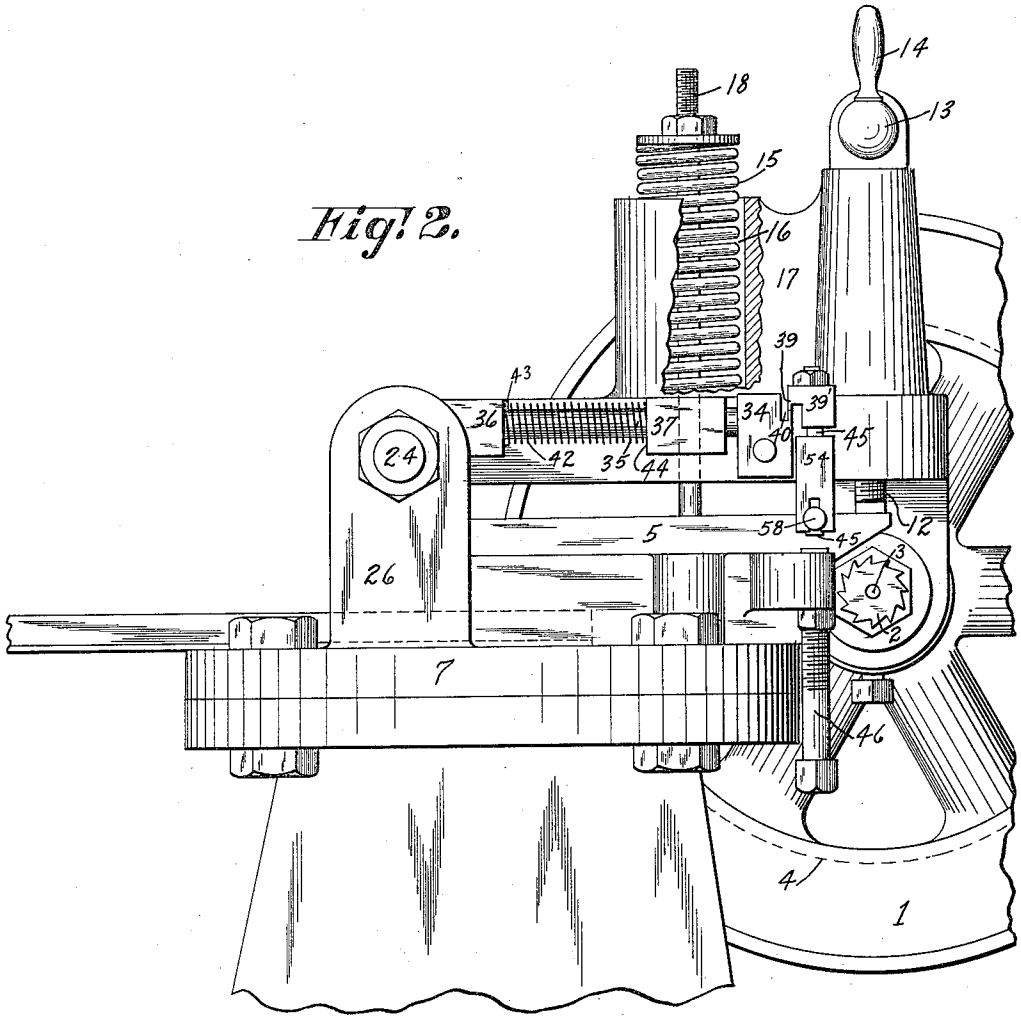
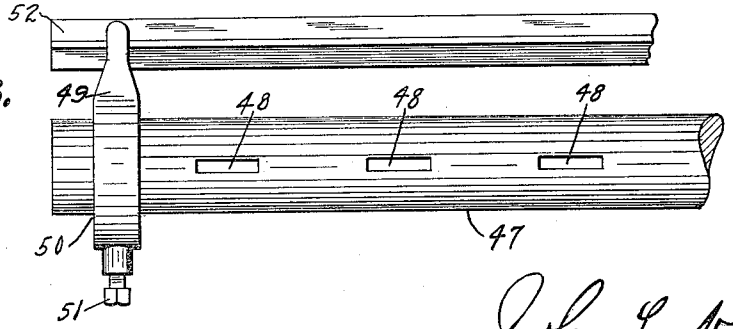


Fig. 6.



Witnesses

H. C. Van Ryn

Inventor

John L. Kunz

By Emrich & Wheeler

Attorneys

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

J. L. KUNZ.

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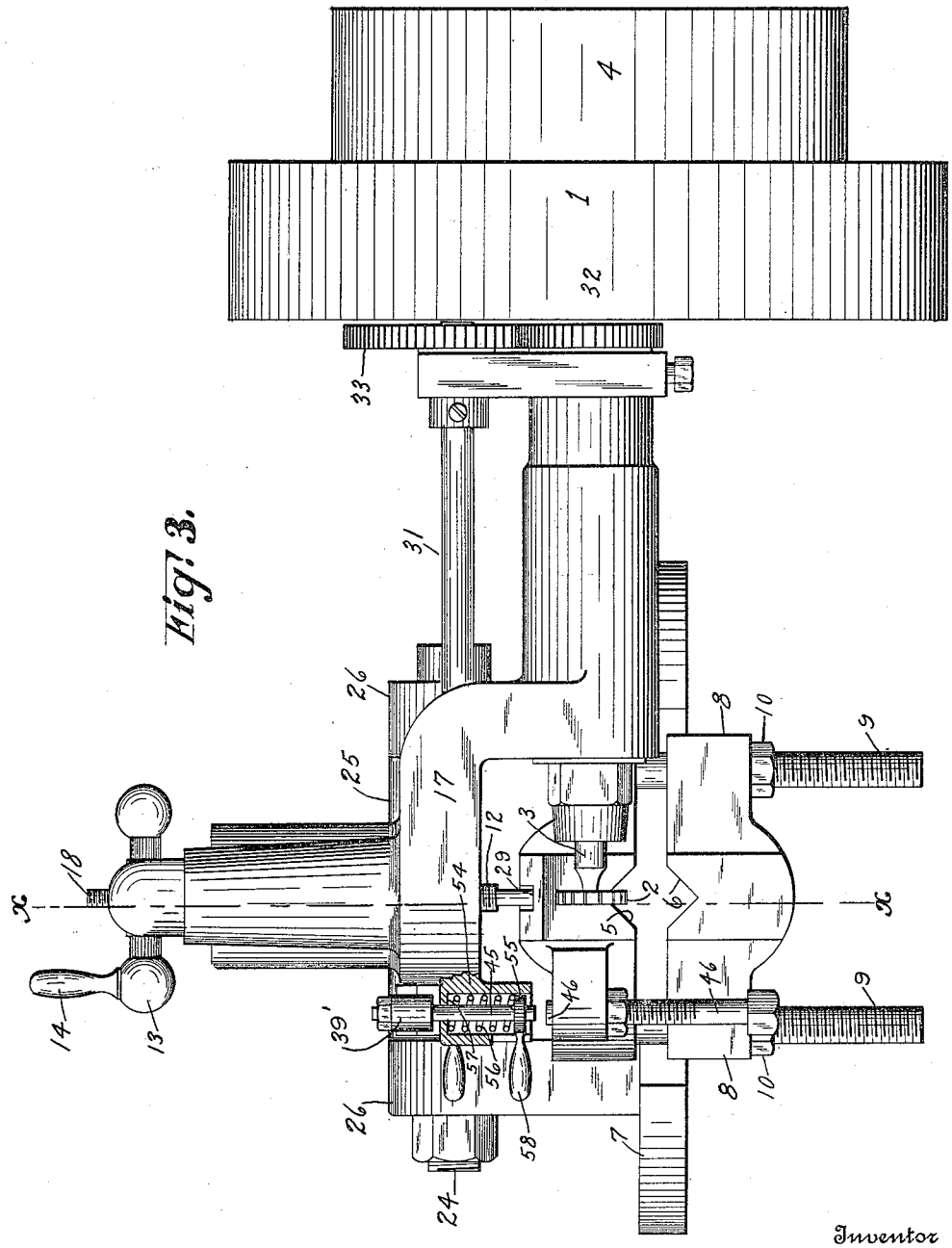
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4 SHEETS—SHEET 3.

Fig. 3.



Witnesses

D. A. Otto.

H. C. Van Ryn.

Inventor

John L. Kunz

By Emrie & Thacher

Attorneys.

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

J. L. KUNZ.

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4 SHEETS—SHEET 4.

Fig. 4.

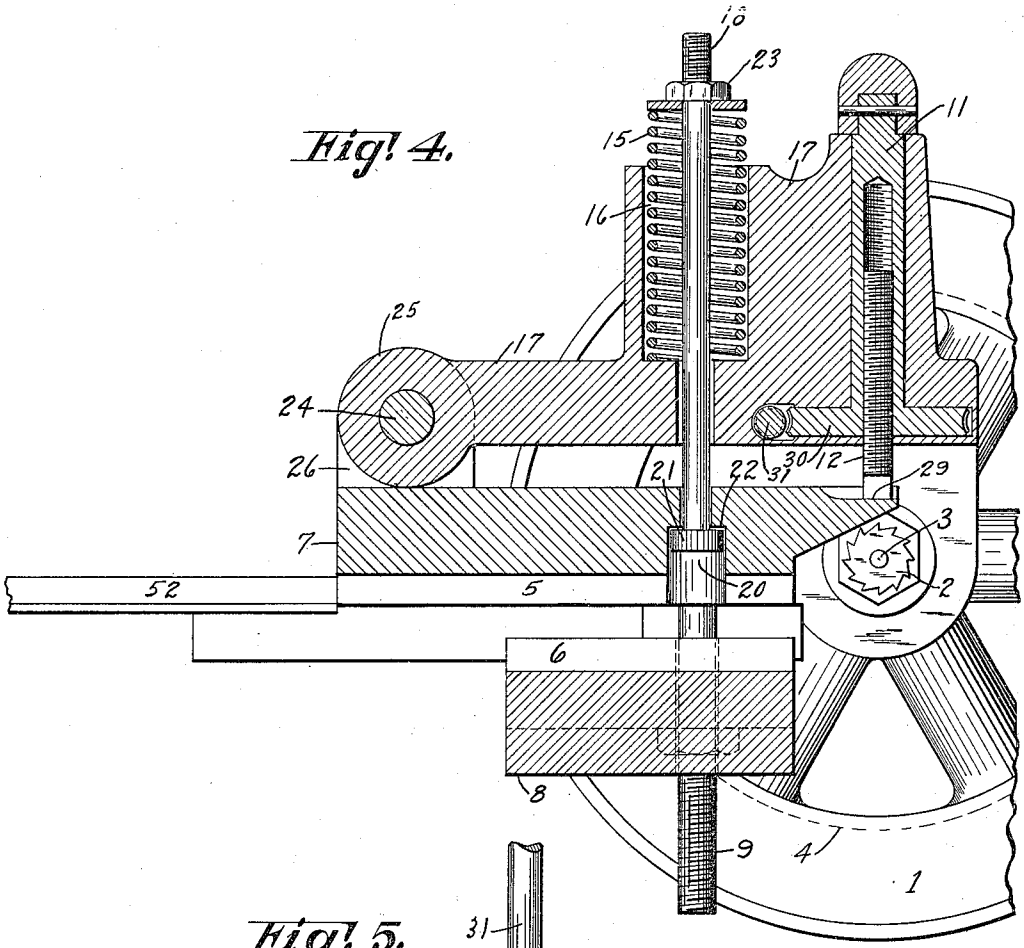
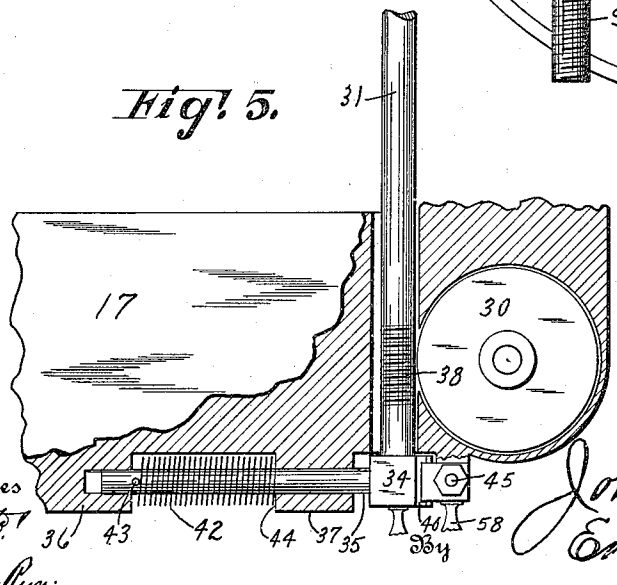


Fig. 5.



Witnesses

H. C. Van Ryn

Inventor

John L. Kunz

By Enoch & Theder

Attorneys

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

JOHN L. KUNZ, OF MILWAUKEE, WISCONSIN.

MACHINE FOR CUTTING KEY-SEATS IN SHAFTING.

1,151,020. Specification of Letters Patent. Patented Aug. 24, 1915.

Application filed March 24, 1913. Serial No. 756,311.

To all whom it may concern:

Be it known that I, JOHN L. KUNZ, a citizen of the United States, residing at Milwaukee, county of Milwaukee, and State of Wisconsin, have invented new and useful Improvements in Machines for Cutting Key-Seats in Shafting, of which the following is a specification.

My invention relates to improvements in machines for cutting key seats in shafting and the like, and it pertains more especially, among other things, to the device for applying the resilient action of a spring to a milling tool for retaining such tool in cutting contact with the shaft as the key seat is being cut, and also to the device for resisting and controlling the action of the spring, whereby the milling tool can be forced forwardly by such spring only as fast as the resistance of such screw to the tension of the spring is withdrawn.

In other words, my invention pertains to the device by which the pressure of a spring as applied to the milling tool, is controlled and regulated by the action of a screw, whereby the milling tool acts under the tension of a spring only instead of by the more positive action of a revoluble screw, whereby the milling tool can never be forced forwardly faster than it cuts its way in the shaft under the yielding action of the spring, and whereby the danger of breaking the milling tool as might be the case when dull, by forcing the same forwardly too fast by a positive screw feed, is avoided.

My invention also pertains further to the device for pivotally connecting the milling tool supporting frame to a stationary frame, whereby the end thrust or forward or backward movement of the tool supporting frame is prevented.

My invention is further explained by reference to the accompanying drawings, in which—

Figure 1 is a plan view thereof. Fig. 2 is a side view, part broken away. Fig. 3 is a front view. Fig. 4 is a vertical section drawn on line *x x* of Fig. 3. Fig. 5 is a detail of the feed mechanism, and Fig. 6 is a plan view of the device for preventing the shaft from turning in its bearings as a plurality of key seats are being cut therein.

Like parts are identified by the same reference numerals throughout the several views.

1 represents a driving pulley, from which motion is communicated to a milling tool 2 through the pulley supporting shaft 3. 4 is an additional pulley of less diameter, through which motion may also be communicated to the milling tool and tool supporting shaft from a motor, not shown, at a greater speed. It will be understood that a shaft in which the key seat is formed is adapted to be rigidly clamped between the stationary jaw 5 and the movable jaw 6. The jaw 5 is formed in the stationary member 7 and the jaw 6 is formed in the movable member 8, and said members 7 and 8 are connected together by the clamping bolts 9, 9, which are provided on their lower ends with clamping nuts 10, 10, whereby when a shaft has been inserted between said jaws 5 and 6, the same is rigidly held in place by turning up the clamping nuts 10 on the clamping bolts 9. It will be understood that preparatory to starting the cutting tool, it is raised so as to contact with the upper side of the shaft by turning up the sleeve 11 on the screw threaded rod 12. The sleeve 11 is provided with a crank arm 13 and handle 14, by which it is manually revolved upwardly and downwardly on the threaded rod 12 as the milling tool is adjusted to its work. When the milling tool 2 has been adjusted, the motor, which is connected with the driving shaft 3 through one of the pulleys 1 and 4, is started, whereby the milling tool is caused to revolve in contact with the surface of the shaft in which the key seat is being cut.

The required pressure for forcing the milling tool into the shaft is applied through the tension of the spiral spring 15. The spiral spring 15 is supported in the chamber 16 of the movable frame member 17 around the threaded shaft 18, and said threaded shaft 18 is connected at its lower end with the stationary frame member 7 within the recess 20 by the head 21, which is adapted to bear at its upper surface against the opposing shoulder 22 of said frame member. It will now be understood that when the nut 23 is turned down against the upper end of the spiral spring 15, the frame member 17 will be forced toward the frame member 7 with a pressure corresponding with the tension of said spring. The frame member 17 is pivotally connected with the stationary frame 7 through the bolt 24, which bolt 24 has closely fitting bearings in the sleeve 25 of the movable frame member and the pivot post 26 of the stationary frame member.

To prevent the milling tool from being forced too rapidly into the shaft which is being cut thereby, I have provided the resistance screw 12, which as stated has threaded bearings in the revoluble sleeve 11 and said screw rests at its lower end on the seat 29 of the lower frame member. It will now be obvious that the frame member 17 can be forced downwardly by the resilient action of the spring 15 only as fast as the sleeve 11 is turned down on the screw 12. The sleeve 11 is automatically turned on the screw 12 through the worm wheel 30 and worm shaft 31, and motion is communicated from the driving shaft 3 to the worm wheel 30 through the pinion 32, gear 33, and shaft 31 to which said gear wheel 33 is secured. Thus it will be obvious that as the cutting wheel is revolved by revolving one of the driving pulleys, the milling tool will not only be revolved, but it will be simultaneously forced downwardly into the shaft in which the key seat is being formed by the resilient action of the spring 15 as fast only as the sleeve 11 is turned down on the screw 12.

It will be understood that owing to the fact that the frame member 17 is securely pivoted to the frame member 7 by the bolt 24, it is prevented from moving forwardly or backwardly and is at all times retained in perfect alinement with the shaft in which the key seat is being cut. Also that the weight of the front end of the frame member 17 rests upon the worm wheel 30 which wheel is formed integral with or rigidly affixed to the threaded sleeve 11, whereby as said worm wheel 30 is revolved from left to right, the threaded sleeve 11 will be caused to move upwardly on the screw 12, whereby the front end of the frame member 17 will be raised and the spiral spring 15 compressed. When, however, said threaded sleeve 11 is revolved in the opposite direction, either manually or by the action of the worm shaft 31 against the teeth of the worm wheel 30, said member 17 will descend and the milling tool will be thereby forced into the key seat of the shaft which is being operated upon with a force equal to the recoil of the spring 15. The end of the shaft 31 opposite the driving pulleys 1 and 4, is supported in a horizontally movable journal box 34 and said journal box is in turn supported upon or rigidly affixed to the slidable shaft 35, said shaft 35 being slidably supported from the frame member 17 in the journal bearings 36 and 37, whereby the protruding end of the worm shaft 31 is adapted to be moved toward the right and left with said shaft 35, whereby the worm 38 formed on said shaft is brought into and out of mesh with the teeth of the worm wheel 30.

The worm 38 is retained in contact with the teeth of the worm wheel 30 by engagement of the downwardly projecting lug 39 formed upon one side of the slidable member 39′, with a recess 40 formed in said slidable journal box 34. Thus it is obvious that by raising the slidable member 39′ slightly, said retaining lug 39 will be brought out of engagement with said recess 40, whereby the free end of said worm shaft 31 will be moved toward the left (Figs. 2, 4 and 5) when it will be free to revolve without communicating any motion to the worm wheel 30 or the parts connected therewith, and whereby the milling tool will be free to revolve without moving downward in the key seat. As a means of automatically disengaging the worm shaft from the worm wheel, I have interposed a spiral spring 42 between the stop 43 formed on the shaft 35 and the opposing surface 44 of said shaft supporting bearing, whereby as said lug 39 is thrown out of engagement with said recess 40, said shaft 35 will be thrown toward the left (Figs. 2, 4 and 5) by the recoil of the spiral spring 42, when the worm 38 will be automatically brought out of contact with the teeth of the worm wheel 30. As a means of automatically disengaging the lug 39 from the recess 40, I have supported the member 39′ from the vertically moving shaft 45, and said shaft 45 is in turn slidably supported from the movable frame member 17. Thus it will be obvious that as the front end of said movable frame member 17 is moved downwardly as the milling tool cuts its way into the key seat as heretofore described, the lower end of said shaft 45 will be brought in contact with the upper end of the bolt 46, whereby the downward movement of said member 39′ will cease the instant the lower end of said shaft contacts with said bolt 46. Thus it will be understood that by the further downward movement of the frame member 17, the lug 39 will be brought out of contact with the recess 40, when said journal box 34, together with its supporting shaft 35, will be quickly moved toward the left by the recoil of the spiral spring 42 against the stop 43, when the free end of the worm shaft 31 will be moved toward the left, whereby the worm 38 will be brought out of mesh with the teeth of the worm wheel 30, when the further movement of the worm wheel 30 will be automatically stopped, as previously stated, when the milling tool will be free to revolve without moving downwardly in the key seat.

47 is a top view of the shaft in which the key seat is being cut.

48 represents a plurality of key seats adapted to be cut by my machine. It will be understood that for some purposes, it becomes necessary to cut a plurality of slots in the same shaft and it is very desirable that all of said seats be formed in alinement with

each other, and to accomplish this object, it becomes necessary to provide means for preventing the shaft 47 from turning as it is adjusted forwardly beneath the milling tool. To accomplish this object, I have provided a clamping member 49, which is provided with an aperture at 50 for the reception of the shaft 47, and a set screw 51 having threaded bearings in one side of the member 49, whereby it is obvious that as said set screw is turned forwardly against the shaft 47, said member 49 will be rigidly secured to said shaft.

52 is a guide bearing which is rigidly affixed at one end to a stationary part of the machine and upon which the member 49 is adapted to rest. Thus it is obvious that when the member 49 rests upon the member 52, it will prevent the shaft 47 from turning in its bearings as the same is adjusted longitudinally therein preparatory to cutting the key seats 48.

The slidable member 39′ is rigidly affixed to the rod 45 and said rod 45 has slidable bearings in the housing 54. To the lower end of the rod 45 is attached a collar 55 and a spiral spring 56 is interposed between the collar 55 and the upper wall 57 of said housing, and the recoil of said spring 56 is such as to force the rod 45, together with the member 39′ downwardly, whereby the lug 39 is forced into the recess 40 of the member 34. To the collar 55 is attached a handle 58. It will now be obvious that when desirous to disengage the lug 39 from the recess 40, it is necessary simply to move said rod 45 upwardly. The rod 45 may be moved upwardly manually by applying pressure on the lower side of the handle 58, whereby it is obvious that the lug 39 will be disengaged from the recess 40, when the member 34 will be thrown toward the left by the recoil of the spiral spring 42 and whereby the worm shaft 31 will be thrown out of engagement with the worm gear 30, as previously described. While the worm shaft may be thus manually disengaged from the worm gear by applying an upward pressure to the handle 58, the same object is automatically accomplished by contact of the lower end 59 of said rod 45 with the upper end of the screw bolt 46. The lower end of the rod 45 is brought in contact with the upper end of the bolt 46 automatically as the sleeve 11 is turned down on the screw threaded shaft 12, whereby it is obvious that when the opposing ends of said rod 45 and bolt 46 are brought in contact, the recess 40 will gradually be brought out of engagement with the lug 39, whereby as soon as the milling tool 2 has reached the limit of its downward movement as pre-determined by the adjustment of the bolt 46, said movable member 34 will be disengaged from the member 39, when said member 34 will be thrown to the left, as previously described, by the recoil of the spring 42, whereby the movement of the milling tool will be automatically stopped as the required depth of the key seat has been cut. Thus it is obvious that the bolt 46 may be adjusted so that the milling tool will cut a greater or less depth as required before it is automatically stopped.

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

1. In a milling tool of the described class, the combination of a stationary frame member, means for rigidly clamping a shaft to said stationary frame member while cutting a key seat therein, a movable frame member pivotally connected at one side to said stationary frame member, means for yieldingly forcing the opposite side of said movable frame member toward said stationary member, a milling tool carried by said movable member, means carried by said movable frame member for revolving said milling tool as it is forced by said yielding pressure toward said shaft, and means for automatically stopping the downward movement of said milling tool when it has reached the pre-determined depth of the key seat in the shaft to be operated upon.

2. In a milling tool of the described class, the combination of a stationary frame member, means for rigidly clamping a shaft to said stationary frame member while cutting a key seat therein, a movable frame member pivotally connected at one side to said stationary frame member, a spring for yieldingly forcing the opposite side of said movable frame member toward said stationary member, means for controlling the yielding pressure applied to said movable frame member, means for increasing and diminishing the tension of said spring, a milling tool carried by said movable member, means carried by said movable frame member for revolving said milling tool as it is forced by said yielding pressure toward said shaft, means for automatically stopping the downward movement of said milling tool when it has reached the pre-determined depth of the key seat in the shaft to be operated upon, and means for preventing said shaft from turning as a plurality of key seats are cut therein.

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

JOHN L. KUNZ.

Witnesses:
JAS. B. ERWIN,
H. C. VAN RYN.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."