

F. KEMPSMITH & T. L. SMITH.

MILLING MACHINE.

No. 480,198.

Patented Aug. 2, 1892.

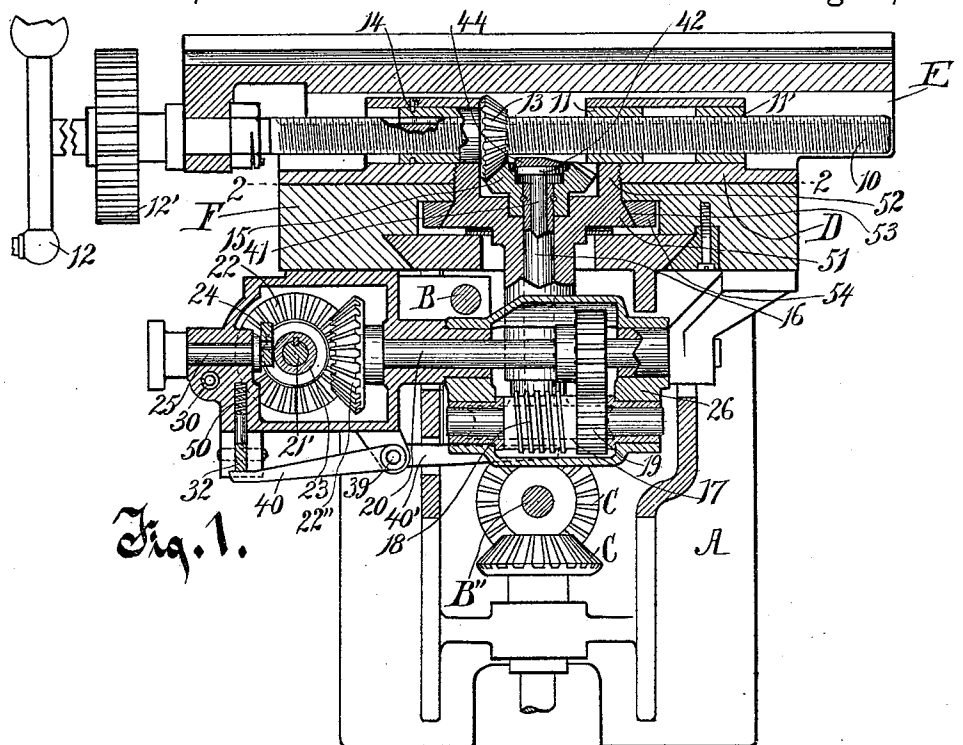
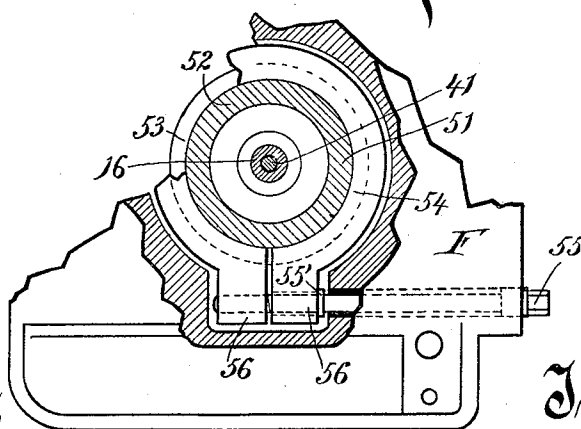


Fig. 2.



Witnesses.

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(No Model.)

2 Sheets—Sheet 2.

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Fig. 3.

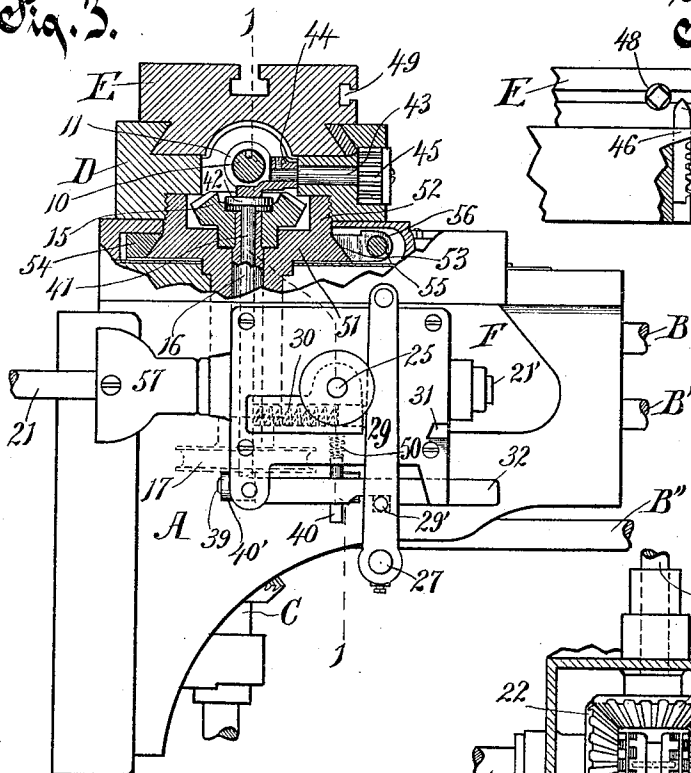


Fig. 4.

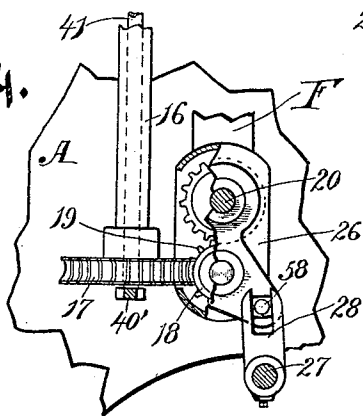


Fig. 6.

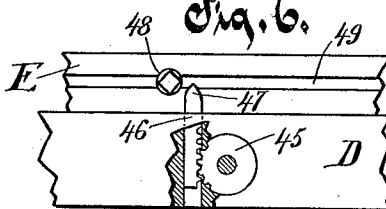
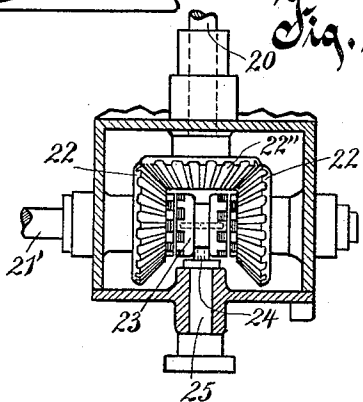


Fig. 5.



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UNITED STATES PATENT OFFICE.

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SAID SMITH ASSIGNOR TO SAID KEMPSMITH.

MILLING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 480,198, dated August 2, 1892.

Application filed December 7, 1891. Serial No. 414,238. (No model.)

To all whom it may concern:

Be it known that we, FRANK KEMPSMITH and THOMAS L. SMITH, of Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented a new and useful Improvement in Milling-Machines, of which the following is a description, reference being had to the accompanying drawings, which are a part of this specification.

Our invention relates to improvements in that class of milling-machines known as "universal" milling-machines, which are distinguished from the ordinary or plain milling-machines by having a work-table arranged to be swiveled to any angle with the spindle, the necessary features of hand and power feed in either direction, and automatic disengagement of the feed at any point of the movement of the table being retained, and equally effective in all angular positions of the table.

The object of our invention is to provide a screw-feed for universal milling-machines which shall be operative in all angular positions of the table, which shall be easily disengaged by hand or automatically at all times, which shall be reversible while the machine is running and which may be used to drive a universal head for cutting spirals; also, to provide an efficient clamping device which shall have no tendency to strain, spring, or warp any of the guiding or sliding surfaces. We obtain these ends by various novel combinations and arrangements of parts shown in the drawings and described in this specification.

Figure 1 is a general section taken longitudinally through the work-table, the plane of the section following the line 1 1 of Fig. 3, the plane of the section being also perpendicular to the spindle, the table being shown for convenience of representation in its normal position. Fig. 2 is a plan view of the mechanism for clamping the work-table guide in any desired angular position. Fig. 3 is a central cross-section of the work-table and its swiveling guide and a partial cross-section of the saddle of the milling-machine. Fig. 4 is a view of the feed-worm and its swinging support, together with the worm-wheel and the vertical feed-driving shaft. Fig. 5 is a plan view of the feed-reversing mechanism. Fig. 6 is an elevation of the parts for automati-

cally disengaging the feed when the table has reached any desired point of its traverse.

The same letters and figures refer to similar parts throughout the several views.

A is the knee of the milling-machine and is gibbed to a vertical slide on the column or frame of the milling-machine. The knee may be raised or lowered to any desired position on the column by means of the crank-shafts B' or B'', the miter-gears CC, and the elevating-screw driven thereby. As the column of the machine does not enter into this specification further, it is omitted in the drawings. Upon the knee A is mounted the saddle F in the usual manner. It may be adjusted to any position on the knee toward or away from the column by the feed-screw B. The saddle supports the table-guide D and its table E. To the under side of this table-guide D is rigidly attached a cylindrical bearing-piece 52, fitting in a hole bored in the top of the saddle. This cylindrical surface is the pivot for swiveling the table-guide. The lower part or base 51 of this bearing-piece 52 has a conical peripheral surface for clamping the table-guide and saddle together, to be described hereinafter, and a dependent bearing for the vertical feed-driving shaft 16. For convenience the table-guide and its attached bearing-piece will be spoken of hereinafter as the "turn-table."

The work-table E slides in ways formed in the upper part of the table-guide D (see Fig. 3) and may traverse in any direction by means of feed-screw 10, by hand through the crank 12 or by power through the gears 13 and 15, as follows: Motion is transmitted to the shaft 21 from the spindle by means of a belt running on cone-pulleys, as is usual in milling-machines. The shaft 21 is telescopic, sliding into a sleeve (not shown) to permit the movement of the saddle F on the knee A. The shaft 21 drives the shaft 21' by means of the universal joint 57, which permits the vertical movement of the knee. Shaft 21' carries two bevel-gears 22 and 22', Fig. 5, loosely mounted upon it, (the inner hubs of these gears being formed into clutch-teeth,) and a clutch 23, feathered and arranged to slide into engagement with either of clutch-gears 22 and 22'. It will be seen that with shaft 21' always turning one way shaft 20 can be driven either

way by shifting the clutch from one gear to the other. This shifting of the clutch is accomplished by the hand crank-shaft 25, Figs. 1 and 5, the crank-pin carrying a bearing-block 24, riding in a groove cut in the periphery of the clutch. The operator by rotating shaft 25 by hand can reverse the direction of motion of shaft 20 while the machine is running. Shaft 20, Fig. 1, extends through the knee and is supported by bearings dependent from and fixed to the saddle F. The hubs of these bearings are formed into journals to support the swinging frame 26, which carries the feed-worm 18. The feed-worm and shaft 20 are connected by spur-gears, and as the bearings supporting the frame 26 are concentric with shaft 20 the operation of these gears cannot be affected by swinging the frame 26. The feed-worm can be engaged with worm-wheel 17, Fig. 4, thus driving the vertical shaft 16 and gear 15, Fig. 1, which in turn actuates gear 13 and rotates the feed-screw 10 through the nuts 11 and 11', thus traversing the table E by power.

The power-feed is set in operation at will by swinging the frame 26 so as to bring the feed-worm 18 into engagement with its worm-wheel 17 and is stopped by reversing this operation. Fig. 4 shows the feed engaged. It is held in engagement by the rock-shaft 27, which carries at its inner end a lever 28, Fig. 4, slotted to act against the pin 58 in the frame 26. On the outer end of shaft 27 is the upright lever 29, Fig. 3, on which is the square pin 29'. The latch 32 is notched to drop over this pin when the worm is engaged, preventing the backward movement of lever 29 and shaft 27, thus holding the worm in engagement with the worm-wheel. A spring 50, in the saddle bears against the latch 32 and holds it yieldingly in engagement with pin 29. The feed can be disengaged by hand by simply lifting the latch 32, which allows the spring 50 to press lever 29 back, and, acting through the rock-shaft 27 and lever 28, throws the swinging frame over, so as to disengage the worm. The lever 29 is forced by the spring against the stop-piece 31, which limits its movement.

The automatic disengagement of the power-feed is accomplished as follows: A rock-shaft 39, journaled under the reversing-gear, Fig. 1, carries two arms or levers, 40 extending under the latch 32 and 40' extending under the center of the turn-table and vertical shaft 16. This vertical shaft is made tubular and a rod 41 passes down through it, the lower end of which rod rests on the lever 40', the upper end of which rod is formed into a button 42. It will be seen that the downward movement of the rod will raise the latch 32 and disengage the feed. A stud-bolt 48 can be made fast at any point in the T-slot 49, which runs the whole length of the table. This stud-bolt is set so that when the desired point of the movement of the table is reached

the traverse of the table will bring it against the trip-pin 47, Fig. 6, forcing it down, the rack-teeth of the trip-pin engaging gear 45 and revolving it with its shaft 43 and the cam 44, (see Fig. 3,) rigidly secured to the shaft. In Fig. 1 the end or foot of the cam 44 only is shown under the feed-screw 10 and resting on the button 42. The rotation of the cam swings this foot out of the horizontal position shown, pressing the rod 41 down and disengaging the power-feed. It will now be apparent, since the tubular feed-driving shaft is in the center of the turn-table and the feed-tripping rod within the tubular feed-driving shaft is also in the center of the turn-table, that neither the power-feed nor automatic disengagement of the feed can be affected by any angular position to which the work-table and turn-table may be moved.

The bearing-piece 52 of the turn-table is provided with a conical surface 53, as shown in Figs. 1, 2, and 3, encircled by a split clamping-ring 54, having an interior conical surface engaging the exterior cone on 52, and a clamping-screw 55, supported by the saddle, is arranged to close or bind the ring 54 on the bearing-piece 52. By tightening screw 55 the ring is caused to close and draws downward on the bearing-piece 52 and table-guide D, at the same time itself moving upward on the cone. The portion of the saddle between the table-guide D and ring 54 is thus compressed; but as the surfaces are parallel no side strain is thrown on the parts and the desired resistance to the rotation of the turn-table is obtained without destroying the adjustment of any of the parts.

On the feed-screw 10 is shown a gear 12', which may be used to drive the index-worm of a universal head on the work-table E. The machine is thus adapted to cut spirals with power-feed, the unlimited swivel of the turn-table permitting spirals of any angle to be milled.

What we claim as our invention, and desire to secure by Letters Patent, is—

1. In a milling-machine, the combination of a tubular vertical feed-driving shaft journaled in the turn-table, gearing for actuating said shaft and for connecting said shaft with the table-feeding screw, and a rod passing through the tubular shaft arranged to disengage the actuating-gearing, substantially as described.

2. In a milling-machine, the combination, with a tubular vertical shaft journaled in the center of the turn-table and geared to the table-feeding screw and to actuating mechanism, of a rod passing through the shaft, movable endwise therein, and means for imparting motion thereto by the movement of the work-table, and thereby to disengage the actuating mechanism, substantially as described.

3. In a milling-machine, the combination of a tubular vertical shaft journaled in the turn-table and geared to the table-feeding screw, a movable rod extending through it, a cam

above the rod, arranged to engage with and force it downward, means on the traversing table, adapted to engage and actuate the cam, and a lever below the rod, arranged to be tilted thereby and to lift a latch and disengage the feed-driving mechanism, substantially as described.

4. In a milling-machine, the combination of a vertical shaft journaled in the turn-table, geared to the table-feeding screw, and carrying a worm-wheel rigid thereon, with a driven shaft, a worm geared thereto at a right angle to the vertical shaft, and a swinging frame in which the worm is journaled, which frame is pivoted about the driven shaft and arranged to carry the worm into and out of engagement with the worm-wheel, substantially as set forth.

5. In a milling-machine, the combination of a driving-shaft, a driven shaft, a worm geared to the driven shaft and journaled in a swinging frame concentric with the driven shaft, which frame is adapted to swing the worm into and out of engagement with its worm-wheel without affecting its driving connections, and gears on the driving and driven shafts for reversing the direction of motion of the worm, substantially as described.

6. In a milling-machine, the combination of a vertical feed-driving shaft carrying a worm-wheel, a worm mounted in a swinging frame, the swinging frame fulcrumed to carry the worm into and out of engagement with the worm-wheel without affecting its driving connections, and a nest of three bevel-gears, two running loosely on a driving-shaft and provided with inwardly-projecting clutch-faces arranged to be singly engaged by a sliding clutch between them, feathered to said driving-shaft, whereby the third gear, the worm, and worm-wheel can be driven in either direction at will, substantially as shown, and for the purposes set forth.

7. In a milling-machine, the combination of a vertical feed-driving shaft journaled in the turn-table and carrying a worm-wheel, a feed-worm journaled in a swinging frame, arranged to carry the worm into and out of engagement with the worm-wheel without affecting its driving connections, a rock-shaft with a lever on its inner end, engaging the swinging frame, and a hand-lever on its outer end, provided with a pin or detent, and a latch or hook engaging the pin or detent when the worm is engaged with worm-wheel, substan-

tially as set forth, and for the purpose specified.

8. In a milling-machine, the combination of a rock-shaft 39, a latch 32, a lever 40, extending under the latch 32, a lever 40', extending under the center of the turn-table, and a vertical rod 41, extending upward through the center of the turn-table, resting on lever 40', and arranged by suitable connections to the work-table to be depressed by the work-table, so as to lift the latch 32, for the purposes set forth.

9. In a milling-machine, the combination, with the shaft 43, journaled in the turn-table and provided with cam 44 and pinion 45, a movable rack-provided pin 46, and means on the traversing table for actuating the pin, of the vertical rod 41, passing through the center of the turn-table and movable downwardly by the limited rotation of the cam, latch 32, and a lever actuated by the rod to lift the latch 32, substantially as described.

10. In a milling-machine, the combination of a turn-table consisting of a table supporting and guiding plate, as D, and a guiding and bearing piece, as 52, rigid to the plate and provided with a peripheral conical surface, with a saddle in which the bearing-piece is received, and a contractible clamping-ring provided with an interior conical surface formed to engage the conical surface of the bearing-piece and when contracted to bear evenly against the saddle on surfaces thereof about and on opposite sides of the axis of the bearing-piece, substantially as described.

11. In a turn-table for a milling-machine, the combination of the table supporting and guiding plate D, the bearing-block 51, rigidly attached thereto and provided with exterior cylindrical guiding-surface, exterior conical clamping-surface, and interior shaft-bearing, the split clamping-ring 54, with interior conical surface and upper plane surface encircling cone on bearing-block, and the clamping-screw 55, substantially as shown and described, and for the purposes set forth.

In testimony whereof we affix our signatures in presence of two witnesses.

FRANK KEMPSMITH.
THOMAS L. SMITH.

Witnesses:

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