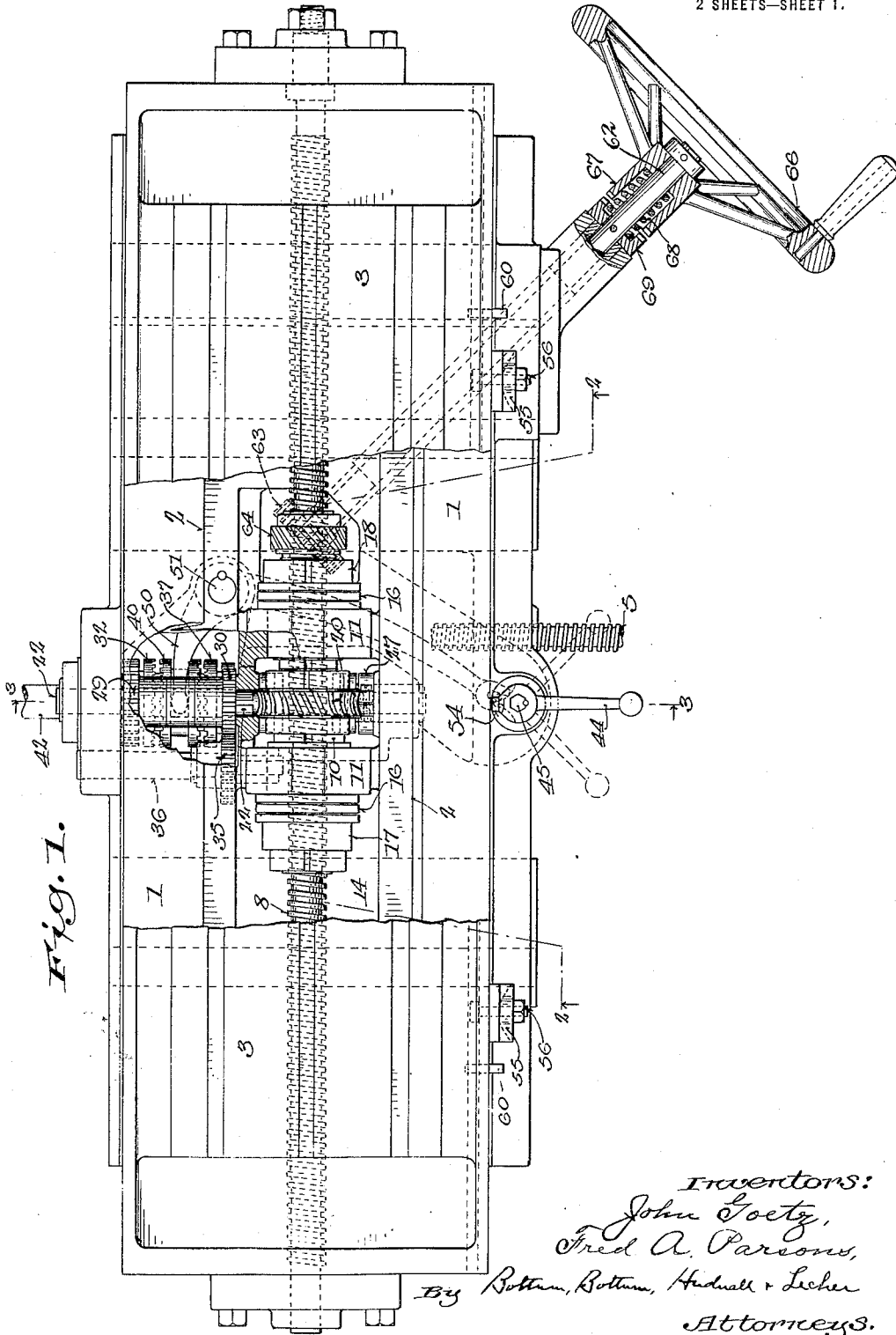


J. GOETZ AND F. A. PARSONS.
TABLE OPERATING MECHANISM FOR MACHINE TOOLS.
APPLICATION FILED MAY 17, 1919.

1,397,731.

Patented Nov. 22, 1921.

2 SHEETS—SHEET 1.



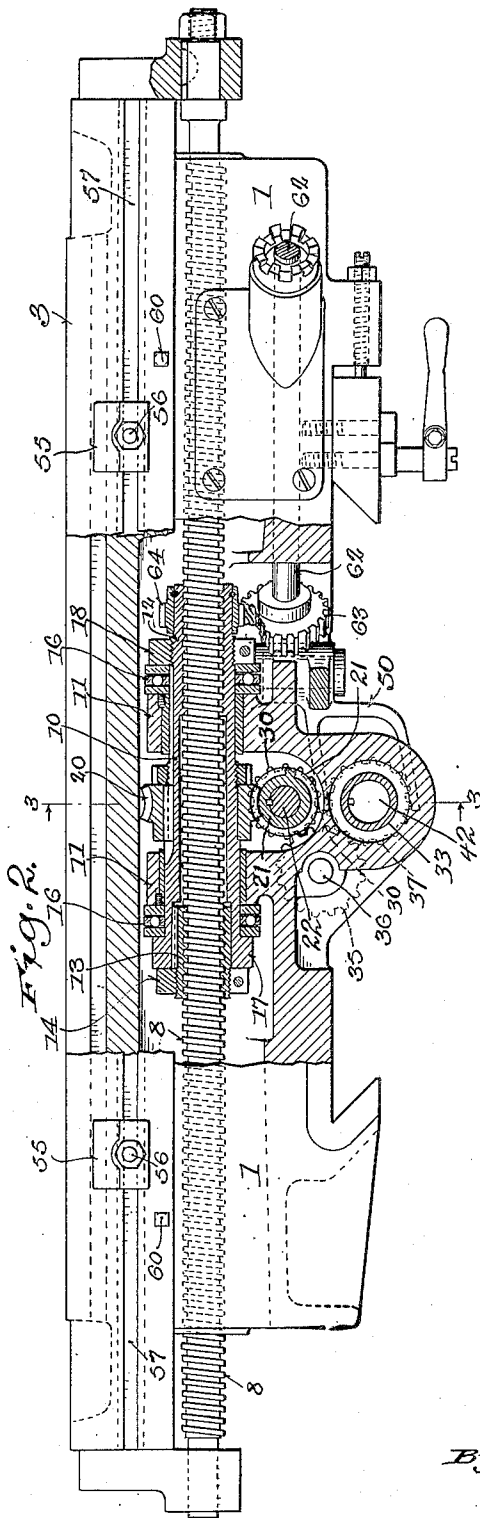
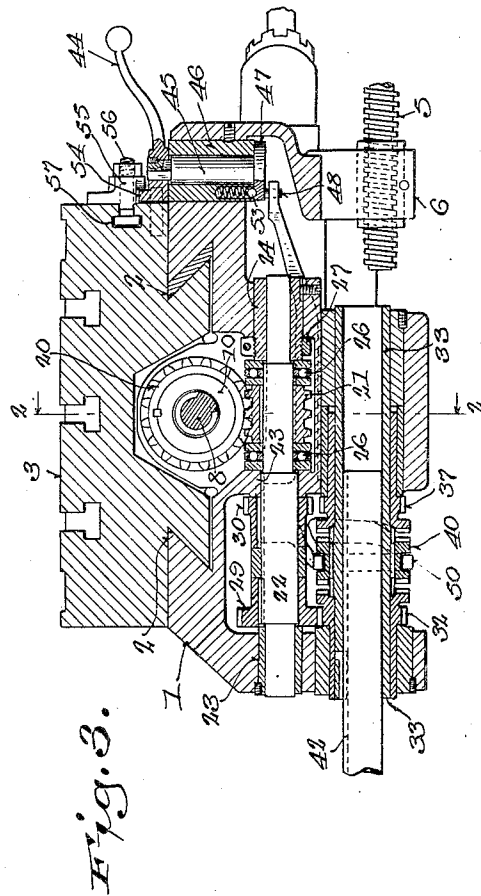
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Inventors:
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UNITED STATES PATENT OFFICE.

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TABLE-OPERATING MECHANISM FOR MACHINE-TOOLS.

1,397,731.

Specification of Letters Patent.

Patented Nov. 22, 1921.

Application filed May 17, 1919. Serial No. 297,921.

To all whom it may concern:

Be it known that we, JOHN GOETZ and FRED A. PARSONS, citizens of the United States, residing, respectively, at Wauwatosa and at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Table-Operating Mechanism for Machine-Tools, of which the following is a specification, reference being had to the accompanying drawing, forming a part thereof.

The main objects of the invention are to secure rigidity or firmness of support, steadiness or smoothness in the movements of the work, and simplicity and compactness of the driving and controlling mechanism; to provide for moving the table in either direction by hand or by power, for automatically stopping it at the limits of its traverse or at any predetermined intermediate point or points in its traverse, and for stopping or reversing its movement by hand at any point in its traverse; to prevent further movement of the table in either direction by power after it has been automatically arrested at an intermediate point in its traverse without changing the adjustment of the automatic tripping device; to facilitate control of the operation of the table; and generally to simplify and improve the construction and operation of the table operating and controlling mechanism.

The claims in this application are for specific table operating mechanism comprising a non-rotatable translating screw fastened to the table, a non-translating rotatable nut mounted on the support for the table in engagement with the screw, a worm gear fixed on the nut, and a worm mounted in a fixed bearing on the table support in constant engagement with the worm gear, such mechanism being disclosed but not specifically claimed in United States Letters Patent No. 1,322,939, dated November 25, 1919.

It consists in the construction, arrangement and combination of parts as hereinafter particularly described and pointed out in the claims.

In the accompanying drawing like characters designate the same parts in the several figures.

Figure 1 is a plan view of a saddle and table unit or assemblage of a milling machine em-

bodying the invention, the middle portion of the table being broken away to disclose the saddle and table operating mechanism mounted thereon; Fig. 2 is a partial front elevation and partial vertical longitudinal section on the line 2—2, Figs. 1 and 3; and Fig. 3 is a vertical cross section on the line 3—3, Figs. 1 and 2 of the assemblage.

A table supporting saddle 1, adapted to be mounted upon and to traverse the knee (not shown) of a milling machine, is provided on the upper side transversely to the saddle ways on the knee with parallel ways 2, for a work table 3.

The saddle with the table is cross-traversed or shifted and adjusted horizontally on the knee transversely to the table ways 2, by means of a screw 5 engaging a nut 6 on the saddle, as shown in Fig. 3, and having a fixed bearing (not shown) in the base or frame of the machine.

The table 3, which is guided and movable horizontally on the saddle by the ways 2 transversely to the ways on the knee, is provided on the under side with a nonrotatable translating screw 8, fastened at its ends to the table parallel with the ways 2. A sleeve 10 rotatably mounted in bearings 11 on the saddle in axial alinement with the screw 8, is provided with two nut members 12 and 13 engaging with the screw. The nut member 13 is splined and axially adjustable in the sleeve 10 to take up wear or play between the screw and nut members, and is adjusted and held in place by a nut 14 threaded on the member 13 and abutting against the end of the sleeve 10. The sleeve and nut members are held against axial displacement relative to the saddle by ball thrust bearings 16, interposed between the bearings 11 and a flange or shoulder 17 on one end of the sleeve and an adjusting nut 18 threaded on the other end of the sleeve. A worm gear 20, keyed or fixed on the sleeve 10 between the bearings 11, meshes with a worm 21 fixed on a shaft 22, supported, as shown in Fig. 3, by bearings 23 and 24 in the saddle below and transversely to the screw 8. The worm 21 is held against axial displacement or play by ball thrust bearings 26, interposed between the ends of the worm and adjacent bearings 23 and 24, the bearing 24 being axially adjustable and locked in adjusted po-

sition by a nut 27 threaded thereon, to take up wear or play in the thrust bearings.

The shaft 22 is provided with two fixed gears 29 and 30, the gear 29 meshing with a gear 32 loosely mounted on a sleeve 33 supported by bearings in the saddle below and parallel with the shaft 22.

The gear 30 meshes with an intermediate reversing gear 35, which is mounted on a stud 36, fixed in the saddle parallel with the shaft 22 and meshes with a gear 37 loosely mounted on the sleeve 33.

A clutch collar or member 40, is splined or feathered on the sleeve 33 between the gears 32 and 37, and is shiftable into engagement with corresponding clutch members formed on or attached to said gears, or into an intermediate neutral position, as shown in Fig. 3, out of driving engagement with both of the gears.

A power transmission or driving shaft 42 is feathered or splined in the sleeve 33, in which it has a sliding bearing, the sleeve being shiftable with the saddle and table lengthwise of the shaft.

The clutch member 40 may be shifted manually into engagement with either of the gears 32 and 37 for feeding or traversing the table in either direction, or into its middle neutral position for arresting the table, or it may be shifted automatically out of engagement with either gear into its neutral position to arrest the movement of the table in either direction by the following means:

A hand lever 44 is fastened to the upper end of a vertical pivot stem 45, which is mounted in a removable bushing 46 in the front side of the saddle within convenient reach of the operator.

The lower end of the stem 45 is formed or provided with a flange or head 47 and a crank pin 48.

A lever 50, fulcrumed on a vertical pin 51 in the saddle, has forked ends, one of which engages with an annular groove in the clutch member 40, and the other with the crank pin 48.

When the lever 44 is in its middle position, as shown by full lines in Fig. 1, the clutch member 40 is in its neutral position, and operative connection between the table 3 and shaft 42 is interrupted. By turning the lever 44 to the right, as indicated by dotted lines in Fig. 1, the clutch member 40 is shifted into engagement with the gear 32 for feeding or traversing the table to the right. By turning said lever to the left, as also indicated by dotted lines in Fig. 1, the clutch member 40 is shifted into engagement with the gear 37, for operatively connecting the shaft 42 through the reversing gear 35 and the gear 30 with the worm shaft 22, and feeding or traversing the table in the reverse direction or to the left. The

direction of movement of the lever 44 thus corresponds with the direction of the resulting movement of the table and unmistakably indicates to the operator the direction in which the lever should be turned to produce movement of the table in the desired direction.

A spring actuated ball or detent 53, confined in a socket in the bushing 46, as shown in Fig. 3, by engagement with spaced sockets or seats in the flange or head 47 of the pivot stem 45, yieldingly holds the lever 44 in either of its extreme positions indicated by dotted lines in Fig. 1, or in its middle neutral position in which it is shown by full lines in the same figure.

The lever 44 is formed or provided with an upwardly projecting lug or trip member 54, close to the front side of the table 3, and one or more dogs 55, are removably and adjustably fastened to the front side of the table by bolts 56, the heads of which engage with a longitudinal T-groove 57. Each dog is formed with a downwardly projecting flange having beveled ends, as shown in Figs. 1 and 3, adapted by engagement with the lug or trip member 54 when the table is fed or traversed in either direction, to turn the lever 44 with the crank pin 48 into and leave it in its middle or neutral position, thereby arresting further movement of the table in the same direction, and permitting the lever to be turned to operate the table in the opposite direction by power.

After the movement of the table in either direction has been arrested by a dog at an intermediate point in its traverse, its further movement by hand in the same direction can be effected, since the dog can pass and clear the lug or trip member 54 in its middle position.

The table 3 is also provided on the front side with fixed pins or projections 60, which by engagement with cam surfaces on the hub of the lever 44 below the lug 54, will automatically shift the lever 44 from either of its extreme positions into its middle position, thereby shifting the clutch member 40 out of engagement with either gear 32 or 37, stopping the table as it reaches the limit of its traverse in either direction, and preventing further movement in the same direction and consequent injury to the machine.

A shaft 62, mounted in the saddle 1 obliquely to the screw 8, is provided at its inner end with a spur gear 63, meshing with a spiral gear 64, fixed on the sleeve 10. At its outer end, conveniently accessible to the operator, the shaft 62 is provided, as shown in Fig. 1, with a hand wheel or crank 66, loosely mounted thereon and formed or provided on its hub with a clutch member 67, which is held normally by a spring 68 out of engagement with a corresponding clutch member 69 fixed on the shaft.

When the clutch member 40 is in its middle neutral position, so that the gears 32 and 37 can turn freely on the sleeve 33 independently of the power shaft 42, the operator can manually feed or traverse the table 3 by thrusting the hand wheel or crank 66 inward till the clutch member 67 engages the clutch member 69, and then turning the hand wheel or crank in the proper direction to effect the desired table movement, the pitch or lead of the worm and worm gear teeth being such that the worm 21 and the gears 29, 30, 32, 35 and 37 will run freely when the worm gear 20 is turned by the hand wheel or crank 66. In this way the table can be moved by hand in either direction after it has been stopped by the engagement of a dog 55 with the lug 54, and while the lever 44 can be turned into position to effect a reverse movement, it cannot be turned into position to effect further movement in the same direction by power.

With the mechanism shown and described, it will be seen that the table may be fed or traversed in either direction by power or by hand, and that it will be automatically stopped at the limits of its traverse by the fixed pins or projections 60, or at any predetermined point or points of its traverse by an adjustable dog or dogs 55, or its movement may be arrested and reversed by hand at any point in its traverse.

It will also be observed that the smooth driving principle of the worm and worm gear is utilized in the power transmission, and the worm being located close to the table and connected directly with the screw 8 by a worm gear and nut, the worm remaining in constant mesh with or fixed driving relation to the worm gear, and provision being made to prevent end play of the worm and to take up wear and lost motion between the nut and screw, not only a simple, self-contained, compact arrangement of the table operating and controlling mechanism is obtained, but also rigidity or firmness of support for the work, and smooth, steady movements of the table are secured.

The movements of the table are controlled by a single lever in the simplest manner, the direction of movement of the lever indicating the direction of movement of the table, and thus avoiding confusion and mistakes and facilitating the operation and control of the table.

Various changes in the construction and arrangement of parts of the mechanism may be made without departure from the principle and scope of the invention as defined in the following claims.

We claim:

1. In table operating mechanism for machine tools, the combination with the table and a support therefor, of a non-rotatable translating screw fastened to the table, a non-translating rotatable nut mounted on said

support in engagement with the screw, a worm gear fixed on the nut, a worm mounted in a fixed bearing on the table support in constant engagement with the worm gear, a rotary power driving member, and transmission mechanism comprising a clutch for operatively connecting and disconnecting the worm and driving member.

2. In table operating mechanism for machine tools, the combination with a saddle and a table movably mounted thereon, of a nonrotatable translating screw fastened to the table, a nontranslating rotatable nut mounted on the saddle in engagement with the screw, a worm gear mounted on the nut, a worm mounted in a fixed bearing on the saddle in constant engagement with the worm gear, a power transmission shaft, reversing mechanism between said shaft and the worm and means for connecting and disconnecting the reversing mechanism and transmission shaft.

3. In table operating mechanism for machine tools, the combination with a movable saddle and a table movably mounted on the saddle, of a nonrotatable translating screw fastened to the table, a nontranslating rotatable nut mounted on the saddle in engagement with the screw, a worm gear mounted on the nut, a worm mounted in a fixed bearing on the saddle in constant engagement with the worm gear, reversing mechanism mounted on the saddle and connected with the worm, a driving shaft arranged transversely to the screw and having a sliding connection with the reversing mechanism, and means for operatively connecting and disconnecting the reversing mechanism and the driving shaft.

4. In table operating mechanism for machine tools, the combination with a saddle and a table movably mounted thereon, of a nonrotatable translating screw fastened to the table, a nut journaled in the saddle in engagement with the screw, a worm gear mounted on the nut, a worm mounted in a fixed bearing on the saddle in constant engagement with the worm gear, reversing mechanism, connected with the worm, a power transmission shaft, manually operated means for operatively connecting and disconnecting said shaft and worm through the reversing mechanism, and means connected with the table for automatically disconnecting said shaft and worm through the reversing mechanism at a predetermined point in the traverse of the table.

5. In table operating mechanism for machine tools, the combination with a saddle and a table movably mounted thereon, of a nonrotatable translating screw fastened to the table, a nontranslating rotatable nut journaled in the saddle in engagement with the screw, a worm gear mounted on the nut, a worm mounted in a fixed bearing on the

saddle in constant engagement with the worm gear, a power transmission shaft, reversing mechanism mounted on the saddle for connecting said shaft and worm to drive the table in either direction, manually operated means for shifting a member of the reversing mechanism into either of its operative positions or into inoperative position to connect the worm and power transmission shaft, and means connected with the table for automatically shifting said member into inoperative position at a predetermined point in the traverse of the table.

6. In table operating mechanism for machine tools, the combination with a saddle and a table movably mounted thereon, of a nonrotatable translating screw fastened to the table, a nontranslating rotatable nut mounted on the saddle in engagement with the screw, a worm gear mounted on the nut, a worm mounted in a fixed bearing on the saddle in constant engagement with the worm gear, a power transmission shaft, means comprising a shiftable member for operatively connecting and disconnecting said shaft and worm, a trip member pivotally mounted on the saddle and connected with said shiftable member, and a dog adjustably mounted on the table and adapted by engagement with the trip member to automatically arrest the table at a predetermined point in its traverse.

7. In table operating mechanism for machine tools, the combination with a saddle and a table movably mounted thereon, of a nonrotatable translating screw fastened to the table, a nontranslating rotatable nut mounted on the saddle in engagement with the screw, a worm gear mounted on the nut, a worm mounted in a fixed bearing on the saddle in constant engagement with the worm gear, a power transmission shaft, means comprising a shiftable member for

operatively connecting and disconnecting said shaft and worm, a trip member pivotally mounted on the saddle and connected with said shiftable member, and a fixed projection on the table adapted by engagement with said trip member to arrest the movement of the table at the limit of its traverse.

8. In table operating mechanism for machine tools, the combination with a saddle and a table movably mounted thereon, of a nonrotatable translating screw fastened to the table, a nontranslating rotatable nut mounted on the saddle in engagement with the screw, a worm gear mounted on the nut, a worm mounted in a fixed bearing on the saddle in constant engagement with the worm gear, a power transmission shaft, reversing mechanism comprising a shiftable member for operatively connecting said shaft with the worm, and a lever connected with said shiftable member when swung in either direction to effect movement of the table in a corresponding direction.

9. In table operating mechanism for machine tools, the combination with a saddle and a table movably mounted thereon, of a nonrotatable translating screw fastened to the table, a nontranslating rotatable nut mounted on the saddle in engagement with the screw, a worm gear mounted on the nut, a worm mounted in a fixed bearing on the saddle in constant engagement with the worm gear, a power transmission shaft, reversing mechanism comprising a shiftable member movable into positions for connecting the shaft and worm to drive the table in opposite directions and into inoperative position, and a lever connected with said movable member.

In witness whereof we hereto affix our signatures.

JOHN GOETZ.
FRED A. PARSONS.