No. 707,095. Patented Aug. 19, 1902.

W. R. FOX & M. LUND.

FEED MECHANISM FOR MILLING MACHINES.

(Application filed Dec. 6, 1901.)

(No Model.) 3 Sheets—Sheet 1.

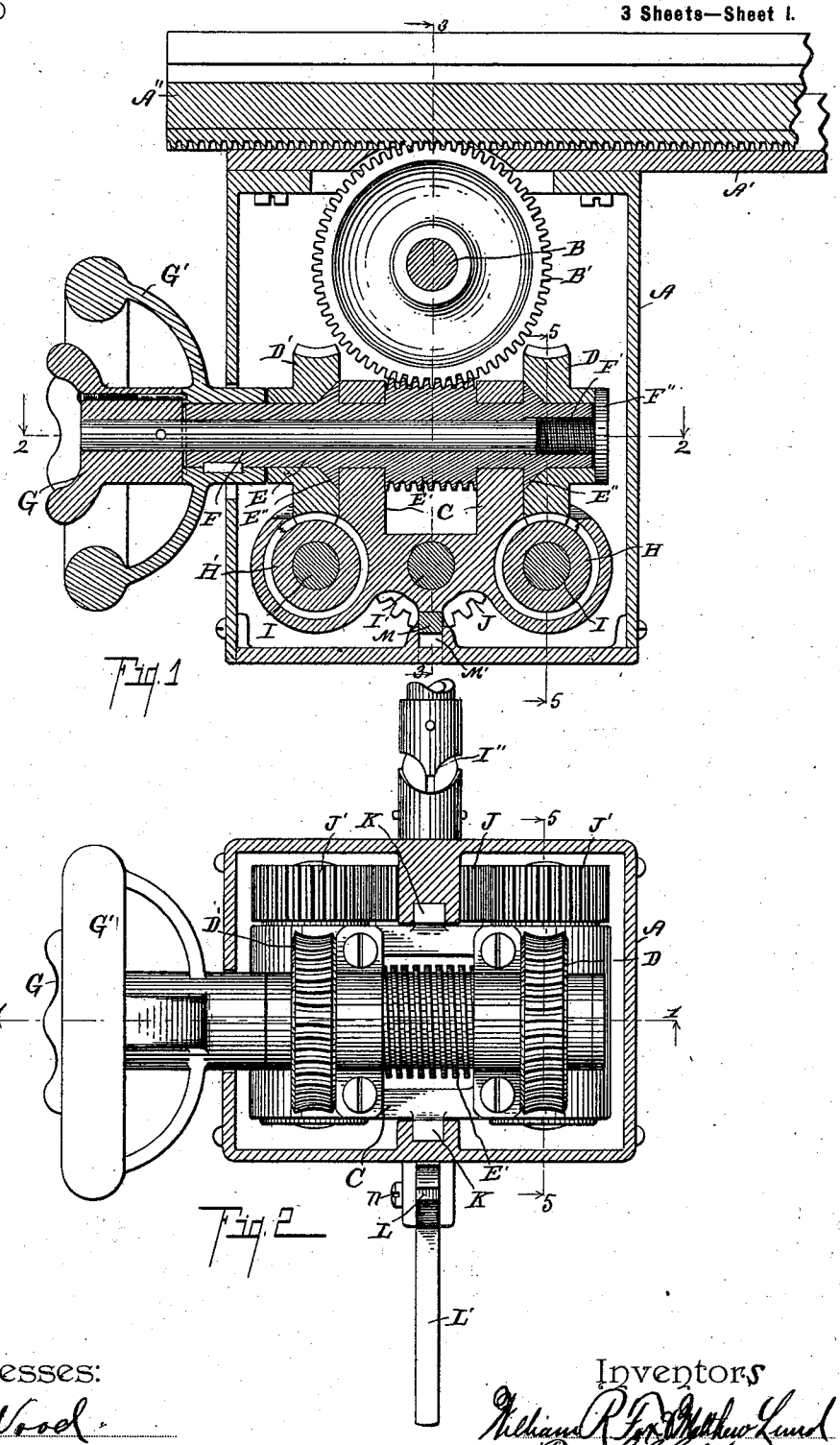


Fig. 1

Fig. 2

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William R. Fox
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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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(No Model.) 3 Sheets—Sheet 2.

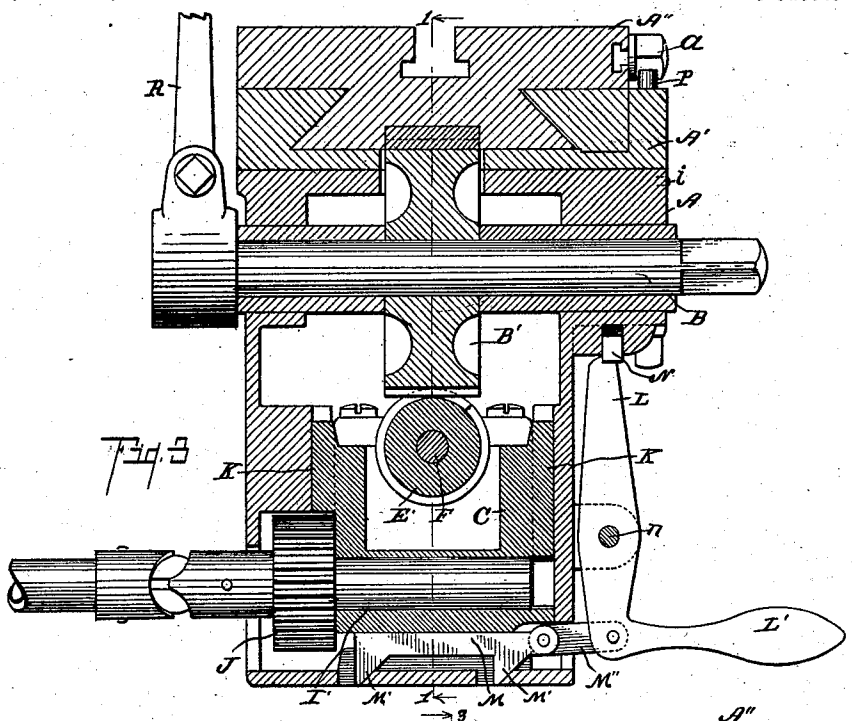


Fig. 3

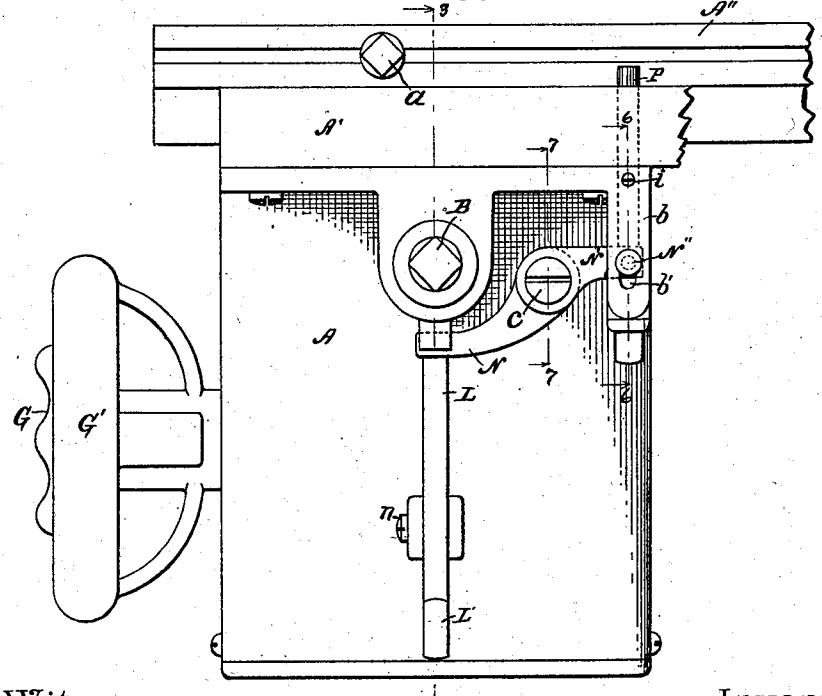


Fig. 4

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(No Model.) 3 Sheets—Sheet 3.

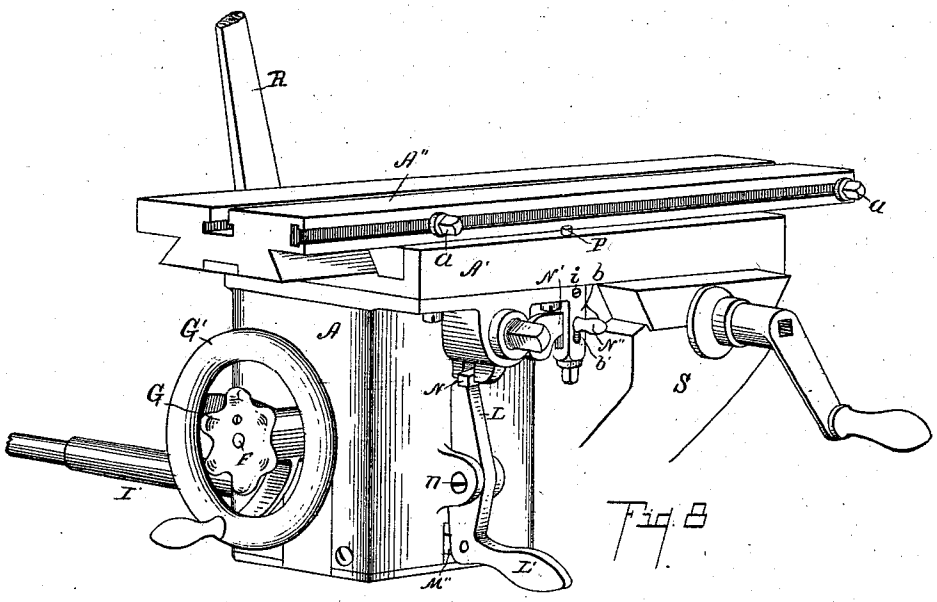


Fig. 8

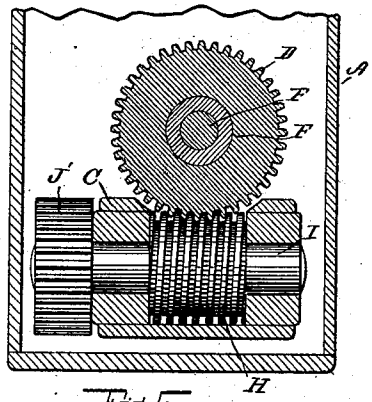


Fig. 5

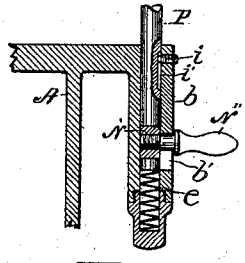


Fig. 6

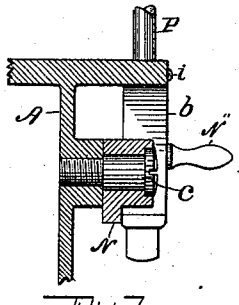


Fig. 7

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UNITED STATES PATENT OFFICE.

WILLIAM R. FOX AND MATTHEW LUND, OF GRAND RAPIDS, MICHIGAN, ASSIGNORS TO THE FOX MACHINE COMPANY, OF GRAND RAPIDS, MICHIGAN.

FEED MECHANISM FOR MILLING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 707,095, dated August 19, 1902.

Application filed December 6, 1901. Serial No. 84,911. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM R. FOX and MATTHEW LUND, citizens of the United States, residing at the city of Grand Rapids, in the county of Kent and State of Michigan, have invented certain new and useful Improvements in Feed Mechanism for Milling-Machines, of which the following is a specification.

This invention relates to improvements in feed mechanism for milling-machines, although the structure is well adapted for other uses.

The objects of the invention are, first, to provide a compact and efficient structure which can be readily controlled to feed in either direction and in which the feed mechanism can also be very easily released to permit the return movement of the carriage; second, to provide an improved reversing means for a mechanism of this kind; third, to provide in a construction of this kind improved means for throwing the same into or out of connection with the carriage of the machine, so that the automatic release shall be prompt and efficient.

Further objects will definitely appear in the detailed description to follow.

We accomplish the objects of our invention by the devices and means described in this specification.

The invention is clearly defined and pointed out in the claims.

A structure embodying the features of our invention is fully illustrated in the accompanying drawings, forming a part of this specification, in which—

Figure 1 is a detail vertical longitudinal sectional view through the feed mechanism, taken on a line corresponding to line 1 1 of Figs. 2 and 3. Fig. 2 is a detail transverse view, partially in section, on a line corresponding to line 2 2 of Fig. 1. Fig. 3 is a detail transverse sectional view taken on a line corresponding to line 3 3 of Figs. 1 and 4. Fig. 4 is a detail side elevation view of the feed mechanism, appearing in full lines. Fig. 5 is a detail sectional view showing the worm-gear connection for actuating the feed-worm, taken on a line corresponding to line 5 5 of Figs. 1 and 2. Fig. 6 is a detail sectional view of a portion of the trip mechanism, taken on line 6 6 of Fig. 4. Fig. 7 is a detail view of the lever N N′ of the trip mechanism, taken on a line corresponding to line 7 7 of Fig. 4. Fig. 8 is a perspective view of the feed mechanism, showing the details of the attachment of the same to a milling-machine and indicating also how the same can be readily attached to a lathe.

In the drawings all of the sectional views are taken looking in the direction of the little arrows at the ends of the section-lines, and similar letters of reference refer to similar parts throughout the several views.

Referring to the lettered parts of the drawings, A is the casing of the feed mechanism, which is secured by suitable means to the frame A′ of a milling-machine or lathe, which is provided with a carriage A″, which is actuated from the driving-gear B′, supported on the shaft B, meshing in a rack on the under side thereof. The gear B′ is actuated by a worm on its under side and meshes with the rack on the carriage, as stated. The shaft B is supported in suitable boxings in the upper part of the casing A and extends outwardly at each end, where it is squared to receive a lever, as R, or a crank at the opposite end for use when it is desired to operate the carriage by hand or to return the same, which can be done when the driving mechanism B′ is out of gear with the reversing mechanism. The frame C is supported within the casing A by suitable guides K, which fit into suitable vertical ways within the casing, as clearly appears in Figs. 2 and 3. Carried by this frame on the shaft or pin I′ is a driving-gear J, which is connected by a tumbling-rod having a slip-joint to the revolving part of the machine. The connection between the driving mechanism and the gear J is the customary ball-and-socket joint with sliding sleeve, which permits the gearing accompanying it being elevated or lowered without changing the position of the gear J. This gear J meshes with the gear J′ J′ at each side thereof, as clearly appears in Fig. 2. The gears J′ are each supported on a shaft I, both of which are provided with worms, as H H′, one of which is right-handed and the other left-handed. Supported in suitable boxings in the frame C is a shaft E, having a worm E′ thereon which meshes with the worm-gear B′,

which engages with the rack of the carriage. Toward each end of the shaft E are flanges E″, conical in form, facing in opposite directions. Supported on the shaft E and capable of being locked thereon by means which we will hereinafter describe are worm-gears D D′, which are actuated by the worms H H′ below. The inner side of each of these worm-gears D D′ is concave, so that they fit against the conical flange E″ E″, so that either of the gears can be clamped securely to the shaft E or both can be released. The shaft E is made hollow and a rod F extends through the same, the inner end of the rod being screw-threaded to engage suitable internal threads on the shaft. On the outer end of the rod F is a hand-wheel G, which is secured to the rod by a suitable pin. Slidably secured to the shaft E by a suitable key or feather is a hand-wheel G′. A spring-catch is provided to prevent the accidental rotation of the hand-wheel G with its rod F relative to the shaft E. The hand-wheel G is adapted to contact with the hub or collar of the hand-wheel G′ and force the collar against the gear D′ to clamp the same to the flange on the shaft E. On the inner end of the rod F is a head F″, arranged to contact with the hub of the worm-gear D to clamp the same to its flange, so that by manipulation of the hand-wheel either gear may be clamped to the flanges E″ E″, as may be desired. Sufficient movement is permitted, so that both gears may be disconnected.

The framework C is raised and lowered by the bar M, having inclined planes M′ M′ on the under side of the same, which fit against suitable inclines in the bottom of the casing A, as clearly appears in Fig. 3, an end view appearing in Fig. 1. A lever L L′ is fulcrumed at *n* on the outside of the casing A and connected by a link M″ to the bar M. The handle L′ of the lever extends outwardly, so that it can be easily grasped (see Figs. 3 and 8) for operating the lever. The upper end of the lever is provided with a notch to form a catch, and a latch N N′ is pivoted at *c* and engages the same. The end N′ of the latch is secured to the pin N″, which is held normally upward by a spring *e*, as clearly appears in Fig. 6. A trip-pin P extends upwardly through the tubular casing *b* to afford a trip for the adjustable stops *a a* on the sides of the carriage to strike and force the end N′ of the latch downward and release the lever L, which will permit the driving mechanism to drop downwardly out of gear.

We have shown a small screw *i* extending into a slot in the side of the pin P for retaining the same, and a pin N″ is provided for the end N′ of the latch, so that the same can be manipulated for throwing the mechanism out of gear. The usual means of adjusting the carriage back and forth is exemplified by the crank S, a tumbling-rod being provided with a slip-joint to permit the required movement.

We desire to state that we have described our structure in the form most approved by us, though we believe the same can be greatly varied in its details without departing from our invention. The particular trip mechanism we have shown we believe to be of especial advantage in relation to the other parts, though a different kind of mechanism might be made use of in connection with the other features. On the other hand, this trip is of advantage on any kind of feed mechanism to which it might be adopted. We have shown the flanges E″ conical for clamping the worm-gears; but we are aware that that might be accomplished with a different form of flange for use in that connection, though we believe the structure we have shown to be most secure and permit of the most ready freeing of the wheels when it is desired to reverse the feed mechanism. Other means of raising and lowering the framework carrying the gears might be made use of, though obviously what we have shown is exceedingly simple and very effective.

The operation of our improved mechanism is as follows, the same being thrown into gear as appears in the different figures and the right-hand worm-gear D being clamped to the shaft E, as appears in Fig. 1. It will be seen that the gear J will act upon the gear J′, which will drive the screw-gear H, which meshes with the screw-gear D, which actuates the same, and consequently rotates the shaft, with its worm E′, which drives the worm-gear B′, which in its turn meshes with the rack on the lathe-carriage. When the carriage has traveled its predetermined distance, one of the stops *a* strikes the trip-pin P, which acts upon the latch N N′, releases the lever L, which of course allows the bar M to move toward the left, and permits the driving mechanism to drop out of engagement. The carriage can then be returned by means of the crank R or by a crank on the opposite end of the shaft B by hand, and when it is returned the mechanism can be thrown into gear by grasping the handle L′ and lifting upwardly upon it, when the same movement will be repeated. When it is desired that the carriage run in the opposite direction, the hand-wheel G is rotated, which moves the flange F″ off from the wheel D and releases the same from the shaft E, and the worm D′ is clamped securely to the shaft. The driving-gear J will then through the gear J′ act upon the worm-gear D′, which drives the worm E′ in the opposite direction, so that by simply turning the hand-wheel G either gear D or D′ can be thrown into or out of work, driving the carriage in whichever direction it is desired, and the same will trip automatically, as before. When it is not necessary to have a quick return, the hand-wheel G can be turned to such position that both wheels D D′ are released, when by turning the hand-wheel G′ the carriage can be moved slightly by hand, and this hand-feeding can be made use of when de-

sired, and the power driving mechanism can be easily disconnected in this way, so that with this structure the operator can manipulate the carriage completely by hand, connect it easily to the power mechanism to drive in either direction, and can easily disconnect the slow driving mechanism and manipulate the carriage by a lever or crank on the squared end of the axle of the pinion or gear which engages the rack of the carriage, all of which is of very great advantage in the operation of a milling-machine or lathe.

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

1. In a feed mechanism for a milling-machine, the combination of a casing A; a shaft B supported in suitable bearings therein; a suitable feed-rack; a toothed wheel B′ on said shaft B adapted to mesh with said rack; a frame C having guides K fitting within suitable vertical guideways within the casing; a shaft E having a worm E′ thereon supported in the said framework adapted to mesh with said toothed wheel B′; flanges E″ conical in form on said shaft E; worm-gears D, D′, supported on the shaft E; a rod F through the center of said shaft screw-threaded at F′ and provided with a head F″ to fit against the worm D; a hand-wheel G′ on said shaft E adapted to fit against the worm-gear D′; a hand-wheel G within the hand-wheel G′, whereby, by manipulating the hand-wheels G, G′, either worm-gear D or D′ can be readily fixed on the shaft E or both of them released; a tumbling-rod; a shaft I′ connected with said tumbling-rod by a suitable telescopic joint; a driving-gear J on said shaft I′; shafts I, I, arranged to each side of said shaft I′; gears J′, J′, on said shafts I, I, meshing with said gear J; worms H, H′, on said shafts I, I, meshing with the worm-gears D, D′, one of which worms is right-handed and the other left-handed; a bar M in the bottom of said casing having inclined planes M′, M′, secured thereto fitting against inclined surfaces in the bottom of the casing; a lever L provided with a suitable handle L′ connected to the said bar M and provided with a notch in its upper end; a latch N, N′, for engaging said notch; a pin P supported in a suitable guide resting on the end N′ of the latch; a coiled spring *e* for forcing the same normally upward; a suitable stop on said carriage adapted to engage the said pin P and automatically disconnect the feed mechanism when the carriage has reached the end of its travel, all coacting substantially as described for the purpose specified.

2. In a feed mechanism for a milling-machine, the combination of the casing A; a shaft B supported in suitable bearings therein; a suitable feed-rack; a toothed wheel B′ on said shaft B adapted to mesh with said rack; a frame C having guides K fitting within suitable vertical guideways within the casing; a shaft E having a worm E′ thereon, supported in the said framework adapted to mesh with said toothed wheel B′; flanges E″ conical in form on said shaft E; worm-gears D, D′, supported on the shaft E; a rod F through the center of said shaft screw-threaded at F′ and provided with a head F″ to fit against the worm D; a hand-wheel G′ on said shaft E adapted to fit against the worm-gear D′; a hand-wheel G within the hand-wheel G′ whereby, by manipulating the hand-wheels G, G′, either worm-gear D, or D′ can be readily fixed on the shaft E, or both of them released; a tumbling-rod; a shaft I′ connected with said tumbling-rod by a suitable telescopic joint; a driving-gear J on said shaft I′; shafts I, I adapted to mesh with the gear J; worms H, H′ on said shafts I, I, meshing with the worm-gears D, D′, one of which worms is right-handed and the other left-handed; a bar M in the bottom of said casing having inclined planes M′, M′, secured thereto, fitting against inclined surfaces in the bottom of the casing; means for automatically controlling said bar to disconnect the feed mechanism when the carriage has reached the end of its travel, all coacting substantially as described for the purpose specified.

3. In a feed mechanism for a milling-machine, the combination of the casing A; a shaft B supported in suitable bearings therein; a suitable feed-rack; a toothed wheel B′ on said shaft B adapted to mesh with said feed-rack; a frame C having guides K fitting within suitable vertical guideways within the casing; a shaft E with a worm E′ thereon supported in the said framework and adapted to mesh with said toothed wheel, B′; worm-gears D, D′, supported on the shaft E; means for rigidly securing either worm-gear D or D′ to the said shaft E or of releasing both of them; a tumbling-rod; a shaft I′ connected with said tumbling-rod by a suitable telescopic joint; a driving-gear J on said shaft J′; shafts I, I, arranged to each side of said shaft I′; gears J′, J′ on said shafts I, I, adapted to mesh with said gear J; worms H, H′, on said shafts I, I, meshing with the worm-gears D, D′, one of which worms is right-handed and the other left-handed; a bar M in the bottom of said casing having inclined planes M′, M′, secured thereto, fitting against inclined surfaces in the bottom of the casing; means for automatically controlling said bar to disconnect the feed mechanism when the carriage has reached the end of its travel, all coacting substantially as described for the purpose specified.

4. In a feed mechanism for a milling-machine or lathe, the combination of a suitable casing; a suitable feed-rack on the carriage of said machine; a frame adjustable up and down within said casing; a worm-gear adapted to engage with said rack; a shaft; a worm thereon for actuating the said gear, the said shaft being carried in the movable frame; worm-gears on said shaft resting outside of suitable flanges; a screw through the center

of said shaft with a head at its outer end for embracing one of said worm-gears and clamping it against the flange and a collar on the other end of the shaft to be forced against the flange by the said screw to clamp the worm-gear at the end, whereby either of the said worm-gears can be securely clamped in position while the opposite is left free, or both can be released; worms transverse to each of said gears, one of which is right-handed and the other left-handed; suitable gears J', J', on the shafts with the said transverse worms and a driving-wheel between them and meshing therewith, whereby the direction of the actuation of the carriage is changed by clamping one or the other of the worm-gears on the shaft bearing the main driving-worm, or the carriage is freed by releasing both of the said worm-gears; and means for adjusting the frame carrying said worm-gearings up and down, whereby the main driving-worm will be engaged and disengaged with the gear-wheel which actuates the rack of the carriage, coacting for the purpose specified.

5. In a feed mechanism for a milling-machine or lathe, the combination of a suitable casing; a suitable feed-rack on the carriage of the machine; a frame adjustable up and down within said casing; a worm-gear adapted to engage with said rack; a shaft; a worm thereon for actuating the said gear, the said shaft being carried in the movable frame; worm-gears on said shaft resting outside of suitable flanges; a screw through the center of said shaft with a head at its outer end for embracing one of said worm-gears and clamping it against the flange, and a collar on the other end of the shaft to be forced against the flange by the said screw to clamp the worm-gear at that end, whereby either of the said worm-gears can be securely clamped in position while the opposite is left free, or both can be released; worms transverse to each of said gears, one of which is right-handed and the other left-handed; suitable gears J, J, on the shafts with the said transverse worms and a driving-wheel between them and meshing therewith, whereby the direction of the actuation of the carriage is changed by clamping one or the other of the worm-gears on the shaft bearing the main driving-worm, or the carriage is freed by releasing both of the said worm-gears, coacting for the purpose specified.

6. In a feed mechanism for a milling-machine or lathe, the combination of a main worm-gear; a hollow shaft with a worm thereon and meshing with said gear; worm-gears carried by said shaft, one of which is right-handed and the other left-handed; flanges on said shaft between said gears; a screw-threaded rod engaging a thread in the interior of said shaft with connections for clamping either one or the other of said gears against the flanges on said shaft or releasing both of the same, and a right-hand worm and a left-hand worm meshing with said worm-gears, with connections for driving the said worms, whereby the direction of the feed can be changed by clamping one of said worm-wheels or the other on the shaft carrying the main worm, as specified.

7. In a feed mechanism, the combination of a hollow shaft; right-hand and left-hand worm-gears thereon; a clamping means consisting of a screw-threaded rod extending through said hollow shaft and having connections at each end for clamping either of said gears securely to the shaft or releasing both of them; right-hand and left-hand worms engaging with the said gears whereby the direction of the rotation of the shaft is changed by clamping the one or the other of said worm-gears thereto, as specified.

8. In a feed mechanism, the combination of the shaft E with flanges E'', E'' thereon; gears to fit against said flanges; a screw-bolt through said shaft with a head at one end to engage the hub of the gear at that end to clamp the same and a collar on the opposite end for clamping the gear at that point; hand-wheels on the said bolt and on the shaft for turning the same and changing their relative position, whereby either of the said gears may be clamped or both freed; connections for driving the said gears in opposite directions whereby the direction of the shaft can be changed by clamping the one or the other, and whereby the shaft can be disconnected by releasing both of the said gears, coacting for the purpose specified.

9. In a feed mechanism, the combination of a casing; a driving-gear; a frame adapted to be adjusted in said casing; gearing carried by said frame for actuating the carriage of a milling or similar machine; a bar with inclined planes thereon adapted to raise or lower said framework to throw said gearing into or out of engagement with the driving-gears, for the purpose specified.

10. In a milling-machine, the combination of a casing A; a driving-wheel within said casing; a movable frame within said casing; suitable gearings carried by said casing; a bar with inclined planes for adjusting the said casing to throw said gearings into or out of engagement with the driving-wheel; a lever connected to said bar; a latch to engage said lever with a spring for holding the same normally into engagement; a trip-pin adapted to act on said latch and a stop on the carriage adapted to engage said trip-pin, whereby the carriage will automatically release the lever and throw the mechanism out of gear when it has reached the end of its travel, coacting for the purpose specified.

In witness whereof we have hereunto set our hands and seals in the presence of two witnesses.

WILLIAM R. FOX. [L. S.]
MATTHEW LUND. [L. S.]

Witnesses:
GEO. K. MCMULLEN,
C. B. HAMILTON.