F. W. A. HERRMANN & A. E. ROBINSON.

OPERATING MECHANISM FOR SHAPERS.

APPLICATION FILED JULY 8, 1914.

1,223,339.

Patented Apr. 17, 1917.

3 SHEETS—SHEET 1.

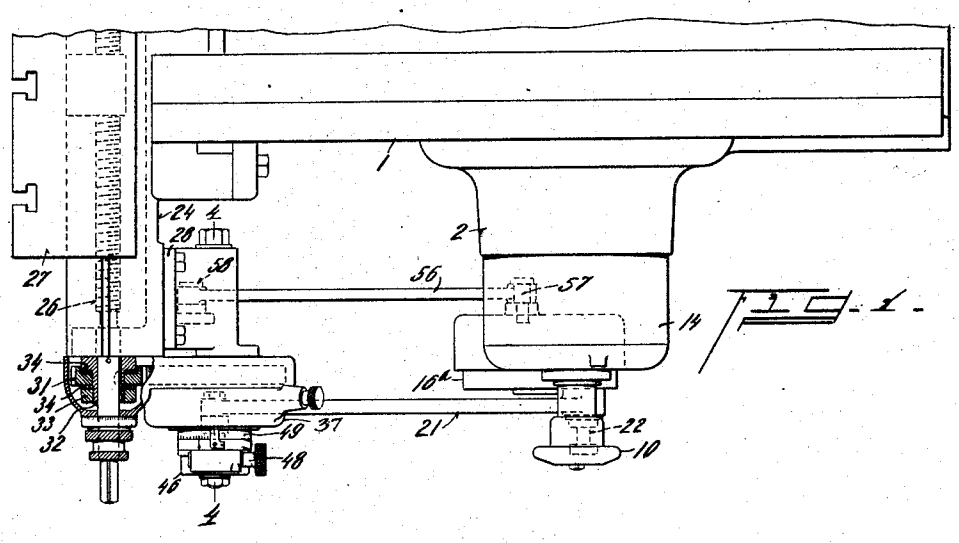


Fig. 1.

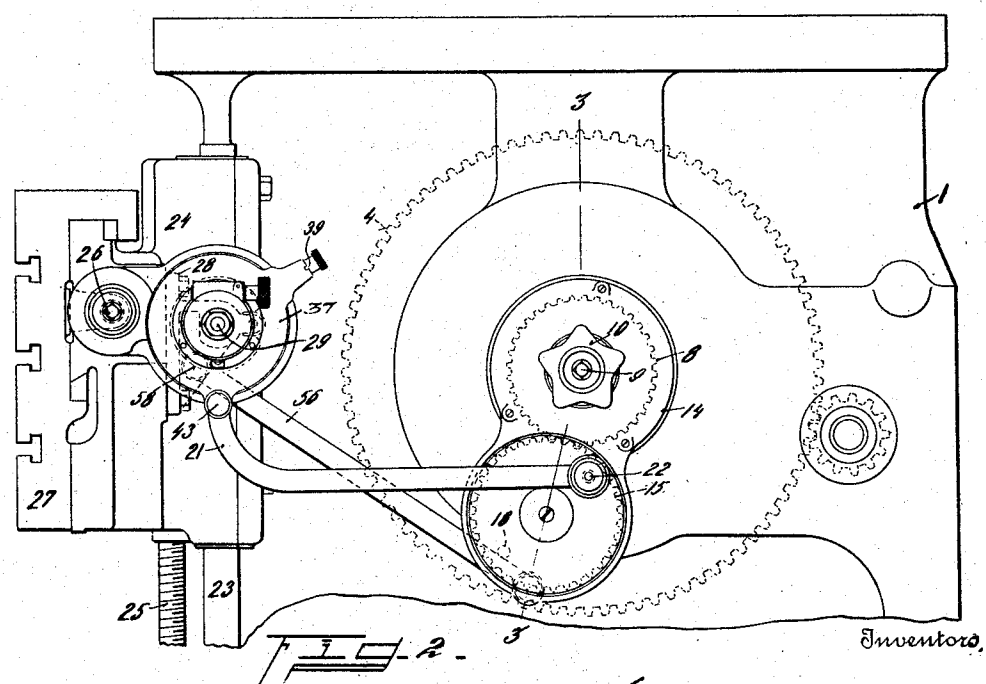


Fig. 2.

Witnesses

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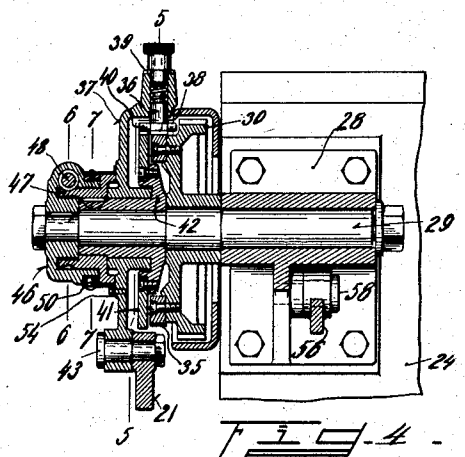


FIG. 4.

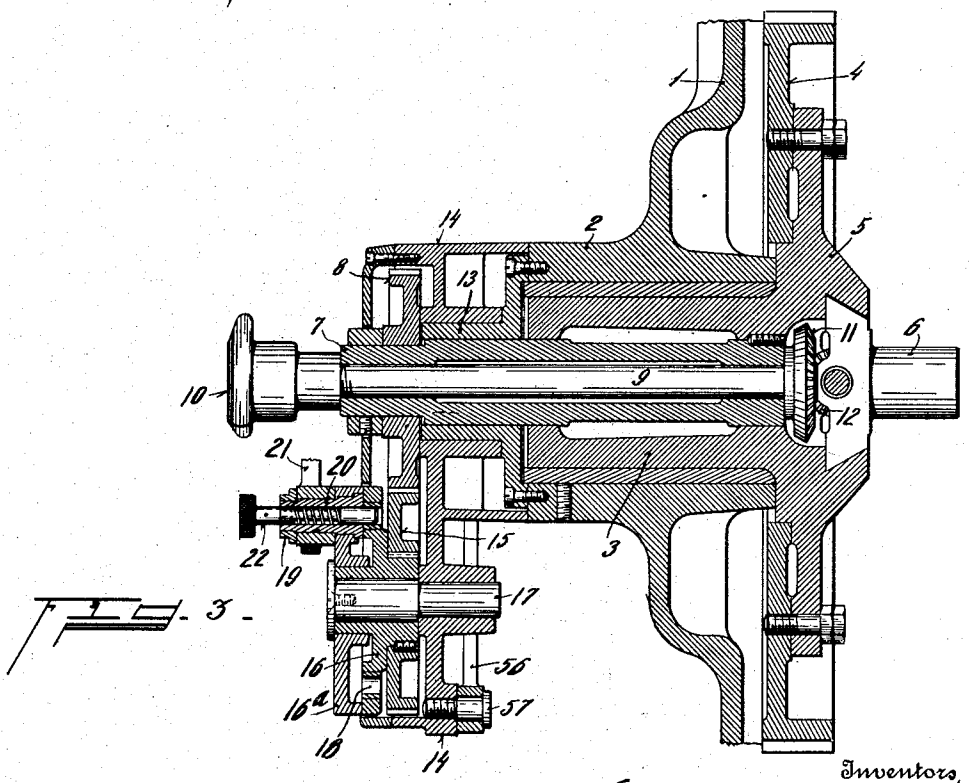


FIG. 3.

Witnesses

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3 SHEETS—SHEET 3.

FIG. 5.

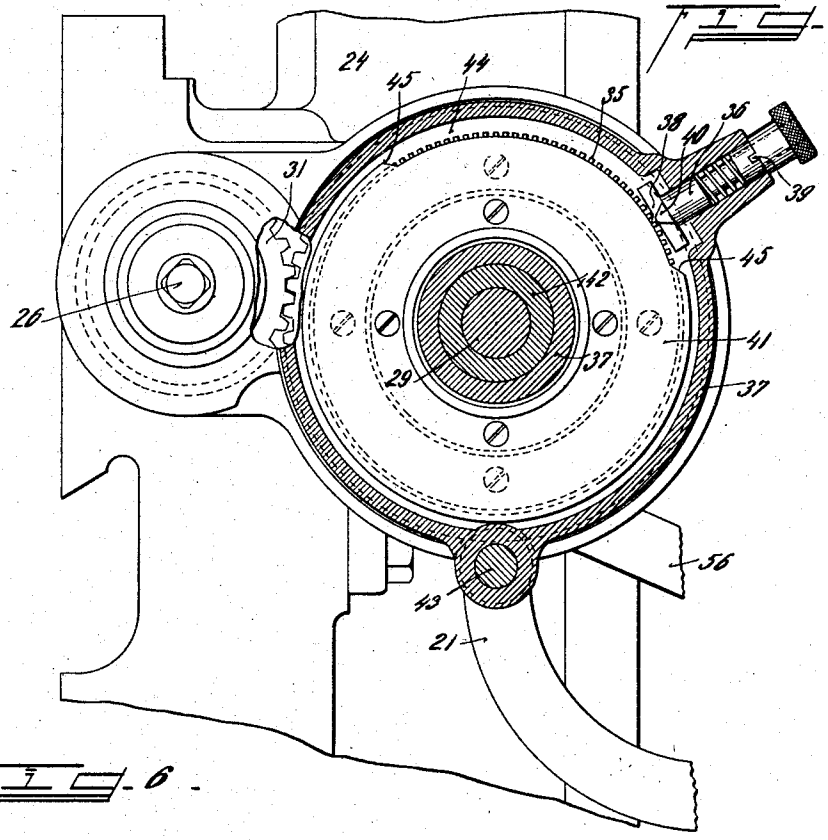
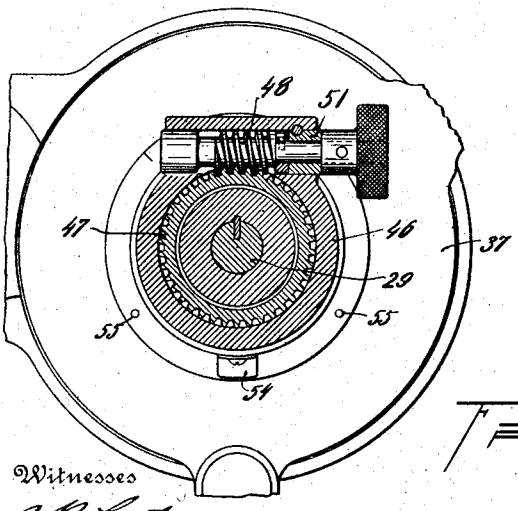


FIG. 6.



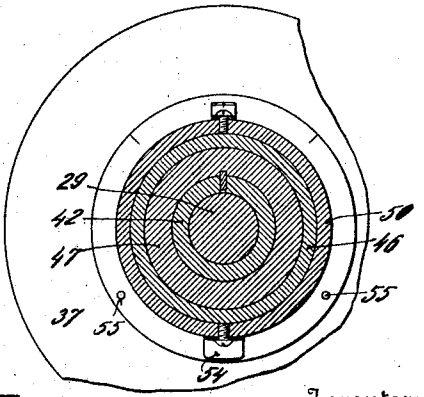


FIG. 7.

Witnesses

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UNITED STATES PATENT OFFICE.

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OPERATING MECHANISM FOR SHAPERS.

1,223,339. Specification of Letters Patent. Patented Apr. 17, 1917.

Application filed July 8, 1914. Serial No. 849,637.

To all whom it may concern:

Be it known that we, FREDERICK W. A. HERRMANN, a subject of the German Emperor, and ALBERT E. ROBINSON, a citizen of the United States, and residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented a new and useful Improvement in Operating Mechanism for Shapers, of which the following specification is a full disclosure.

The invention relates to transmission mechanism for converting continuous rotary motion into intermittent rotary motion in either forward or reverse directions, rendering it available in the complete organization herein shown and described for rotating the feed screw of a metal cutting machine tool preferably that of a shaping machine for traversing its work supporting carriage or table.

In the ordinary use of a shaping machine the carriage is fed during an idle or non-cutting stroke of the ram carrying the cutting tools, and this in either direction of carriage traverse. The feeding action, therefore, must be coördinately controlled with the movements of the ram, and the mechanism herein offers a quick and convenient change of the direction of carriage traverse without stopping the machine. The length of carriage traverse in either direction is micrometrically determined and regulated while the parts are in motion, so that the intermitting feed length can be varied with precision to set the cutting feed to that at which it is most suitable to the work machined.

Thus the cutting capacity can be increased without injury to the machine for the regulation can be made in minute degrees while the machine is in operation and without calling for undue service on the part of the operator. The carriage in a shaping machine ordinarily is adjustable to various types which results in a change of the relative location of some of the parts of the feed transmission devices, increasing or decreasing their connecting length, and this is accomplished herein by a permanent length of connector connecting with a planetary crank, whereby the parts are equally effective at any elevation of the carriage to which it may be adjusted with no loss in the transmitting power.

This eliminates any loose or slip connections between the main source of power and the ratchet mechanism which is subjected to constant change with the rise and descent of the carriage, and unless carefully observed results in a loss of power or length of transmitting stroke.

An object, therefore, of the invention is to provide transmission mechanism for the feeding devices of a shaping machine, in which the manual duties and observation are minimized, and the functions thereof altered, while the parts are in motion and its results within micrometric precision.

Another object of the invention is to provide two sets of motion converting devices for converting rotary into reciprocating motion, rotative as a unit, and in which a crank is preferably the converting means for each, with one or both having its crank axle transferable to relative coincident lines at one side of the rotative axis, or alternately to relatively opposing sides of such axis for producing coördinate functioning results.

Another object of the invention is to provide a crank comprising coaxially journaled members, one provided with a crank arm unitarily rotatable and separable to independently rotate the same to transfer the crank axle from one side of the main axis to an opposite side of the members as a unit, and whereby the change can be made without discontinuing the rotative power.

Another object of the invention is to provide a swingingly supported or planetary crank of motion converting devices for automatically maintaining a definite connecting length between an adjustable crank driven device and crank axle.

Another object of the invention relates to ratchet motion converting devices, converting reciprocating into intermittent rotary motion in either forward or reverse directions, together with means for regulating the operating interval of either stroke. Thus the traversing feed interval of the carriage of a shaping machine can be regulated and this in a micrometric degree.

Another object of the invention relates to pawl and ratchet devices, wherein the pawl has an oscillating or reciprocating action to impart intermittent motion to the ratchet, combined with trip devices under micrometric regulation for minutely controlling a

motion imparting interval in either stroke of the pawl.

Various other objects and advantages are more elaborately set forth in the description of the accompanying drawings illustrating a preferred embodiment of the invention as applied to a shaping machine, and in such drawings like characters of reference denote corresponding parts throughout the several views, of which:—

Figure 1 is a top plan view of the feeding devices as applied to a shaper, with only a portion of the shaper shown.

Fig. 2 is a side elevation thereof.

Fig. 3 is an enlarged section on line 3—3, Fig. 2.

Fig. 4 is a section on line 4—4, Fig. 1.

Fig. 5 is an enlarged section on line 5—5, Fig. 4.

Fig. 6 is an enlarged section on line 6—6, Fig. 4.

Fig. 7 is an enlarged section on line 7—7, Fig. 4.

As the invention concerns only the feeding devices for the table or carriage of a shaping machine, the drawings are not unnecessarily encumbered by an elaborate illustration of a complete machine tool, but sufficiently illustrates the invention, in its primary application to a shaping machine, from which its construction and mode of operation can be clearly understood.

We have only illustrated the upper portion of the main frame of a shaping machine, omitting the ram and its reciprocating means as well as the means for elevating the work supporting table or carriage, as they may be of any type of construction.

The frame 1 of the machine has its right wall provided with an annular bearing flange 2, within which an extended tubular hub 3 of the crank gear 4 is supported and journaled.

The crank gear and its hub are of two-part construction, united by the flange 5, integral with the hub, and the flange 5 is provided with a gib-way for adjustably supporting the crank pin 6, which operates the ram pitman. The crank gear, however, may be of any form of construction and driven in any suitable manner, and for the purposes herein comprises a main driving member for the feeding devices.

An elongated sleeve 7 is fixed concentrically within the hub 3 and projects beyond one end thereof to receive a gear 8 of the feeding devices. The sleeve 7 has a rod 9 concentrically rotatable therewith and provides an element of the adjusting means for changing the throw of the crank pin 6. The outer end of the rod 9 has a hand-knob 10 for manually rotating the rod, with the opposite or inner end of the rod provided with a beveled gear 11 intermeshed with a beveled gear 12 fixed to a screw shaft journaled within the head of the crank pin, the crank pin head being of dove-tailed formation, slidably mounted within the hub member 5 of the bull gear or main driving gear, thus rotating the knob and imparts motion to the beveled gear and screw, moving the crank pin toward or from the axle of gear 4.

Motion converting mechanism.

As the feed of the shaper is of an intermittent character to advance the carriage and its work supporting table during the return stroke of the ram, which can best be accomplished from devices having a reciprocating motion, its relative operation with the movements of the ram are more easily controlled. The feeding devices and the ram receive their motion from the same source, which is a common practice in the shaper art, thus the feeding devices are in connection with gear 4. A gear 8 is fixed to the sleeve 7, which is connected with the crank gear 4. This gear serves as an intermediary and is in mesh with a gear 15 fixed upon a hub projection of the feed crank, which in this instance is composed of two parts, with the gear 15 fixed to the member 16. This member 16 is loosely journaled upon a stud 17 fixed within a boss in the swinging frame 14, see Fig. 3. Thus the feed crank and its gear as planetary crank mechanism rotate about its own axis and capable of swinging about the axis of gear 8. The advantage of such construction will be more fully hereinafter described.

A second disk crank member 16ª is rotatably mounted upon its companion member 16, but adapted to be joined thereto so that the two crank members and their gear 15 rotate as a unit. It is obvious that the number of parts comprising the feed drive crank may be reduced or integrally combined, although the construction herein offers good mechanical design in the manufacture thereof.

The crank member 16 is provided with two crank or detent apertures 18, defining motion imparting abutment walls, diametrically disposed relatively, and alternately engaged for a respective forward or reverse feed motion.

The crank members and their gears are held in position upon the swinging frame by the head of the stud 17. The crank projecting from the member 16ª comprises a stud or thimble 20, having an annularly shouldered end seating within a shoulder orifice in the member 16ª and projects beyond said member to pivotally receive the connecting link 21 and the parts secured in position by a nut 19 fixed upon the thimble 20. A detent spring tension plunger 22 is concentrically slidable within the crank thimble and adapted to register with either of the apertures 18 for uniting said crank members and provides a convenient and

quick means for readily uncoupling the members to discontinue the feed or engage the same in a second position required for producing a coördinate feed stroke with the return stroke of the ram when altering the direction of feed to produce its feeding stroke in the proper half cycle of the gear. The forward feed is produced in the forward stroke of the connecting rod and is the result of a half cycle of the crank and during the return cycle of the ram crank gear which moves the connecting link and ram in relatively opposing directions with the half cycle of the crank members moving their connected reciprocating elements reversely, that is, the ram in a forward cutting stroke and the connecting link in a return idle stroke. Thus it is readily apparent that if the crank positions were not changed in a reverse feed of the carriage which is produced by the return stroke of the connecting link, it would occur during the half cycle of the crank, imparting the feeding stroke to the ram, operating the feed and ram simultaneously instead of alternately, which would produce a tapering cut and not a straight cut, more generally required.

It is obvious that such relatively alternate strokes of the connecting link and ram could be produced by different gear ratios, other than herein shown, and maintain the planetary arrangement of the crank which offer quite an advantage when elevating the carriage to automatically adjust the parts to their change of position.

The change of the crank position relatively with its rotative cycle can be made while the parts are in motion by manually withdrawing the detent from one aperture engagement and immediately release the same, when it will automatically engage in the second aperture by the continued rotation of the crank member 16. The change always produces an idle interval to the crank member 16ª until the succeeding aperture in the member 16 comes into registry with the detent and which always occurs during the forward or cutting stroke of the ram making it impossible to erroneously connect the parts. It can also be utilized as a means for discontinuing the feed of the carriage by locking the detent in a released position, although its general qualification is for producing the relative alternate power strokes of the connecting link and ram.

Intermittently operated feeding devices.

The forward face of the frame 1 is provided with the usual way or vertical rails 23, upon which the saddle 24 traverses in changing the elevation of the work supporting table or carriage, with the elevation regulated in the well known manner by an elevating screw 25, either manually operated or driven by power. The saddle is provided with the usual cross-ways and cross feed screw 26 engaging the nut of the carriage 27 for transversely moving the carriage upon the saddle with the direction of rotation of the screw 26 governing the direction of carriage travel. The screw shaft 26 is intermittently rotated so as to be revolved upon the rearward or return stroke of the ram under normal condition, although it is possible in the machine herein to revolve the shaft simultaneous with the cutting stroke of the ram for producing a taper cut. The intermittent rotation of the screw shaft is accomplished by ratchet mechanism, which broadly constitutes a general principle and a well recognized standard in machines of this class, so that the general advantages thereof need not be elaborated thereon herein.

With our improvement, the ratchet devices are possessed with additional advantages, some relating to the details of construction, while others lend themselves to producing new results, and among an important advantage is the micrometric adjustment, regulation and control of the feed, enabling the feeding traverse of the carriage, to be quickly and conveniently changed for each cutting stroke of the ram, and this with micrometric precision, so that the feed can be proportioned to meet the metal cutting requirements.

The saddle 24 has a rearwardly projected bearing bracket 28, see Fig. 4, which supports a stud or axle 29 upon which the ratchet mechanism is supported, a gear 30 freely journaled upon the axle 29, is in mesh with a pinion 31 frictionally connected with the screw shaft 26, see Fig. 1. The gearing being in train with the ratchet wheel, which, in this instance, is unitarily combined with the gear 30. The friction connection of the pinion 31 with the screw shaft 26 provides an automatic release from the shaft to arrest its feeding rotation at the limits of carriage traverse, either right or left.

As a preferred construction, it comprises a shoulder thimble 32 keyed or fixed to the screw shaft upon which the pinion is concentrically mounted, a nut 33 is screw threaded upon the end of the thimble, and friction disks or washers 34 interposed upon each side of the pinion and shoulder of the thimble on one side and nut on the other, with the members frictionally combined to withstand the required resistance by tightening up the nut 33. The washers are of pliable or elastic material, and as the parts are normally bound together yielding only in emergency instances are not subjected to great wear, therefore do not require frequent renewal or adjustment. Its construction is simple and efficient through which the carriage feed can be readily discontinued when subjected to excessive strains, and its sta-

bility is not interfered with in changing the elevation of the carriage as is common in other forms of safety appliances now in general use in machines of this class, nor does it interfere or discommode the manual feed of the carriage.

The feed screw shaft 26 is intermittently rotated to coördinately produce an intermittent length of carriage traverse, either to the right or left, depending upon the direction of rotation of the screw shaft in each power stroke of the ratchet mechanism. The ratchet mechanism primarily qualifies as motion converting and reversing devices, in that the reciprocating motion of the connecting link is again transposed to the rotary intermittently or of interval duration, so as to be dormant on the cutting stroke of the ram with the rotary direction reversible by alternating the pawl intermesh with its ratchet. In one instance the stroke is transmitted during the forward stroke of the connecting link for producing the forward feed of the carriage, while in a second instance motion is imparted with the returning stroke of the connecting link for reversing the feed of the carriage.

In a preferred arrangement the ratchet is directly connected to the gear 30 and in train with the screw shaft, but it is obvious that the same could be directly applied to the screw shaft assuming the place of gear 31, and the gearing is employed to produce a relative geometric result with a minimum feed crank throw. The ratio of the gears being optional to meet the desires of the manufacturer.

The ratchet comprises a peripherally toothed annulus 35, rigidly secured to one side of the gear 30, and is rotated by a plunger pawl 36 slidably supported within a boss projected from the swinging frame 37. The pawl tooth is normally yieldingly urged toward the ratchet, so as to intermesh therewith in a power stroke and automatically release therefrom upon the return stroke of the pawl. A pawl tooth 38 extends diametrically across one end of the plunger or pawl shank, presenting an angular surface and an abutting shoulder surface, one to engage the teeth of the ratchet in one movement of the pawl at the inclined surface to guide the pawl outwardly so as to ride over the teeth in an opposite stroke of the pawl. The opposite end of the plunger or shank of the pawl has a knurled knob for manually grasping the pawl to withdraw the same from its ratchet engagement and provided with the diametrically extended lugs 39, adapted to intermesh with a notch in the frame boss as a means for locking against rotation so as to retain the same in one of its set positions for either forward or reverse ratchet engagement. The lugs also provide means for setting the pawl in a released position for disengagement of the power feed of the carriage, which is accomplished by engaging the lug upon the outer end of the frame boss, a common and well known means for confining the pawl in its various positions.

Micrometer carriage feed regulating mechanism.

The plunger pawl adjacent its toothed end is provided with a diametrically extended guide pin 40, adapted to project over the periphery of a trip cam 41 in either of its alternate active positions, whereby the pawl may be automatically disengaged from its ratchet during either stroke for regulating and controlling the length of feed. A trip cam is shown as of two part construction, comprising a flange hub member 42, to which is secured a cam annulus having its periphery recessed, as shown in Fig. 5, of a circumferential length approximately equal to the stroke of the pawl, so as not to interfere with the maximum movement thereof but capable of controlling or disengaging the pawl at any point less than a complete stroke. The hub member is loosely concentrically supported upon the axle 29, which in turn loosely supports the swinging frame 37. The swinging frame 37 is pivotally connected at 43 with the connecting bar 21, whereby the frame is rocked back and forth in each revolution of the crank member 19. The trip cam is revolubly mounted upon the axle 29, but normally locked in a rigid position and is revolved by micrometer means, so that its cam surfaces may be delicately adjusted. The recess 44 in the periphery of the cam provides a clearance for the radiating pawl pin 40, which is suitably shaped to ride freely over the cam or inclined surfaces, determining the extremity of the recess and guide the pawl pin upon the periphery of the cam, which is of an extended diameter sufficient to disengage the pawl tooth from the ratchet. Two opposing cam or inclined surfaces 45 are provided which severally serves for the alternate right or left feeding strokes of the pawl. As the pawl rides upon the inclined surface, it guides the same upon the larger diameter circumferential surface, which urges the pawl outwardly or away from its ratchet engagement, discontinuing the feed of the carriage during the remaining portion of a pawl stroke. As the length of the pawl stroke in either direction is constant, it is readily perceptible that a feeding stroke or motion can be minutely regulated to any fraction minus its full stroke or the feed absolutely cut out, if desired. The opposing relations of the cam surface 45 severally accommodate the two feeding

strokes of the pawl and moving as a unit only one at a time can be positioned for tripping the pawl. The pawl trip-pin 40 projects radially from opposite sides of the pawl, so that it will always be in position to engage with the trip-cam in any feeding stroke of the pawl, which is reversed by a partial rotation transposing the tooth of the pawl to change its inclined surface relatively with the ratchet enabling the use of a single trip cam having opposing trip surfaces which must be relatively positioned when a change in the direction of feed is made. It is obvious, however, and within the aspect of this invention to duplicate the trip parts as independent means for separately controlling the forward and reverse feeds, wherein each may remain set when the feed is reversed.

Trip cam setting.

The setting of the trip-cam is micrometrically accomplished, so that the intermittent length of carriage feed or traverse may be accurately and delicately regulated and in the arrangement herein is quickly and conveniently made for either direction of carriage feed. Each direction of feed requires a separate regulation in this instance, wherein the setting mechanism unitarily serves for either direction, which is preferred as it minimizes the number of parts. The axle or stud 29 has a rigid support as a stationary cup-shaped worm casing 46, concentrically telescopically fitting over the worm wheel 47 fixed to the hub projection of the trip cam 41 with its teeth intermeshed with a worm shaft 48 journaled within the casing 46. The end of the worm wheel opposite its tooth circumference has an annular flange 49, projected therefrom, its circumference marked with graduating indications in duplicate arrangement upon opposite sides of a neutral line.

A reckoning annulus 50 is concentrically rotatively supported upon an annular portion of the casing 46, adjacent the flange 49, and of coincident diameter, which is provided with a neutral indicating line upon its periphery from which the graduations either right or left are read upon the flange 49 and to and from which the adjustments are made for setting the feed to any selected graduation. The micrometer reading or indications are harmonious with the ratchet teeth divisions of the length of pawl stroke and coördinately indicative of the pawl controlling position of the trip cam 41; rotating the worm rotates the trip cam either to the right or left to adjust its cam surface relatively to the movements of the pawl. The worm shaft 48 has an annular boss at one end rotatively fitting into a bore of the casing 46 and the opposite end of the shaft is of a reduced diameter and projected beyond the casing bore to receive a hand knob with which the worm is rotated, and also receive a bushing collar 51, which is pinned to the casing to longitudinally confine the shaft within its bore.

When changing the elevation of the carriage, the pawl supporting frame 37 will shift the traversing arc of the pawl by reason of the definite length of connecting link which will displace the neutral position of the reckoning indication, and likewise alter a prearranged setting of stroke regulation for the reason that the cam is not affected by any elevating movement of the carriage. The neutral indicator annulus 50 is automatically shifted to bring its reckoning mark to a position of neutrality by the oscillating stroke of the swinging frame. The annulus has a projecting lip 54 disposed interveningly between oppositely arranged pins 55 projecting from the swinging frame 37 and circumferentially spaced the length of oscillating stroke of the frame plus the width of the lip 54, so that as they oppositely engage the lip 54 in any deranged position, and swing the same to a midway position between the arc-paths of the pins again neutralizing the reckoning mark from which the trip cam adjustment is made for such second elevation. The setting, however, must be readjusted for each change in the elevation of the carriage to maintain the selected feed of carriage.

Compensating connecting length.

As the connecting link between the pawl frame and crank is of a non-extensible or definite length, means must be provided for compensating for the change of length during the elevation of the carriage, and this is herein automatically accomplished and with a constant transmitting connection between the motion imparting parts with no variance in the length of transmitting stroke, or in its power. This also renders its possible accurate and definite micrometric adjustment or regulation of the feed traverse of the carriage. As has been heretofore described, the feed crank and its gear 15 are possessed of planetary motion rotating about their own axis and about the axis of gear 8 or the main driving gear 4 coaxial therewith, it is therefore possible to swing the feed crank and its gear toward or from the pawl frame 37. Such motion is automatically produced coördinately with the elevating motion of the carriage by pivotally connecting the swinging frame 14 through a connecting link 56, said link is pivotally connected at 57 to the swinging frame at one end, with its opposite end pivotally connected at 58 to the bracket 28, projected from the saddle 24.

This compensating movement of the feed crank possesses many advantages and materially increases the cutting efficiency of the shaper in producing an accurate feed of the carriage at the ratio selected most satisfactory. It relieves the operator from making special adjustments after each elevating instance, in fact, it requires no observation from that score as is required in the present designs of shapers.

It is obvious that certain duplication of parts could be made as additions to the structure herein illustrated in its preferred form for independently and severally functioning to accomplish the result herein set forth, in various capacities, as, for instance, the unitary right and left feed regulations, whereby a separate setting could be had for both right and left, and such changes are fully regarded within the province of this invention to be recognized as equivalents, with such enlargements merely increasing the cost of manufacture without proportionately increasing its utility. The same may also be said in the separable construction of some of the elements or sectional form wherein integrality would equally suffice, but as herein shown are represented as of high-class mechanical design, possessing advantages in manufacture, assembling and durability of the parts.

The general operation of the above described mechanism will now be described.

Assuming that the stroke of the ram has been determined by manipulation of the hand knob 10, the saddle 24 is elevated to bring the work to proper elevation for tool engagement, thereby swinging the frame 14 and contained parts on the bearing 2, through the connecting link 56. The detent plunger 22 of the feed actuating link 21 being engaged in either of the two detent apertures 18 of the crank member 16, (depending on the direction of carriage feed desired) the rotary motion of said crank member is converted into reciprocatory feed link motion and the link 21 being connected to the swinging frame 37, transmits a uniform rocking movement to said frame. The rocking movement of the frame 37 is transmitted to the feed ratchet through the ratchet plunger 36, the degree of ratchet feeding engagement thereof being controlled by the trip cam plate 41 as positioned by the worm shaft 48.

Having described our invention, we claim:—

1. A device of the nature disclosed combining a support, a transversely translatable member mounted on said support and adjustable to various elevations thereon, oscillatory ratchet feeding devices for translating said member, crank devices connecting with said ratchet feeding devices susceptible to planetary motion to compensate for a definite intervening connecting length between said feeding and crank devices in the variance of elevation of said feeding devices, and connecting means for said devices.

2. A device of the nature disclosed combining planetary movable motion converting devices, motion imparting devices variable as to their relative location to said motion converting devices, and means connecting the two devices for planetarily moving the motion converting devices.

3. A device of the nature disclosed, combining planetary movable motion converting devices, intermittent reversible motion imparting devices variable as to the relative location to said motion converting devices, and means connecting the two devices for planetarily moving the motion converting devices.

4. A device of the nature disclosed combining a pair of motion converting devices unitarily rotatable, and each provided with an eccentric motion imparting axis, the eccentric axis of one of said devices transferable diametrically to opposite sides of its normal axis, whereby the forward and return semi-cycles of said eccentric axes may be relatively coincidentally or alternately disposed.

5. In a device of the nature described, a crank comprising two adjacent axially alined members, one thereof constituting a crank member independently rotatable upon the axis of the other, and means for unitarily combining said members, whereby the crank axis may be transferred upon opposite sides of the axes of said members.

6. In a device of the nature described, a crank comprising two adjacent axially alined members, one constantly rotatable, and the second independently rotatable upon the other axis, a crank axle projecting from one of said members, and means for connecting said members for unitarily rotating the same, and alternately transferring the crank axis in a dimetric line upon opposite sides of the axis of the crank as a unit.

7. In a device of the nature described comprising two adjacent members, one thereof constantly rotatable, and provided with apertures in a diametric line upon opposite sides of its axis, the second independently rotatable upon the first and provided with a projecting crank axle adapted to be adjusted in coaxial registry with said apertures severally, and a detent member concentric with said crank axle and movable for engaging into an aperture of said first member to unite said members rotatably, and the crank axle capable of being transferred to opposite sides of the axis of the members as a unit.

8. A rotary motion converting device comprising two axially alined members, one having diametrically opposite motion

imparting abutment walls, the other having a crank axle and means carried by the second named member adapted to engage either abutment wall of the first member to operatively connect both members.

9. In a device of the nature disclosed, comprising planetary movable motion converting devices combining a swinging frame, a frame bearing two adjacent crank members rotatively journaled upon said frame eccentric to its fulcrum, the one constantly rotative, and the second independently rotative upon the first and provided with a crank stud, means for rotatively connecting said members and alternately changing the crank axle location to opposite sides of the axis of said members, a motion imparting device capable of being variably located relatively from said frame bearing and means connecting the two devices, whereby through the planetary motion of said crank members compensation is made coördinately to the relative separating positions of said devices.

10. A rotary motion converting device comprising a driving crank member having diametrically opposite motion imparting abutment walls, a driven crank member having a crank stud and means carried by the driven member and axially alined with said stud, to engage either abutment wall of the driving member to combine the crank members as an operative unit.

11. In a device of the nature described, comprising a rotative driving member, confined supporting means therefor, a driven member, adjustable supporting means therefor, a crank supporting frame swingingly mounted upon the axis of said driving member and hingedly connected to said adjustable supporting means, a crank member journaled upon said swinging support connecting with said driving member and its crank in pivotal connection with said driven member, whereby the crank member is susceptible to planetary motion compensatory with the adjustments of said driven member and its support in maintaining a definite crank coupling length between said members.

12. A device of the nature disclosed comprising a support, a crank device susceptible of planetary adjustment, a translatable carriage mounted on said support and adjustable to different elevations, an intermittently operated feed device for translating the carriage, an oscillatory actuator therefor operatively connected to the crank device and having a uniform arc of oscillation, adjustable means controlling the actuator functions and provided with an indicating scale, a neutral indicator adjustably mounted on the carriage, a connecting member intermediate the carriage and crank device for planetarily adjusting said device and circumferentially varying the zone of actuator oscillation coördinately to the relative locations of the carriage and crank device and means carried by the actuator for automatically normalizing the neutral indicator relative to the zone of actuator oscillation.

In witness whereof, we hereunto subscribe our names, as attested by the two subscribing witnesses.

FREDERICK W. A. HERRMANN.
ALBERT E. ROBINSON.

Witnesses:
EMMA SPENER,
L. A. BECK.

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