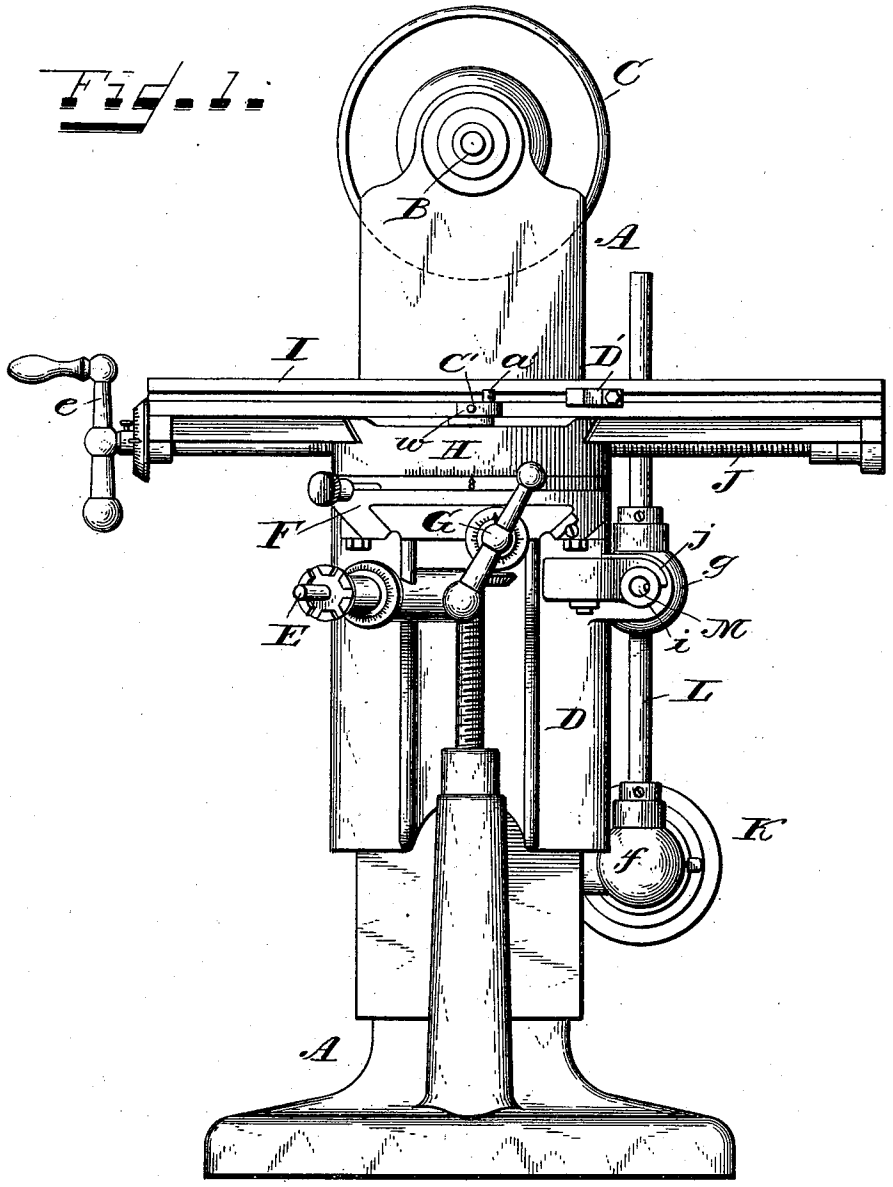
(No Model.) 4 Sheets—Sheet 1.

F. HOLZ.

MILLING MACHINE.

No. 513,683. Patented Jan. 30, 1894.

Fig. 1.



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(No Model.)

4 Sheets—Sheet 2.

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Fig. 2.

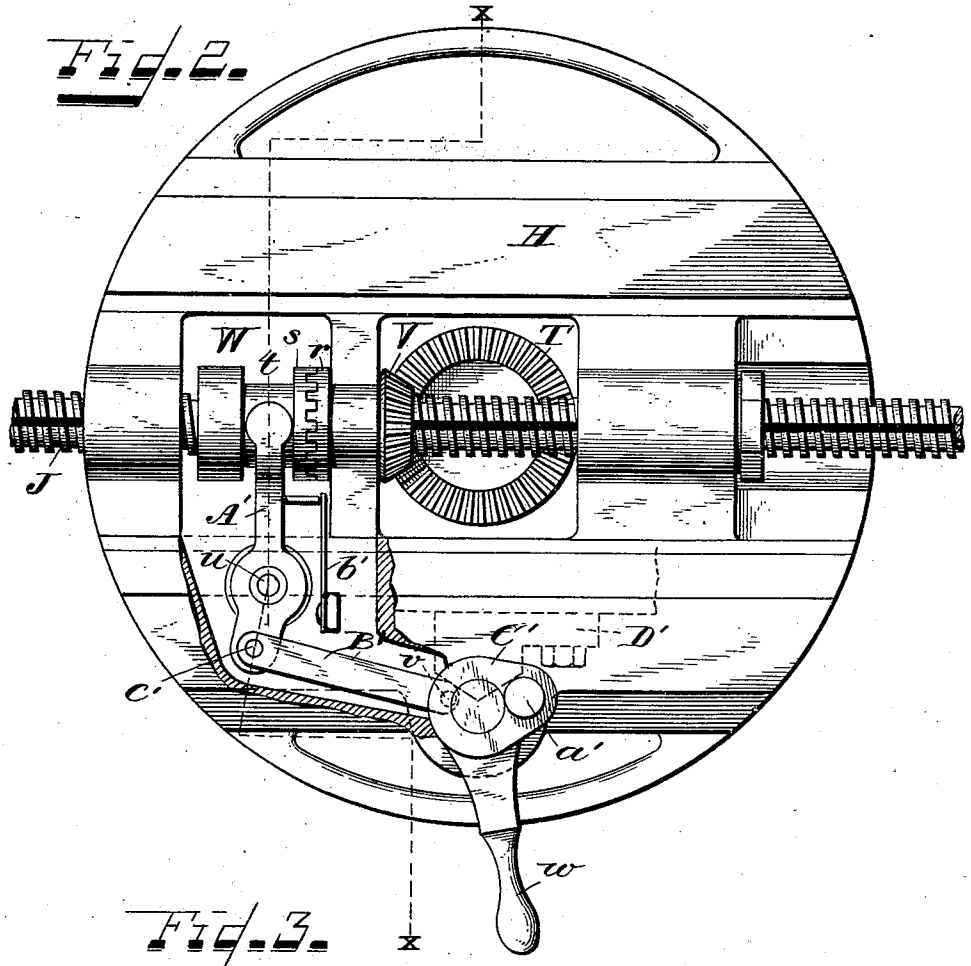
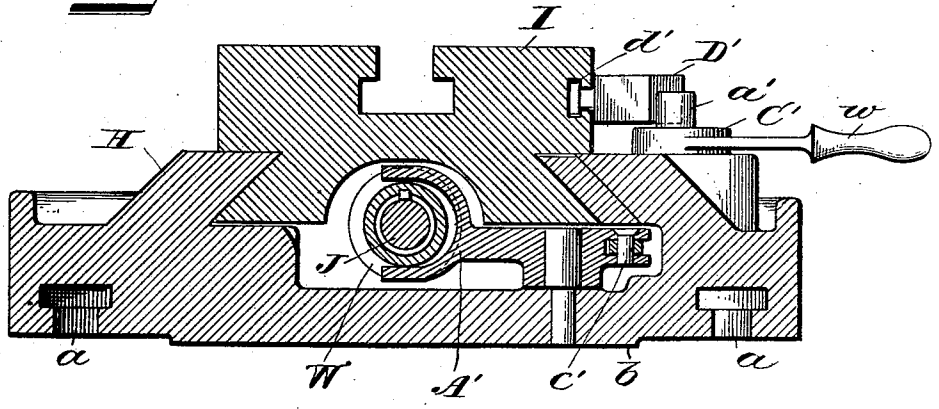


Fig. 3.



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MILLING MACHINE.

No. 513,683. Patented Jan. 30, 1894.

Fig. 4.

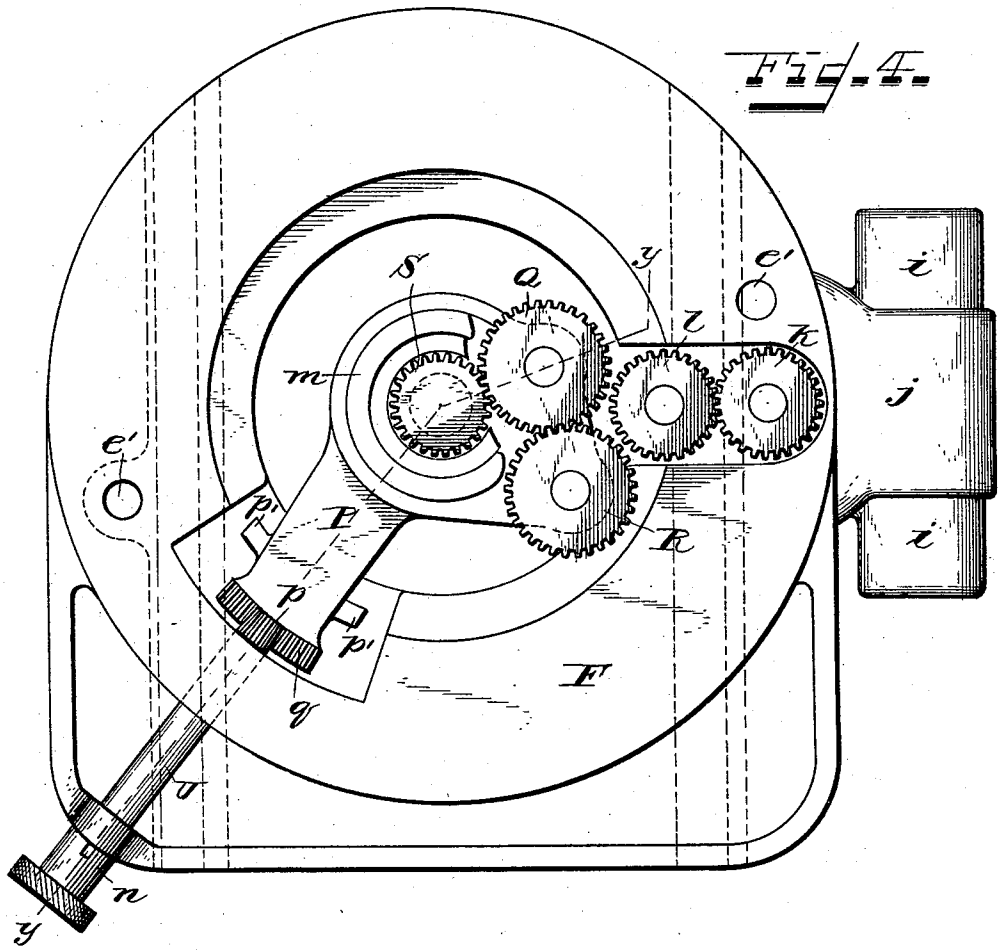
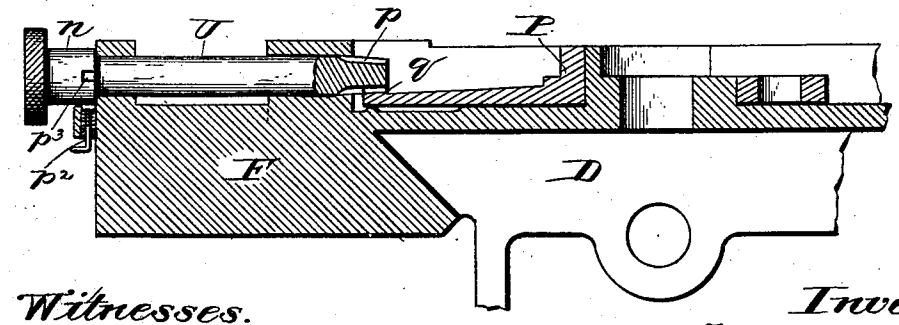


Fig. 5.



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MILLING MACHINE.

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Fig. 6.

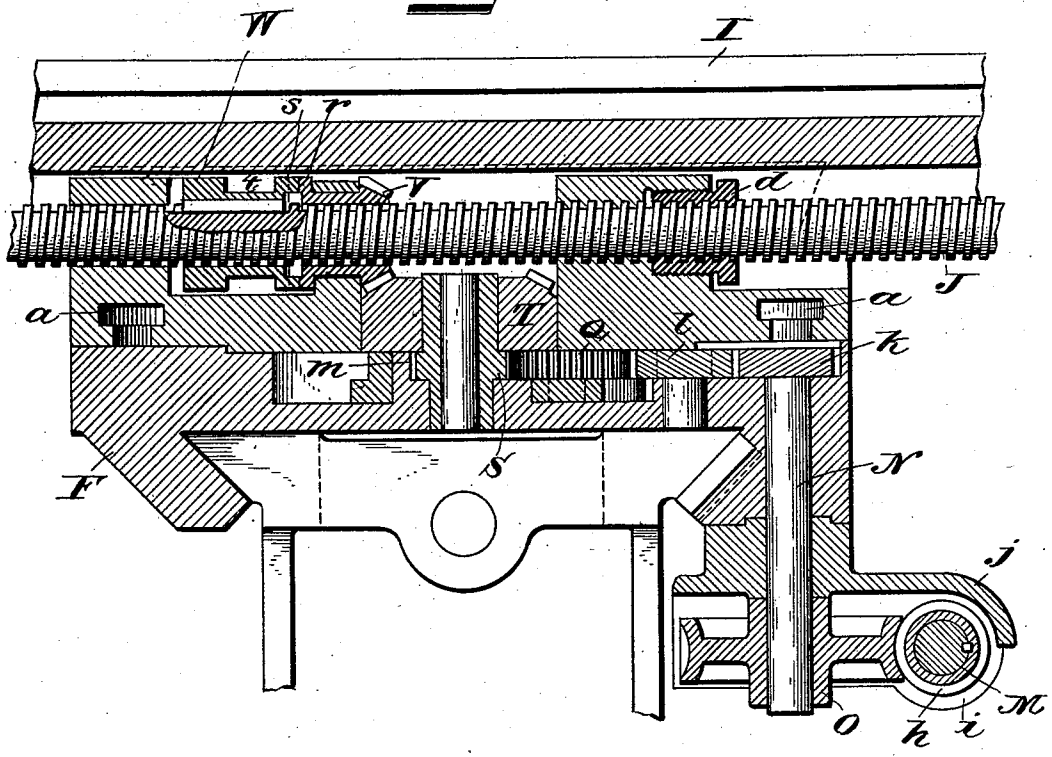
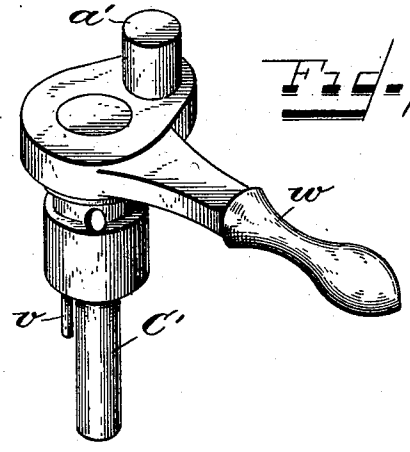


Fig. 7.



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UNITED STATES PATENT OFFICE.

FREDERICK HOLZ, OF CINCINNATI, OHIO, ASSIGNOR TO THE CINCINNATI MILLING MACHINE COMPANY, OF SAME PLACE.

MILLING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 513,683, dated January 30, 1894.

Application filed May 22, 1893. Serial No. 475,127. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK HOLZ, a citizen of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in 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 that class of machines known as universal milling machines wherein the work-carrying table has all of the independent movements common to such machines, and its object is to improve the construction of the various mechanisms whereby greater strength, rigidity and efficiency of action are obtained.

The novelty of my invention will be hereinafter set forth and specifically pointed out in the claims.

In the accompanying drawings:—Figure 1, Sheet 1, is a front elevation of a milling machine embodying my invention. Fig. 2, Sheet 2, is an enlarged plan view of the monitor housing. Fig. 3, Sheet 2, is a sectional elevation of the same through the dotted line *x*—*x* of Fig. 2. Fig. 4, Sheet 3, is an enlarged plan view of the saddle. Fig. 5, Sheet 3, is a sectional elevation of part of the same on the dotted line *y*—*y* of Fig. 4. Fig. 6, Sheet 4, is an enlarged sectional elevation on the axis of the feed shaft showing part of the table, the monitor housing, the saddle, and part of the knee, and the parts therein contained. Fig. 7, Sheet 4, is an enlarged perspective of the clutch operating handle and eccentric.

The same letters of reference are used to indicate identical parts in all the figures.

Referring to Fig. 1, in describing the machine in general which may be of the usual or any suitable construction, A is the frame or standard of the machine in the top of which is journaled the cutter arbor or live spindle B driven by the usual cone pulley C.

D is the knee dovetailed on the front of the frame and vertically adjustable by screw shaft E in the usual or any suitable manner. The saddle F is dovetailed on the knee and is adjustable in and out by the screw shaft G.

Adjustably locked to the saddle by easily accessible bolts through openings *e'*, Fig. 4, in the same, is a circular monitor housing H, with a circumferential T slot *a*, Fig. 3, on its under side for the heads of the locking bolts; and this housing is centered by a boss *b*, Fig. 3, engaging a bore on the upper side of the saddle. The work carrying table I is dovetailed in the top of the monitor housing and is provided with the usual feed screw J engaging a threaded bore *c*, Fig. 6, formed in the monitor housing, which bore is provided with a threaded sleeve *d* for taking up wear or back-lash, and the screw is operated by hand from the hand wheel *e* or by the machine automatically by mechanism to be presently described.

On the back of the arbor B is the usual cone pulley, not shown, but belted to a cone pulley K, Fig. 1, on a horizontal shaft journaled on the lower side of the frame and having at its forward end a bevel pinion meshing with a similar pinion on a vertical shaft L both of which pinions are confined in a globular housing *f*.

Journaled on the side of the knee just under the saddle is a horizontal worm shaft M having on its rear end a bevel pinion meshing with a similar pinion feathered so as to slide on the vertical shaft L and both of these pinions are confined in a globular housing *g*.

Feathered so as to slide upon the shaft M is a worm *h*, Fig. 6, confined between ears *i* on a hood *j* projecting from and carried by the saddle; and journaled in the saddle is a vertical shaft N, Fig. 6, having fast on its lower end a worm wheel O constantly meshing with the worm *h* and on its upper end, in a recess in the top of the saddle, a pinion *k*, Figs. 4 and 6. The pinion *k* meshes with a similar pinion *l* journaled in the recess in the top of the saddle.

Pivoted upon a central boss *m*, in the recess on the top of the saddle, which boss is cut away on one side as shown in Fig. 4, is a bell-crank plate P having journaled thereon two intermeshing gears Q, R, the former of which constantly meshes with a pinion S within the boss *m* and carrying above it a bevel gear T, confined in a central bore in the monitor housing H. The outwardly projecting arm of the plate P has a segment rack

q on its upper side with which a pinion p cut on the end of a spindle U meshes. The spindle U is journaled horizontally in the saddle and has a projecting knob or hand wheel n by turning which very slightly both gears Q and R are either disengaged from pinion l to stop the automatic feeding of the table I, or either Q or R is made to engage with pinion l to feed the table I automatically to the right or to the left. Nicks can be made in the hub of the knob n to register with a nick in the saddle to indicate the proper adjustment of the plate P. The outwardly projecting arm of the plate P has also two projecting lugs or stops p' arranged to come in contact with the side walls of the recess containing the arm when the plate is shifted to bring either of and when either of these gears is in mesh the gears Q R into mesh with the gear l, with gear l the direction of revolution and the resistance of the feed screw serve to hold it into mesh so that it cannot become accidentally disengaged. When the parts are in the position of Fig. 4, with gears Q and R out of mesh with gear l, a spring projected latch p^2, Fig. 5, with a beveled end in a housing on the saddle engages a beveled slot or recess in the knob n to hold the latter from turning accidentally and to form a lock for the spindle U. Two other similar recesses p^3 may be formed in the knob to be engaged by the latch p^2 when the spindle is turned in either direction to engage gear R or Q with gear l.

Now referring to Figs. 2, 3, 6 and 7, I will explain the mechanism for connecting and disconnecting the shaft J and the automatic feed. The gear T meshes with a bevel pinion V loose on the shaft J and held from endwise movement in a cross piece of the monitor housing. The outer face of the pinion V has teeth r to form one-half of a clutch which is engaged by other teeth s forming the other half of the clutch on a sleeve W feathered on the shaft J and having a circumferential groove t in which is confined a shifter fork A' pivoted as at u in the monitor housing. The outer end of the shifter A' is connected by a pivoted link B' to a pin v, Fig. 7, projecting from the hub of a spindle C' journaled vertically in the monitor housing and having a top piece carrying a handle w and a stud or pin a'. A spring b' secured to the monitor housing bears against a stud on the fork A' and acts to hold the clutch teeth disengaged except when the handle w is moved to the left when it is desired to engage the clutch, whereupon the spring is put under tension and the axis of the shifter spindle, the axis of the pin v and the axis of the pivot c' which connects link B' and shifter fork A' are brought into a straight line to form a toggle joint or dead lock as seen in Fig. 2, which cannot be broken except by positively moving the handle w. This may be done by hand or automatically by a beveled lug or wiper block D', indicated in dotted lines in Fig. 2 and shown in full lines in Figs. 1 and 3, which is adjustable in a T slot d' in the front face of the table I and locked thereto by a bolt passed through the lug and whose head is confined in the T slot. The pin a' is in the path of this beveled lug and when the table is moved to the desired point the side of the lug D' presses the pin a' outward thereby turning the shifter spindle breaking the toggle joint and disengaging the clutch teeth whereupon the spring b' being released throws the shifter fork outward and holds the clutch disengaged and the feed of the table is stopped as will be readily understood. The lug D' may be adjusted at any point on the table to the right or left and will act on the shifter spindle whether the table be feeding to the right or to the left. The especial advantage of this manner of disconnecting the table from the automatic feed is that the pressure required to break the toggle lock is both light and is exerted horizontally so as not to have a tendency to tilt the table as it would if the pressure were upward as in some disconnecting mechanisms.

From the foregoing description it will be seen that the mechanism for starting and stopping the automatic feed may be controlled entirely by the spindle U, and likewise that the table can be fed in either direction without disconnecting the clutch mechanism; also that by disconnecting the clutch mechanism either by hand or automatically the automatic feed is thereby stopped; also that no tilting or lifting strain, which might spoil fine work, is put upon the table in automatically disengaging the cluch; also that by making the monitor housing circular the saddle need not be drawn from the standard so far as to prevent striking when the table is angled, and for the same reason a shorter cutter arbor can be used, both points adding to the rigidity of the machine under cutting operation; finally by making the monitor housing circular the index for angles of spirals can be placed on its outer periphery which being of large diameter permits a coarse graduation and a consequent fine adjustment. This index is shown in Fig. 1.

The work is carried on the table in the usual or any suitable manner, and the latter may be provided with the universal indexing and dividing head and the tail-stock of my prior patent No. 432,621, of July 22, 1890.

Having thus fully described my invention, I claim—

1. In a milling machine, the combination of a vertically adjustable knee, a saddle adjustable thereon, a circular indexing monitor housing adjustably clamped to the saddle, and the longitudinally movable work-carrying table carried directly by and sliding in said monitor housing, substantially as described.

2. In a milling machine, the combination of the work-carrying table and its feed screw engaging the support of the table, a gear in said support driven by the machine, two intermeshing gears carried on a pivoted shifter,

a gear driven by one of the last named gears for driving the feed screw and a projecting hand piece for operating said shifter, whereby upon operating said hand piece the shifter is actuated to engage either of the gears thereon with the gear driven by the machine or to disengage both therefrom, substantially as described.

3. In a milling machine, the combination of the work-carrying table and its feed screw engaging the support of the table, driving mechanism in said support actuated by the machine, a pinion carrying one part of a clutch loose on said screw and engaging said driving mechanism, a sleeve carrying the other part of said clutch and feathered on said screw, a pivoted shifter for said sleeve and a spring therefor tending normally to disengage the clutch, a hand shifter and a pivoted link connecting the hand shifter and sleeve shifter and so arranged that when the clutch is engaged a toggle joint is effected, substantially as described.

4. In a milling machine, the combination of the work-carrying table and its feed-screw, a circular monitor housing in which the table is dovetailed and with which said screw engages, an adjustable saddle to which the monitor housing is adjustably and axially clamped, a gear in said saddle driven by the machine, two intermeshing gears carried on a shifter pivoted in said saddle concentric with the axis of the monitor housing, a gear concentric with the axis of the housing driven by one of the last named gears for driving the feed screw, and a projecting hand piece for operating said shifter, whereby upon operating said hand piece the shifter is actuated to engage either of the gears thereon with the gear driven by the machine or to disengage both therefrom.

5. In a milling machine, the combination of the work-carrying table and its feed screw engaging the support of the table, a gear in said support driven by the machine, two intermeshing gears carried on a pivoted shifter, a gear driven by one of the last named gears for driving the feed screw, a rack on said shifter and a pinion on a projecting hand-operated spindle engaging said rack, whereby upon turning said spindle the shifter is actuated to engage either of the gears thereon with the gear driven by the machine or to disengage both therefrom, substantially as described.

6. In a milling machine, the combination of the work-carrying table and its feed screw, a circular monitor housing in which the table is dovetailed and with which said screw engages, an adjustable saddle to which the monitor housing is adjustably and axially clamped, a gear in said saddle driven by the machine, two intermeshing gears carried on a shifter pivoted in said saddle concentric with the axis of the monitor housing, a gear concentric with the axis of said housing driven by one of the last named gears for driving the feed screw, a rack on said shifter, and a pinion on a projecting hand-operated spindle engaging said rack, whereby upon turning said spindle the shifter is actuated to engage either of the gears thereon with the gear driven by the machine or to disengage both therefrom, substantially as described.

7. In a milling machine, the combination of the work-carrying table and its feed screw engaging the support of the table, driving mechanism in said support actuated by the machine, a pinion carrying one part of a clutch loose on said screw and engaging said driving mechanism, a sleeve carrying the other part of said clutch and feathered on said screw, shifting mechanism for said sleeve, and an adjustable wiper on the table engaging said shifting mechanism horizontally, substantially as described.

8. In a milling machine, the combination of the work-carrying table and its feed screw engaging the support of the table, driving mechanism in said support actuated by the machine, a pinion carrying one part of a clutch loose on said screw and engaging said driving mechanism, a sleeve carrying the other part of said clutch and feathered on said screw, a pivoted shifter for said sleeve and a spring therefor tending normally to disengage the clutch, a shifter provided with a pin or projection, a pivoted link connecting both shifters and so arranged that when the clutch is engaged a toggle joint is effected, and an adjustable wiper on the table to engage the pin or projection on the shifter to automatically stop the feed, substantially as described.

9. In a milling machine, the combination of the work-carrying table and its feed screw engaging the support of the table, driving mechanism in said support actuated by the machine for driving the screw, means for reversing and disconnecting said driving mechanism by hand from one point, and clutch mechanism for connecting and disconnecting said driving mechanism from another point, substantially as described.

10. In a milling machine, the combination of the horizontal central gear S, the shifter P concentric with said gear and having journaled thereon the pinions Q, R, the former constantly in mesh with the pinion S, the rack q on the shifter, the spindle U engaging said rack, a latch for holding said spindle and shifter in their adjusted positions, and the driving gear l with which either of the pinions Q, R can be made to engage, substantially as described.

11. In the automatic table-driving mechanism of a milling machine, the combination of a gear, as l, constantly driven by the machine, a gear, as S, for driving the screw, the shifter P provided with stop lugs p' and pivoted on an axis concentric with gear S and carrying two intermeshing gears Q, R, the former of which is constantly in mesh with gear S, and means for moving said shifter to engage or

disengage gears Q, R and gear *l*, substantially as described.

12. In the automatic table-driving mechanism of a milling machine, the combination of the screw J, the gear T driven by the machine, the pinion V meshing therewith loose on the screw and carrying the one part *r* of a clutch, the sleeve W feathered on the screw and carrying the other part *s* of a clutch, the forked shifter A′ pivoted in the table support and engaging the sleeve W, the shifter spindle C′ pivoted in the table support, and the pivoted link B′ connecting said spindle fork, substantially as described.

13. In a milling machine, the combination of the work-carrying table I, the wiper block D′ adjustable in a slot on its front face, a clutch for engaging and disengaging the table-feeding screw with mechanism driven by the machine, means for operating said clutch, and the shifter spindle C′ for said means provided with the pin *a′* in the path of travel of the wiper-block D′, substantially as described.

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