H. BAERBALCK.

FEEDING MECHANISM FOR METAL WORKING MACHINERY.

APPLICATION FILED AUG. 24, 1918.

1,358,051. **Patented Nov. 9, 1920.**

3 SHEETS—SHEET 1.

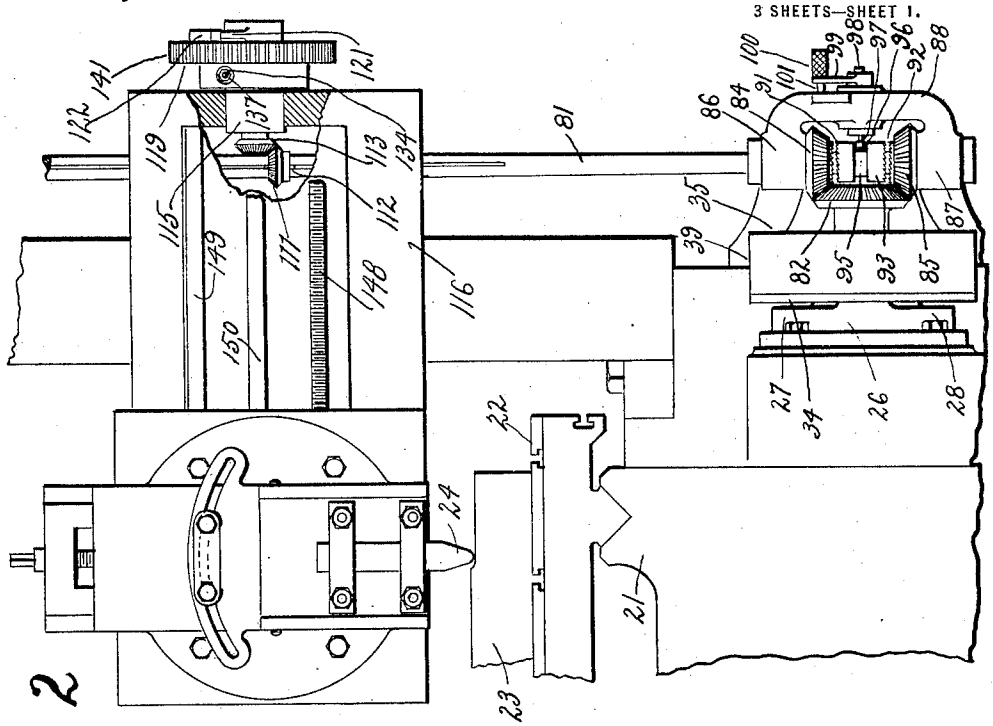


Fig 2

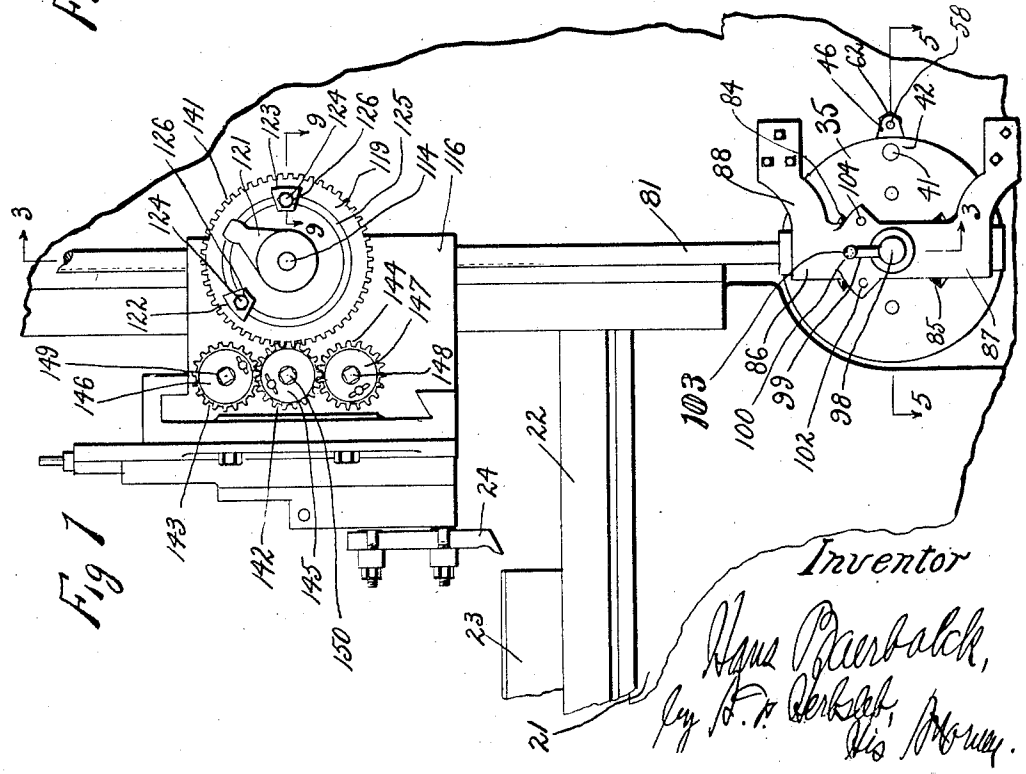


Fig 1

Inventor

Hans Baerbalck,

by R. F. Berkley, his Attorney.

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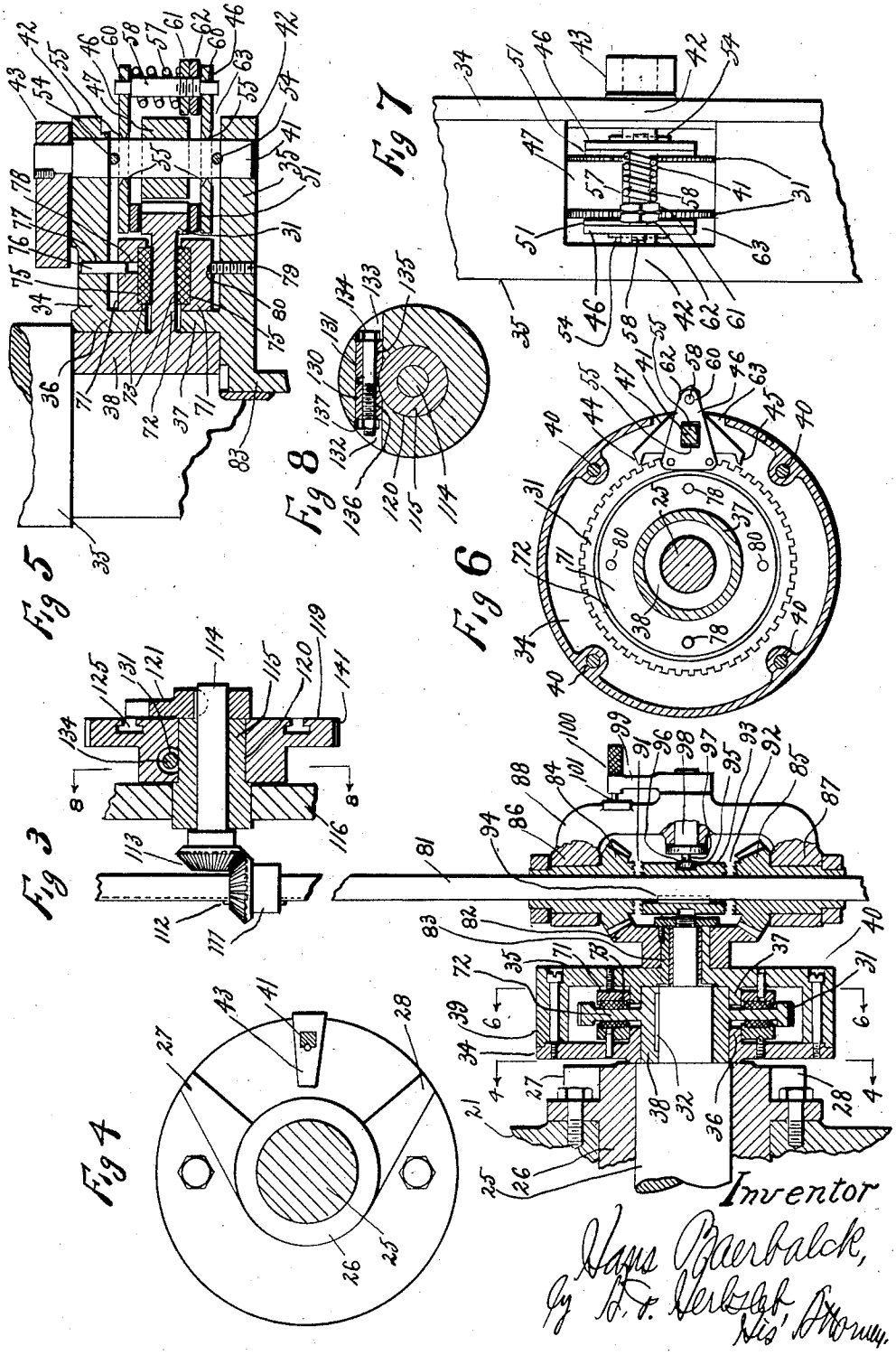


Fig 5

Fig 8

Fig 7

Fig 6

Fig 3

Fig 4

Inventor

Hans Baerbalck,

by L. F. Herbst

His Attorney.

H. BAERBALCK.

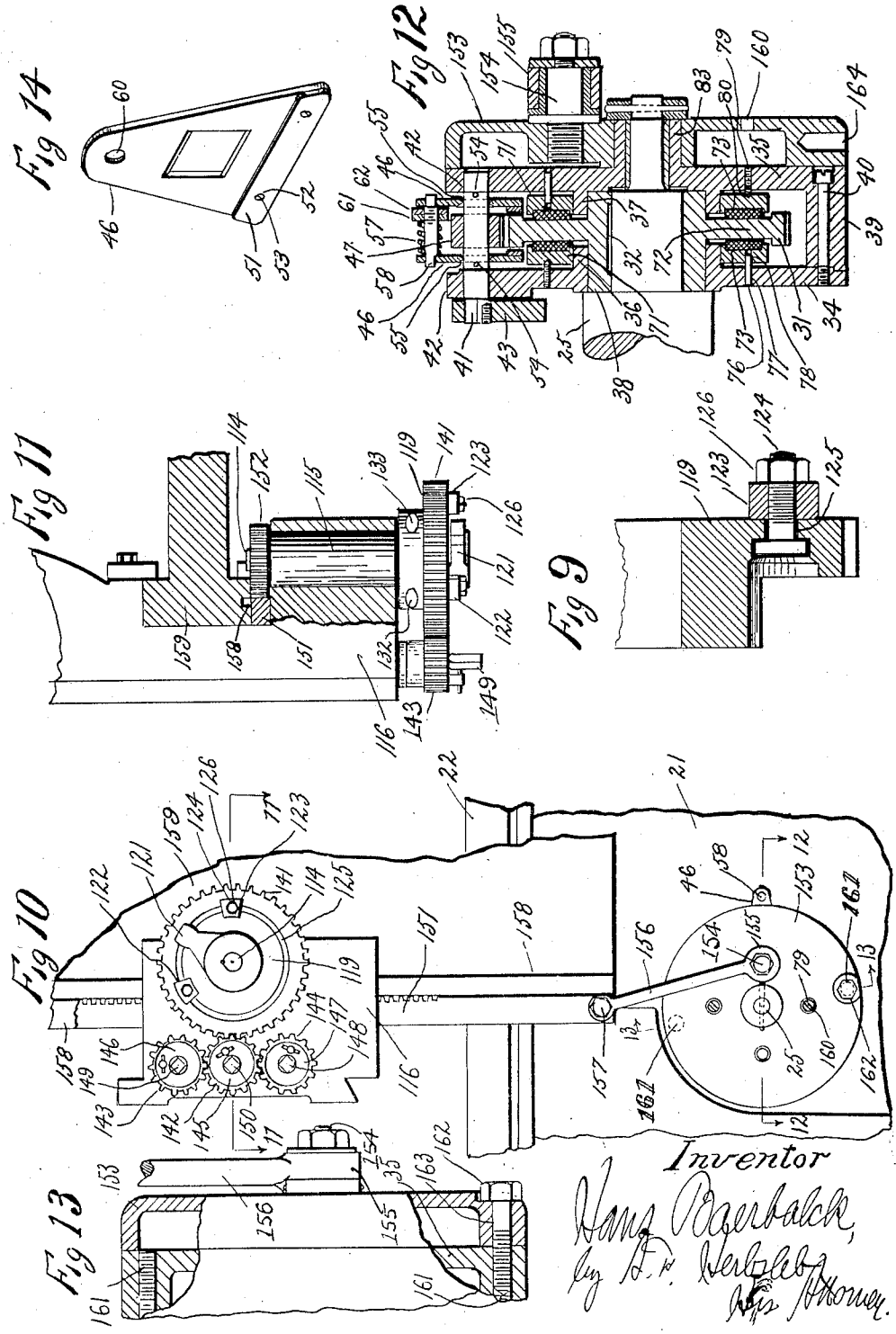
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3 SHEETS—SHEET 3.



UNITED STATES PATENT OFFICE.

HANS BAERBALCK, OF HAMILTON, OHIO, ASSIGNOR TO THE HAMILTON MACHINE TOOL COMPANY, OF HAMILTON, OHIO, A CORPORATION OF OHIO.

FEEDING MECHANISM FOR METAL-WORKING MACHINERY.

1,358,051. Specification of Letters Patent. Patented Nov. 9, 1920.

Application filed August 24, 1918. Serial No. 251,266.

To all whom it may concern:

Be it known that I, HANS BAERBALCK, a subject of the Emperor of Germany, residing at Hamilton, in the county of Butler and State of Ohio, have invented certain new and useful Improvements in Feeding Mechanism for Metal-Working Machinery, of which the following is a specification.

My invention relates to means for feeding a movable element in metal cutting machinery, such as tool-support, for example a tool-head or a slide on the head, whether the head be a cross-head or a side-head.

It is the object of my invention to provide new and improved means of the character mentioned which are capable of performing heavy duty, of great accuracies in the extents of feeding movements, and are of simple construction and highly efficient in operation.

My invention is capable of use when employing a rotary shaft as the transmitting element of the feeding means, and also when employing a so-called rack and pinion feed, and I have illustrated my invention in connection with both said characters of feed, the rack and pinion feeding means being exemplified as a modification.

My invention consists in novel means for communicating the motion of a reciprocating driving element to a motion converting member, in a novel ratchet and pawl structure serving as a motion converting member, in novel means for causing coaction between the ratchet and pawl of said structure, in novel friction means for causing change of relation in said ratchet and pawl structure, and in novel means for transmitting motion of the motion converting member to the element to be fed.

The invention will be further readily understood from the following description and claims, and from the drawings, in which latter:

Figure 1 is a side elevation of so much of a metal planing machine as is necessary to illustrate my invention.

Fig. 2 is a front elevation of the same.

Fig. 3 is a central vertical axial section of my improved device, taken on the line 3—3 of Fig. 1.

Fig. 4 is a cross-section of the same, taken in the plane of the line 4—4 of Fig. 3.

Fig. 5 is a detail of the same in horizontal cross-section, taken on the line 5—5 of Fig. 1.

Fig. 6 is a cross-section of the same, taken in the plane of the line 6—6 of Fig. 3.

Fig. 7 is a rear elevation of the casing partly broken away.

Fig. 8 is a cross-sectional detail on the line 8—8 of Fig. 3.

Fig. 9 is a cross-section taken in the plane of the line 9—9 of Fig. 1.

Fig. 10 is a side elevation showing a modification of my improved device employing a rack and pinion feed.

Fig. 11 is a plan view of the same, partly in section on the line 11—11 of Fig. 10.

Fig. 12 is a horizontal axial section of the same, taken on the line 12—12 of Fig. 10.

Fig. 13 is a detail of the same, taken on the line 13—13 of Fig. 10; and,

Fig. 14 is a perspective view of the friction lever.

I have exemplified my invention as employed in a metal planing machine comprising a bed 21 on which a table 22 is arranged to reciprocate for effecting the cutting operation, the work, instanced at 23, being suitably supported on and fixed to the table. A suitable cutting tool 24 acts on the work to cut the same during movement of the table in one direction, the movement of the table in the opposite direction returning the work to initial position for a subsequent cut, the tool in the meantime being fed to an advanced cutting position, this feeding being accomplished at either the end or the beginning of the cutting stroke, or of the returning or idle stroke of the table.

The table is operated in suitable ordinary manner by a reciprocating element, instanced as a usual bull-wheel pinion shaft 25, journaled in a suitable bearing 26 in the frame, instanced as a bushing suitably secured to the frame. This bushing has suitable stops 27, 28, thereon. The bull-wheel pinion shaft has an extension which may be instanced as the reciprocating driving element for the feeding mechanism.

A ratchet-wheel 31 is suitably secured to said extension so as to rotate with the reciprocating driving element, as by means of a key 32. Plates 34, 35, are journaled about the axis of rotation of the reciprocating driving element, being instanced as provided with bearings 36, 37, about the jour-

nal-hub 38 of the ratchet-wheel. There is preferably an inclosing connecting web 39 between said plates so as to form a box, screws 40 connecting the parts of the box.

A rock-shaft 41 is journaled in bearings 42 in the box, hereinafter termed a feed-box, and has an arm 43 rigidly secured thereto and extending therefrom. Pawls 44, 45, rock with the rock-shaft and are exemplified as rigid with each other, as by being formed as a double pawl 47. Friction connection is arranged to be made between said shaft and the ratchet-wheel, in order to rock said pawls at the initiation of motion of the ratchet-wheel. This is accomplished in the present exemplification by means of friction levers 46, which have rocking bearing about the rock-shaft. The rock-shaft is at that portion thereof which has the pawls and the friction-levers received thereabout shown as square in cross-section.

The friction-levers are provided with friction shoes 51, which are arranged to impinge the sides of the ratchet-wheel. The friction shoes are provided with apertures 52 received about pins 53 secured to said levers for positioning the shoes. The friction-levers rock on pins 54 received through the rock-shaft, these pins acting as fulcrums for said rocker-levers. The walls of the opening in said levers parallel with said pins are preferably formed as knife-edges 55. The shoes are pressed toward the ratchet-wheel by means of a spring 57 received about a rod 58, the ends of which are reduced and pass through apertures 60 in said friction-levers. The rod is threaded for receiving nuts 61, 62, for adjusting the tension of the spring and thereby adjusting the friction contact between the friction shoes and the ratchet-wheel. The outer ends of the friction-levers extend through an opening 63 in the feed-box.

When the direction of motion of the reciprocating element is changed, a motion in the same direction is imparted to the ratchet-wheel. The friction contact between the ratchet-wheel and the shoes causes a rocking of the friction-levers and of the rock-shaft, for causing engagement between one of the pawls and the ratchet-wheel, the ratchet-wheel being exemplified as a square-toothed ratchet wheel, for having the pawls engage therewith in either direction of movement of the ratchet-wheel.

As soon as the pawl engages one of the teeth of the ratchet-wheel, the feed-box is thereby caused to rotate with the reciprocating element, and the rotation of the feed-box in the similar direction continues until the arm on the rock-shaft strikes the opposite stop which coacts therewith. This has the effect of rocking the rock-shaft to intermediate position, and releases the pawl which has had engagement with the ratchet-wheel, for placing both pawls in neutral position.

The coacting side-faces of the arm and of said stops are so formed, as by being coincident with radial lines of said reciprocating element, that when there is engagement between either of the side-faces of said arm and its coacting stop face, the rock-shaft is rocked for placing the pawls in neutral or idle relations. As soon as motion of the ratchet-wheel in an opposite direction is initiated, the contact-face of the arm recedes from the coacting face of the stop for permitting rocking of the rock-shaft, by reason of frictional engagement of the friction shoes with the ratchet-wheel, and thereby causing the pawl to engage with a tooth of the ratchet-wheel, carrying the feed-box in the opposite direction with the ratchet-wheel in the further rotation of the latter.

This combined rotation of the ratchet-wheel and feed-box continues until the opposite face of the arm strikes the opposite stop, whereupon the arm is rocked in the opposite direction, for releasing the engaged pawl and placing both pawls in neutral or idle relation. The axis of the rock-shaft is also preferably within the range of the stationary stops, so that a continuation of the swinging of the arm beyond neutral positions of the pawls is avoided, for insuring stopping of rotation of the feed-box. The rotation of the ratchet-wheel within the feed-box continues, however, the friction connection between the ratchet-wheel and the friction-levers permitting this rotation without strain upon the feed-box.

Annular friction plates 71 are at the respective sides of the web 72 of the ratchet-wheel, being journaled on the bearing hubs 36, 37, of the side plates of the feed-box. Friction rings 73, preferably of a fabric material or leather, are located between the ratchet-wheel and the friction-plates, being exemplified as let into grooves 75 in said plates. Pins 76, received in holes 77, 78, respectively in the feed-box, and the annular friction-plates, and fixed in the holes 77, cause the feed-box and plates to rotate together. Adjustment of friction contact between the feed-box and ratchet-wheel is obtained by means of adjusting screws 79 threaded into the plates of the feed-box, for pressing the friction rings between said friction plates and the web of the ratchet-wheel. The inner ends of the adjusting screws 79 are let into recesses 80 in the friction-plates to cause the friction-plates and feed-box to rotate together. The friction contact between the ratchet-wheel and the feed-box prevents the feed-box from continuing movement in an assumed direction when the ratchet-wheel has stopped or reversed.

The motion from the feed-box to the fed

element is in my preferred form transmitted by means of a rotating shaft 81. Motion is exemplified as transmitted to the transmitting shaft by means of a bevel-gear 82, which is fast on a hub 83 of the plate 35. Bevel gears 84, 85, which mesh with the bevel-gear 82, have their hubs journaled in bearings 86, 87, of a bracket 88 extending from the bed of the machine. The transmitting shaft is journaled in said bevel-gears. Clutches 91, 92, are located between said bevel-gears about the transmitting shaft, one of the faces of each of said clutches, exemplified as toothed clutches, being located on a sleeve 93 having spline-connection 94 with said transmitting shaft, the opposite faces of said respective clutches being on the bevel-gears 84, 85. The sleeve is provided with an annular groove 95 in which a roller 96 on a crank-pin 97 is received, the crank-pin being on a rock-shaft 98 arranged to be rocked by an arm 99 having a suitable pull-pin handle 100 thereon, the pin 101 whereof is arranged to coact with suitable apertures 102, 103, 104, on the bracket for operatively connecting either of said clutches for rotating the transmitting shaft in either direction, or placing said clutch-sleeve in neutral position.

The connection between the transmitting shaft and the element to be fed, exemplified as a tool-support is, in the present exemplification, effected by means of a bevel-gear 111 having spline-connection 112 with said transmitting shaft. The bevel-gear 111 meshes with a bevel-gear 113 fast on a shaft 114 journaled in a bushing 115, which is in turn fixed in the cross-rail 116. A transmitting face-plate 119 is suitably journaled about a journal 120 on the bushing. An arm 121 extends from the shaft 114 and is arranged to engage tappets 122, 123, adjustably secured in desirable radial positions on the transmitting face-plate, as by means of T-bolts 124 arranged to be adjustably placed in an annular T-slot 125 in said face-plate, a nut 126 clamping the parts in adjusted positions.

The parts are so adjusted that when the arm 121 is rotated in either direction, there is sufficient duration of contact between said arm and one of the tappets to impart the desired amount of movement to the face-plate for transmitting the desired amount of feed to the element to be fed, instanced as the tool-support.

To insure cessation of feeding movement of the element being fed upon cessation of movement of the arm, the face-plate has friction-brake connection with the bushing, as by means of friction shoes 130, 131, whose brake-faces engage the journal 120. The friction shoes are located in recesses 132, 133, in the hub of said plate. A bolt 134 passes through a bore 135 in one of said shoes and has threaded engagement 136 in the other of said shoes for increasing or decreasing the frictional resistance between said shoes and said journal, a jam-nut 137 fixing the parts in adjusted position. Overthrow of feeding movement of the face-plate is thus prevented.

The transmission of feeding movement from the face-plate to the element being fed may be by any ordinary or well-known means, instanced as accomplished by providing the face-plate with gear-teeth 141, which mesh with a gear 142, the latter meshing with gears 143 and 144, the gears 142, 143, 144, being parts of ordinary or well-known ratchet-boxes 145, 146, 147, of usual construction, having connection with a usual feed-screw 148 and usual rods 149, 150, for respectively causing lateral feeding movement of the tool-head or heads, and up and down feeding movements of the respective tool-slides.

Referring to Figs. 10, 11, 12 and 13, I have, as a modification, shown the transmitting elements as a rack 151, and a pinion 152, the pinion being fixed to the shaft 114 for transmitting its movements to the arm 121. A crank-plate 153 is fixed to the hub 83 of the feed-box. It is provided with a crank-pin 154, about which the bearing 155 of a pitman 156 is received, the pitman being articulated by articulation 157 with the feed-rack 151 extending lengthwise of the guide-way 158 of the column 159 of the machine, on which the cross-head is adjusted up and down. The feed-rack meshes with the feed-pinion 152. Holes 160 in the crank-plate provide access to the screws 79.

The crank-plate is arranged to be secured in different positions to the feed-box, for causing the feeding stroke of the feed-rack to be either in up direction or in down direction, the idle stroke of the feed-rack being in the opposite direction. For this purpose the crank may be positioned with relation to the feed-box, so that its crank-pin is at either side of the vertical plane in which the rocking axis of the feed-box is located.

For accomplishing this the feed-box is provided with a pair of threaded apertures 161, into either of which a bolt 162, passing through a hole 163 in the crank-plate, is arranged to have threaded engagement. When this threaded engagement is had with one of said threaded apertures, the crank-pin is at one side of the rocking axis of the crank-plate, and when the engagement is had with the other threaded aperture, the crank-pin is at the other side of said axis.

The crank-plate is provided with peripheral recesses 164 into which the end of a file or other suitable device may be inserted for turning the crank-plate, when it is desired to change its position with relation to the feed-box. This change of position is for the pur-

pose of changing the time of feed from the end of the cutting stroke to the end of the return or idle stroke of the table of the machine, or vice versa.

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

1. In feeding mechanism for metal working machinery, the combination of an alternate rotary driving member, a driven member, pawl and ratchet mechanism for connecting said members for direct and reverse rotation, friction means coöperating with said driving member for operating the pawl mechanism to connect with the ratchet mechanism for either direction of rotation, stops at predetermined points coacting with said pawl mechanism for rendering the same inactive, and friction members between the said driving and driven members.

2. In feeding mechanism for metal working machinery, the combination of an alternate rotary driving element, an alternate rotary driven element, a plurality of motion-transmitting means between said alternate rotary driving element and said alternate rotary driven element, each of said motion-transmitting means including a positive driving means, said positive driving means each including coacting parts, means for causing alternate engagements between said coacting parts for rotations of said respective positive driving means in opposite directions, and means for adjusting the coactive relation between said coacting parts in one of said positive driving means.

3. In feeding mechanism for metal working machinery, the combination of a pair of alternate rotary members, one of which is a driving member and the other of which is a driven member, one of said members including ratchet-wheel means, and the other of said members comprising oppositely disposed pawls, means between said pawls and one of said members which includes said ratchet-wheel means whereby to cause opposite movements of said pawls for alternate reverse engagements thereof with said ratchet-wheel means, and friction means between said members to counteract inertia of movement between them.

4. In feeding mechanism for metal working machinery, the combination of a pair of alternate rotary members, one of which is a driving member and the other of which is a driven member, one of said members including ratchet-wheel means, and the other of said members comprising oppositely disposed pawls, means between said pawls and one of said members which includes said ratchet-wheel means whereby to cause opposite movements of said pawls for alternate reverse engagements thereof with said ratchet-wheel means, friction means between said members to counteract inertia of movement between them, and means for adjusting said friction-means.

5. In feeding mechanism for metal working machinery, the combination of a pair of alternate rotary members, one of which is a driving member and the other of which is a driven member, one of said members including a ratchet-wheel means, and the other of said members comprising oppositely disposed pawls coacting with the latter, a rocking element therefor, friction means between said rocking element and said ratchet-wheel means whereby the alternate rotations of said ratchet-wheel means cause reverse rocking movements of said pawls, stops to cause disengagement between said pawls and said ratchet-wheel means, and friction means between said members to counteract inertia of movement between them.

6. In feeding mechanism for metal working machinery, the combination of a pair of alternate rotary members, one of which is a driving member and the other of which is a driven member, one of said members including a ratchet-wheel, and the other of said members comprising a rocking member, oppositely disposed pawls coacting with said ratchet-wheel, a pair of levers pivoted on said rocking member, and friction shoes on said levers coacting with said ratchet-wheel to rock said rocking member, said shoes acting resiliently on said ratchet-wheel.

7. In feeding mechanism for metal working machinery, the combination of a pair of alternate rotary reciprocating members, one of which is a driving member and the other of which is a driven member, one of said members including a ratchet-wheel, and the other of said members comprising a rocking member, oppositely disposed pawls coacting with said ratchet-wheel, a pair of levers pivoted on said rocking member, friction shoes on said levers coacting with said ratchet-wheel to rock said rocking member, said shoes acting resiliently on said ratchet-wheel, and annularly arranged friction means between said ratchet-wheel and said other of said members for counteracting the inertia of motion of said driven member.

8. In feeding mechanism for metal working machinery, the combination of a ratchet-wheel, a casing about the same, a rock-shaft pivoted on said casing, oppositely disposed pawls thereon, friction-levers pivoted to said rock-shaft, resilient means for resiliently pressing the friction portions of said friction-levers toward said ratchet-wheel whereby to rock said pawls, annular friction-plates in said casing, friction-rings between said friction-plates and said ratchet-wheel, and means causing combined rotation of said annular friction-plates and said casing.

9. In feeding mechanism for metal working machinery, the combination of a ratchet-

wheel, a casing about the same, a rock-shaft pivoted on said casing, oppositely disposed pawls thereon, friction-levers pivoted to said rock-shaft, resilient means for resiliently pressing the friction portions of said friction-levers toward said ratchet-wheel whereby to rock said pawls, annular friction-plates in said casing, friction-rings between said friction-plates and said ratchet-wheel, means for adjusting the pressure of said friction-plates toward said ratchet-wheel, and means causing combined rotation of said annular friction-plates and said casing.

10. In feeding mechanism for metal working machinery, the combination of a ratchet-wheel, a casing about the same, a rock-shaft pivoted to said casing, oppositely disposed pawls thereon, opposed friction-levers pivoted to said rock-shaft and provided with friction-parts, a screw-rod between said friction-levers, a spring about said screw-rod, a nut on said screw-rod for adjusting said spring, an arm on said rock-shaft, and stops for coaction with said arm for rocking said rock-shaft.

In testimony whereof, I have hereunto signed my name in the presence of two subscribing witnesses.

HANS BAERBALCK.

Witnesses:
H. V. HILKER,
FRANK P. SCHMITT.