June 12, 1928.

1,673,078

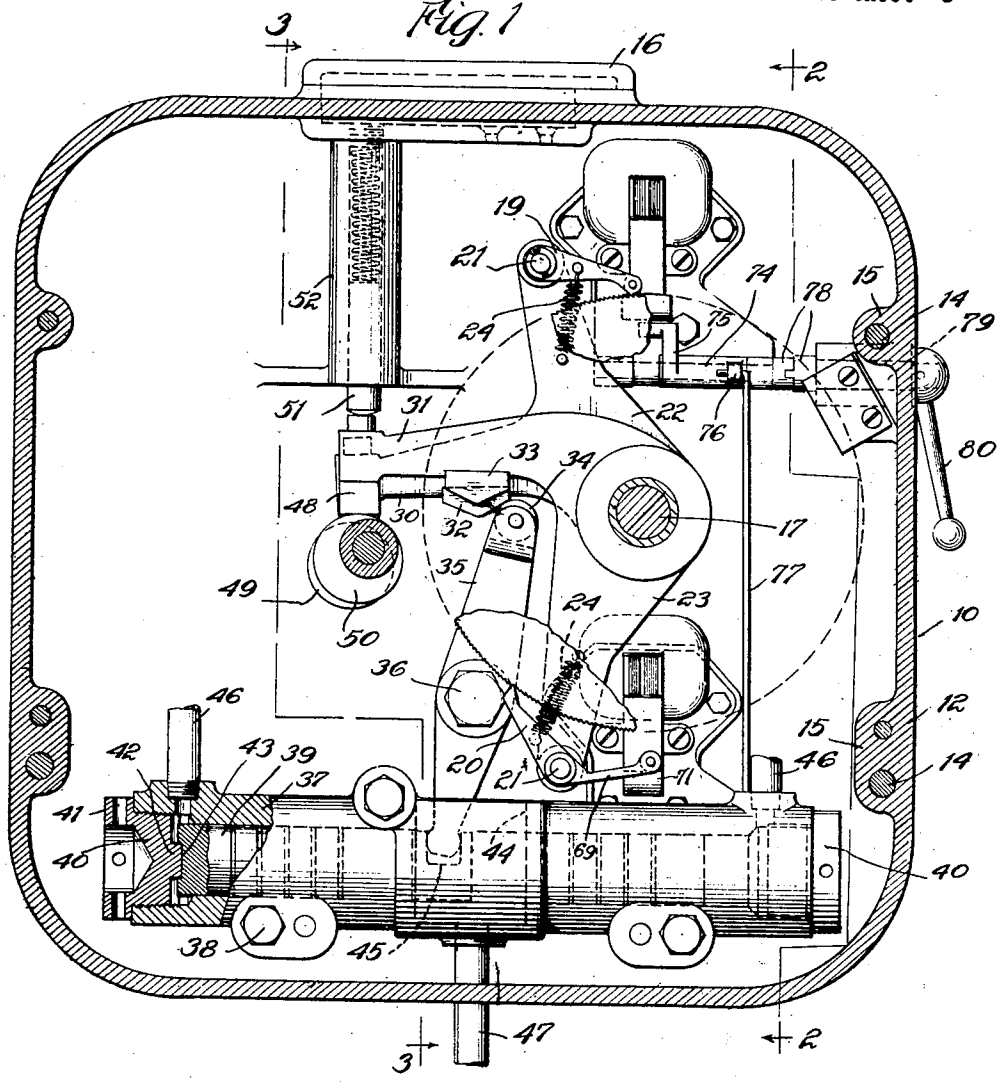
H. E. KEMPTON ET AL

FEED MECHANISM FOR MACHINE TOOLS

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3 Sheets-Sheet 1

Fig. 1



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Fig. 2

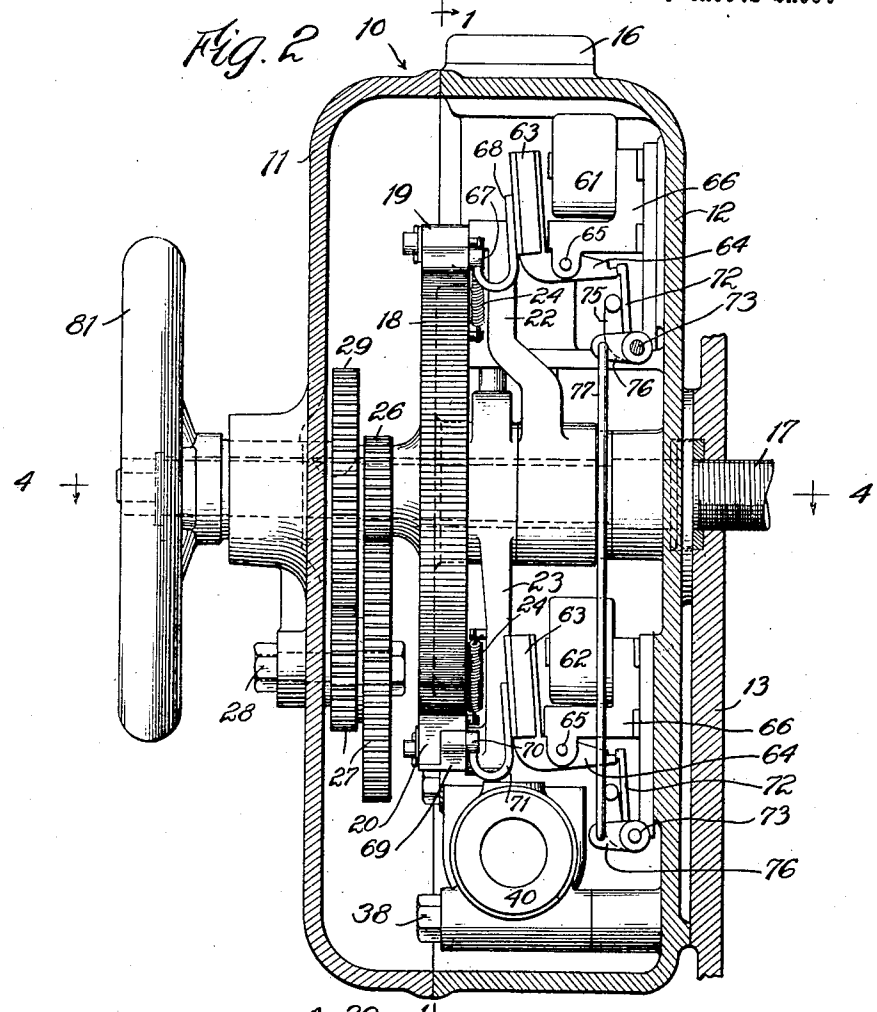
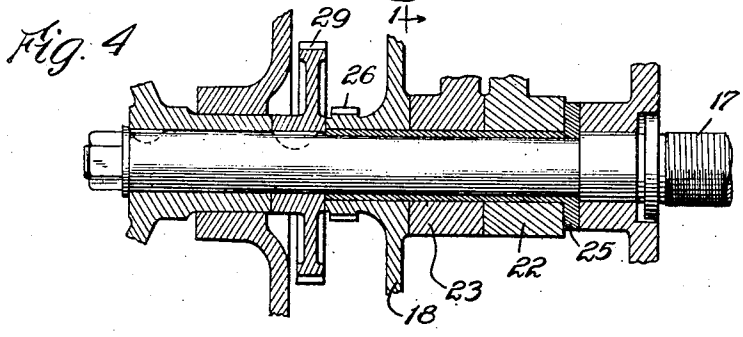


Fig. 4



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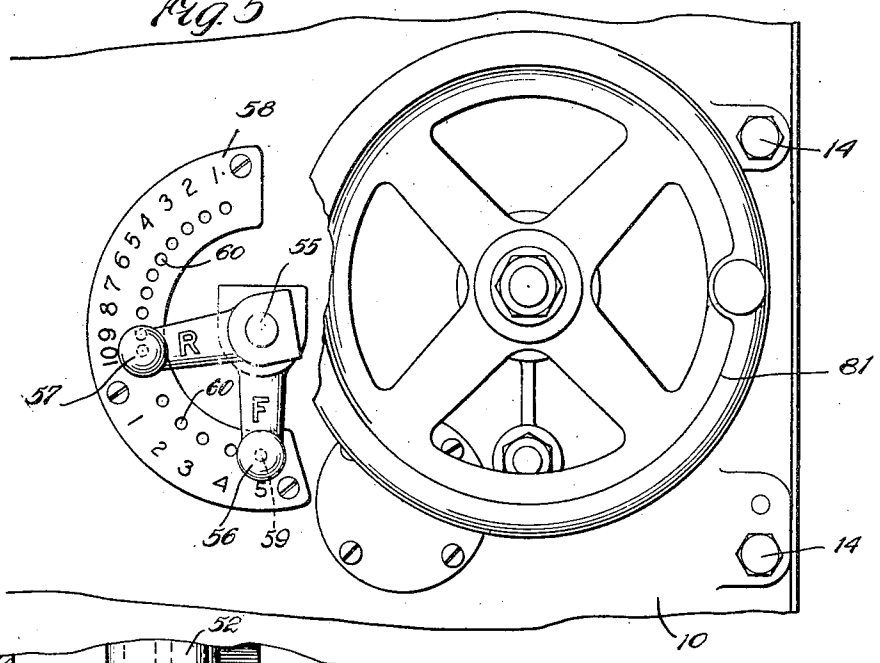
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FEED MECHANISM FOR MACHINE TOOLS

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Fig. 5



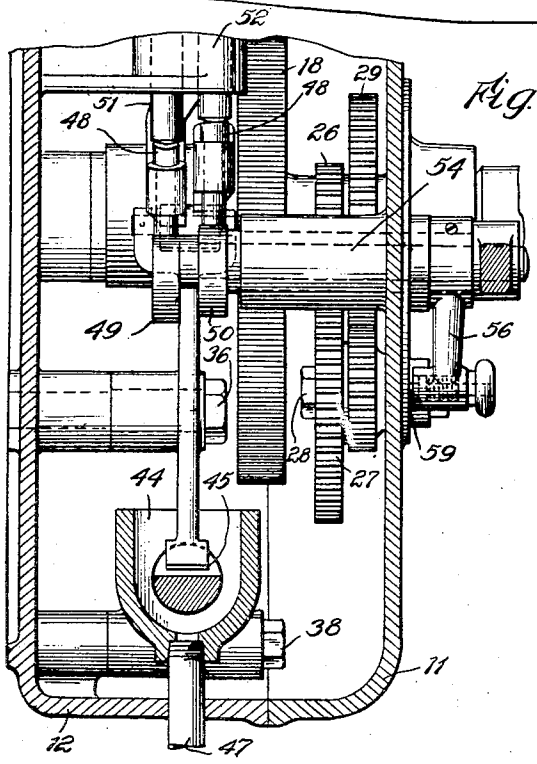
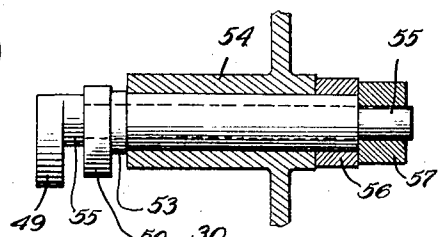


Fig. 3

Fig. 6



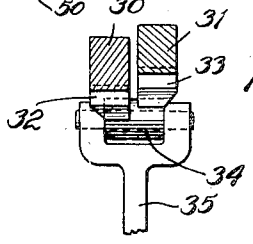


Fig. 7

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Patented June 12, 1928. 1,673,078

UNITED STATES PATENT OFFICE.

HERBERT E. KEMPTON AND KEITH F. GALLIMORE, OF FOND DU LAC, WISCONSIN, ASSIGNORS, BY MESNE ASSIGNMENTS, TO THE HEALD MACHINE COMPANY, OF WORCESTER, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

FEED MECHANISM FOR MACHINE TOOLS.

Application filed February 17, 1923. Serial No. 619,774.

This invention relates to improvements in feed mechanisms, and relates more particularly to a mechanism for automatically and intermittently feeding a carriage of a grinding machine or other machine tool.

A general object of the invention is to provide an improved feeding mechanism which comprises a ratchet device wherein the pawl is in constant engagement with the toothed element during the feeding operation, and to provide means for varying the length of reciprocation of the pawl by converting the regular or uniform movements of an actuating means into a variable length of movement of the pawl.

More specifically stated, it is an object of the invention to provide a manual control which is operable while the mechanism is running for accomplishing the varying reciprocation of the pawl as described.

Another object is to provide a feed mechanism of this character which comprises two pawls engaging a toothed element of a ratchet device and to provide means for reciprocating said pawls through different lengths of stroke and for independently varying the length of reciprocation of both pawls.

Another object is to provide an improved mechanism of this character in which the pawl is effective upon the toothed element immediately upon the beginning of the stroke of the pawl so as to eliminate any lost motion greater than the distance between two adjacent teeth on the toothed element.

Another object is to produce a feeding mechanism of the above type which will be simple in construction and efficient and accurate in operation.

Ancillary objects and advantages will be made apparent from the following detailed description taken in connection with the accompanying drawings in which Figure 1 is a vertical sectional view taken along the line 1—1 of Fig. 2 with certain parts broken away illustrating our improved feeding mechanism.

Fig. 2 is a vertical section taken in the plane of line 2—2 of Fig. 1.

Fig. 3 is a fragmentary vertical section taken in the plane of line 3—3 of Fig. 1.

Fig. 4 is a sectional detail showing the feed-screw shaft and taken in the plane of line 4—4 of Fig. 2.

Fig. 5 is a fragmentary front elevation showing the hand feed and the automatic feed adjustments.

Fig. 6 is a sectional detail view showing the mechanism for adjusting the automatic feed.

Fig. 7 is a detail view illustrating part of the actuating mechanism for the feed screw.

While our invention is susceptible of various modifications, we have shown in the drawings and will herein describe in detail the preferred embodiment, but it should be understood that we do not thereby intend to limit the invention to the exact construction disclosed, but aim to cover in the subjoined claims all modifications and alternative constructions falling within the scope of the invention.

In the preferred embodiment of the invention herein disclosed, the feed mechanism is housed and supported within a feed box or casing 10 comprising two sections 11 and 12 of which the latter is suitably secured to a supporting wall 13. The wall 13 usually comprises a portion of a machine base or frame. The sections 11 and 12 are removably held together by bolts 14 passing through lugs 15 formed on the adjacent edges of the sections. Access may be had to the interior of the casing through an opening in the upper wall of the casing which is ordinarily closed by a removable cover 16.

Extending through the wall 13 into the casing 10 is a feed screw 17 upon which is loosely mounted a ratchet wheel 18 adapted to be intermittently rotated through small degrees by pawls 19 and 20 positioned respectively above and below said feed screw. The pawls 19 and 20 are pivoted at 21 upon the upwardly and downwardly extending arms respectively of two bell-crank levers 22 and 23 loosely mounted upon the feed screw 17, and are resiliently held in engagement with the ratchet wheel 18 by springs 24 attached to said arms. A bearing sleeve 25 is preferably interposed between the feed screw shaft 17 and the bell-crank levers and ratchet wheel.

Rotation of the ratchet wheel 18 is transmitted to the shaft 17 through a reducing gear train comprising a spur gear 26 inte-

grally formed on the forwardly extending hub of the ratchet wheel. The gear 26 meshes with a double gear 27 mounted upon a stub shaft 28 and which engages a gear 29 keyed upon the shaft 17 to rotate the latter.

The bell-crank levers 22 and 23 are provided with two parallel and laterally spaced arms 30 and 31 respectively which extend horizontally to the left of the shaft 17 and carry two triangular cam blocks 32 and 33 on their undersides and intermediate their ends. A roller 34 is adapted to engage the cam blocks to reciprocate the pawls 19 and 20, and is mounted in the upper forked end of a lever 35 pivoted at 36 and connected at its lower end with a suitable reciprocating element such as the moving part of a cylinder and piston unit.

In the present instance the piston and cylinder unit for oscillating the lever 35 comprises a cylinder 37 which is horizontally supported in the lower part of the casing 10 by bolts 38, and an elongated piston 39 adapted to reciprocate freely within said cylinder. Plugs 40 close the ends of the cylinder 37, and are provided with peripherally bored flanges 41 to facilitate their insertion. Projections 42 on the inner ends of the plugs 40 are adapted to enter suitable apertures 43 in the opposite ends of the piston 39 to guide and cushion the latter near the end of its stroke. Centrally of its ends, the cylinder 37 is enlarged to form a chamber 44 open at the top, thereby in effect providing a double cylinder. The piston 39 is centrally provided in the chamber 44 with a notch 45 which receives the lower end of the lever 35. Pressure fluid is alternately introduced into the opposite ends of the cylinder 37 and expelled therefrom through pipes 46 leading to a suitable source of pressure fluid and controlling means (not shown). Any oil or pressure fluid working from the ends of the cylinder 37 to the chamber 44 is drawn off through a drain pipe 47.

The effect of the reciprocation of the piston 39 upon the pawls 19 and 20 is varied by raising and lowering the arms 30 and 31 to adjust the degree of engagement between the roller 34 and the cam blocks 32 and 33. While any other suitable means may be used for making these adjustments, we prefer to employ means which will now be described. Pins 48 pass through the free ends of arms 30 and 31, and are provided with enlarged lower heads which ride upon the working faces of two eccentrics 49 and 50 mounted in spaced relation directly below said arms 30 and 31, respectively. Spring pressed plungers 51 mounted in sleeves 52 engage the upper ends of the pins 48 to hold them resiliently against the eccentrics. The eccentric 50 is positioned at the inner end of a hollow shaft 53 extending through a sleeve 54 to the front of the casing 10. The eccentric 49 has a shaft 55 extending through the shaft 53. Arms 56 and 57 are provided at the outer ends of the shafts 53 and 55 respectively whereby the operator can independently adjust the degree of reciprocation of each of the pawls 19 and 20. In the initial position of adjustment, the eccentric 50 holds its associated arm 31 in a slightly higher plane than that of the arm 30 so that the oscillating lever 35 will cause the pawl 19 to effect a rough or heavy feed and the pawl 20 to effect a fine feed. When both pawls are in engagement with the ratchet wheel 18, only the rough feed pawl is effective. Mounted on the front of the casing 10 is a segmental plate 58, underlying the arms 56 and 57, which indicates the different adjustments of the eccentrics. Spring pressed plungers 59 in the free ends of the arms 56 and 57 engage holes 60 in the segmental plate 58 to hold said arms in their adjusted positions.

Various means may be used for successively and selectively lifting and holding the pawls 19 and 20 out of engagement with the ratchet wheel 18. We preferably employ means comprising electromagnets 61 and 62, each of which is provided with an armature 63 having a rearwardly extending arm 64 pivoted at 65 just below the magnet core 66. The arm 64 limits the outward movement of the armature. A roller 67 mounted on the free end of the pawl 19 continually overlies during its reciprocation and is adapted to be engaged by the convex outer end of an arm 68 secured to the adjacent armature. The pawl 20 is provided with an arm 69 fixed with relation thereto which carries a roller 70 at its free end adapted to be engaged in any of its positions by the concave end of an arm 71 attached to the armature of the electromagnet 62.

When the desired amount of feed has nearly been obtained, the circuit through the electromagnet 61 is automatically closed by means (not shown) which becomes operative when the feed screw 17 has fed the carriage which is moved thereby a certain predetermined amount. The arm 68 immediately raises the pawl 19 whereupon the fine feed pawl 20 becomes effective to complete the operation. When the desired amount of feed has been obtained, the electromagnet 62 is excited to completely discontinue the automatic feeding operation.

In actuating the armatures 63 to disengage the pawls from the ratchet wheel 18, the rear ends of the arms 63 are moved into their lowermost positions wherein they are immediately engaged and retained by dogs 72 until manually released. The dogs 72 are mounted upon individual shafts 73 sup-

ported in the rear of the casing 10, and tend to move into holding engagement with the arms 64 by their own weight. Keyed upon each shaft 73 is a sleeve 74 having an arm 75 extending across the front side of the adjacent dog. Laterally extending arms 76 on the sleeves 74 are connected by a rod 77. The upper shaft 73 is connected by a coupling 78 with a shaft 79 extending to one side of the casing 10 and having a handle 80 whereby the operator may manually rotate the sleeve 74 to release the arms 64 whereupon the engagement of the pawls with the ratchet wheel is re-established.

The feed screw 17 extends to the front of the casing 10 and has a hand wheel 81, whereby the feed may be manually adjusted in either direction when the pawls are being held in their inoperative positions.

In practice, when beginning a new operation with the pawls held away from the ratchet wheel by the dogs 72, the initial feed may be manually effected by rotating the wheel 81, after which the automatic feed may be instituted by releasing the arms 64 through the handle 80. After the operation is completed and the automatic feed discontinued, the feed screw 17 is manually backed up to reposition it for the new operation.

We claim as our invention:

1. A feeding mechanism having, in combination, a ratchet wheel mounted on a shaft, two levers mounted on said shaft adjacent said ratchet wheel, a coarse feed pawl carried by one lever, a fine feed pawl carried by the other lever, means for simultaneously oscillating said levers, and means for independently varying the degree of oscillation of said levers.

2. A feeding mechanism having, in combination, a ratchet wheel, two independent feed pawls mounted to rotate said wheel, means for simultaneously actuating said pawls, and means for independently adjusting the length of movement of each pawl.

3. A feeding mechanism having, in combination, a ratchet wheel, pawls mounted to rotate said ratchet wheel, means for actuating said pawls to move unequal distances, means for independently adjusting the movement of said pawls, and electromagnetic means for progressively rendering said pawls ineffective beginning with the pawl having the greatest movement.

4. A feeding mechanism having, in combination, a ratchet wheel, a plurality of pawls mounted to engage said ratchet wheel, means for actuating said pawls to move unequal distances, and means for progressively disengaging said pawls from said ratchet beginning with the pawl having the greatest movement.

5. A feeding mechanism having, in combination, a ratchet wheel, a plurality of pawls mounted to engage said ratchet wheel, means having a regular or uniform movement for actuating said pawls, and adjusting means operable to independently vary the extent of movement of said pawls by said last mentioned means.

6. A feeding mechanism having, in combination, a shaft, a ratchet wheel mounted on said shaft, a lever mounted on said shaft, a pawl carried on one arm of said lever and engaging said ratchet, a cam carried on the other arm of said lever, an oscillating lever mounted to engage said cam to reciprocate said pawl, means for adjusting the degree of engagement between said cam and said oscillating lever, and means for oscillating said lever.

7. A feeding mechanism having, in combination, a ratchet wheel, a lever, a pawl carried by said lever for engaging said ratchet wheel, a cam on said lever, an eccentric engaging said lever for varying the initial position of said cam, means for engaging said cam to move said lever in one direction, and spring means to return it to said engagement with said eccentric, thereby reciprocating said pawl, the degree of reciprocation being dependent upon the position of said cam with respect to said means.

8. A feeding mechanism having, in combination, a ratchet wheel, two levers mounted adjacent to said ratchet wheel, a pawl carried on each lever for engagement with said ratchet wheel, a cam on each lever, oscillatory means for engaging said cams, said cams projecting into the path of said oscillatory means and each cam being adjustable into different initial positions to vary the extent to which it projects into said path, and means for actuating said oscillatory means to reciprocate said pawls, said pawls being reciprocable unequal distances when said cams are adjusted into unlike initial positions.

9. A feeding mechanism having, in combination, a ratchet wheel, two levers independently mounted adjacent said ratchet wheel, a pawl carried on each lever for engaging said ratchet wheel, and means for simultaneously oscillating said levers unequal distances, whereby said pawls will be caused to reciprocate unequal distances.

10. A feeding mechanism having, in combination, a lever, a stationary cylinder horizontally mounted below said lever, and having a central open chamber, a movable piston in said cylinder having a slot movable in said chamber, a second lever having its lower end within said slot, and a roller mounted in the upper end of said second lever for engaging said first mentioned lever to oscillate the latter.

11. A feeding mechanism having, in combination, a ratchet wheel, a member having an operable connection with said wheel to rotate the latter, a stationary horizontal cyl-

inder having a lateral opening, a piston movable in said cylinder, and a lever having one end in said opening in engagement with said piston and its other end in engagement with said first mentioned member to actuate the latter.

12. A feeding mechanism having, in combination, a ratchet wheel, two levers having operable connections with said wheel to rotate the latter and extending side by side, means for engaging said levers to oscillate them, an eccentric for each lever, said eccentrics being mounted to engage the adjacent free ends of said levers, means for holding said levers in engagement with said eccentrics, and means for adjusting said eccentrics to vary the effectiveness of said first mentioned means.

13. A feeding mechanism having, in combination, a hollow shaft, an eccentric on one end of said shaft, a shaft within said first mentioned shaft, a second eccentric on said last mentioned shaft, means for independently rotating said shafts to adjust the positions of said eccentrics, a ratchet wheel, levers having their free ends in engagement with said eccentrics, said eccentrics being so formed that in their initial positions said levers occupy different positions, means for operating said ratchet wheel from said levers when oscillated, and means for oscillating said levers, the relative degree of oscillation being dependent upon the relative and initial positions of said eccentrics.

14. A feeding mechanism having, in combination, a shaft, a ratchet wheel mounted on said shaft, two bell-crank levers mounted on said shaft and having two arms extending in opposite directions and two arms in the same general direction, a pawl mounted on each of said first mentioned arms and adapted to engage said ratchet, means for engaging the last mentioned arms to actuate said pawls, and means for disengaging said pawls from said ratchet wheel.

15. A feeding mechanism having, in combination, a shaft, a ratchet wheel and two bell-crank levers mounted on said shaft, said levers having two oppositely extending arms and two parallel extending arms, pawls mounted on each of said first mentioned arms and adapted to engage said ratchet wheel, cams mounted on the other of said arms, means for engaging said cams at regular intervals to reciprocate said pawls, and means for varying the initial position of said cams with respect to said engaging means to vary the degree of reciprocation of said pawls.

16. A feeding mechanism having, in combination, a shaft, a ratchet wheel having an operable connection with said shaft, two bell crank levers having laterally extending arms, pawls supported on said levers and adapted to engage said ratchet wheel to rotate the latter in one direction, cams mounted on said arms, and means for simultaneously engaging said cams to move said levers whereby said pawls will be reciprocated.

17. A feeding mechanism having, in combination, a shaft, two bell-crank levers having an operable connection with said shaft and comprising two arms extending side by side, cams mounted on the underside of said arms intermediate their ends, eccentrics mounted to engage the free ends of said arms, means for adjusting said eccentrics to vary the position of said arms, and means for engaging said cams to lift said arms whereby said shaft is rotated.

18. A feeding mechanism having, in combination, two pivotally mounted levers having arms extending side by side, means engaging the ends of said arms to adjust the relative and initial positions thereof, means for oscillating said arms, a feeding element, and means connecting said arms to said feeding element to actuate the latter when said arms are oscillated.

19. A feeding mechanism having, in combination, a ratchet wheel, two pawls independently mounted to engage said ratchet wheel, a single means for actuating said pawls, means for individually varying the length of reciprocation of said pawls, and means for successively rendering said pawls ineffective to rotate said ratchet wheel.

20. A feeding mechanism having, in combination, a ratchet wheel, a pair of levers mounted adjacent to said wheel and carrying a pair of feed pawls, means for actuating said levers, two electromagnets for lifting said pawls out of engagement with said ratchet wheel, a pair of dogs for holding said pawls out of engagement with said ratchet wheel, and a single manually operable means for releasing said dogs to allow said pawls to engage said ratchet wheel.

21. A mechanism of the character described having, in combination, a ratchet device comprising a toothed element and two pawls, and means for reciprocating said pawls comprising two parts each connecting to one of said pawls a cooperating actuating part having a regular or uniform movement tending to impart uniform movement in one direction to both pawls, spring means to hold said parts against said actuating parts, and means for independently varying the effect of said actuating part on said other parts and thereby independently varying the lengths of reciprocation of said pawls.

In testimony whereof we have hereunto affixed our signatures.

HERBERT E. KEMPTON.
KEITH F. GALLIMORE.