Oct. 13, 1925. 1,556,784

G. E. GREENLEAF ET AL

TOOL OPERATING MECHANISM

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Fig. 2.

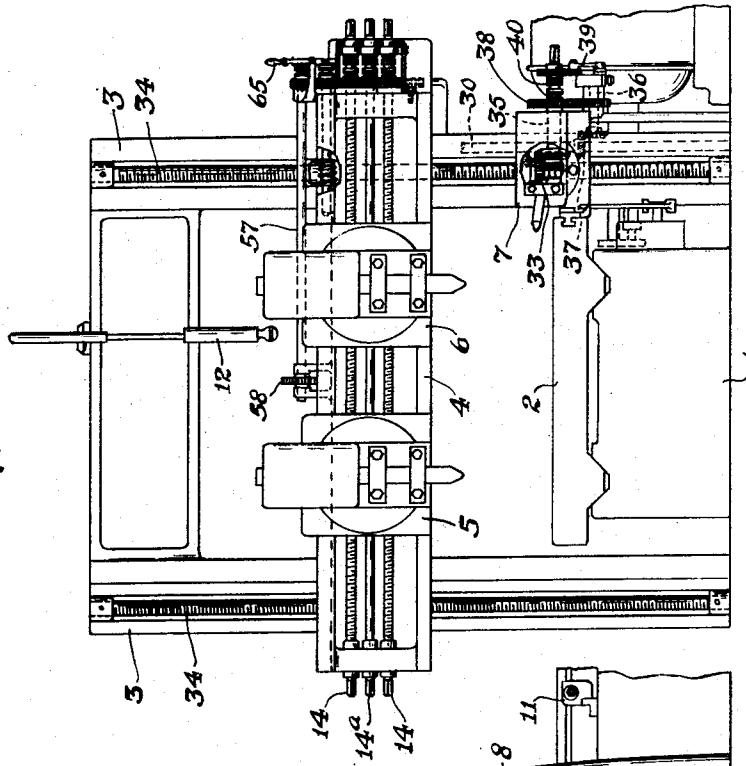
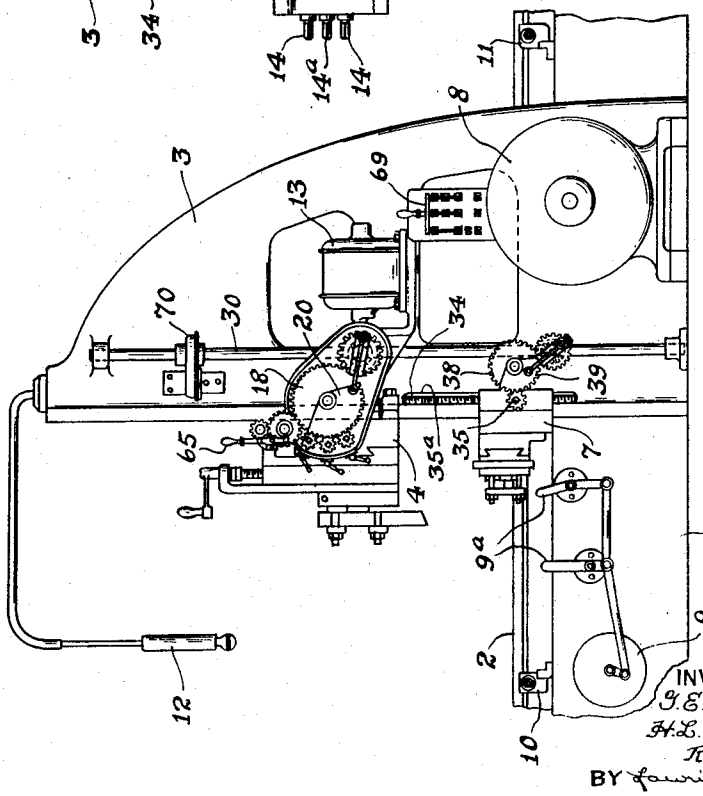


Fig. 1.



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Fig. 3.

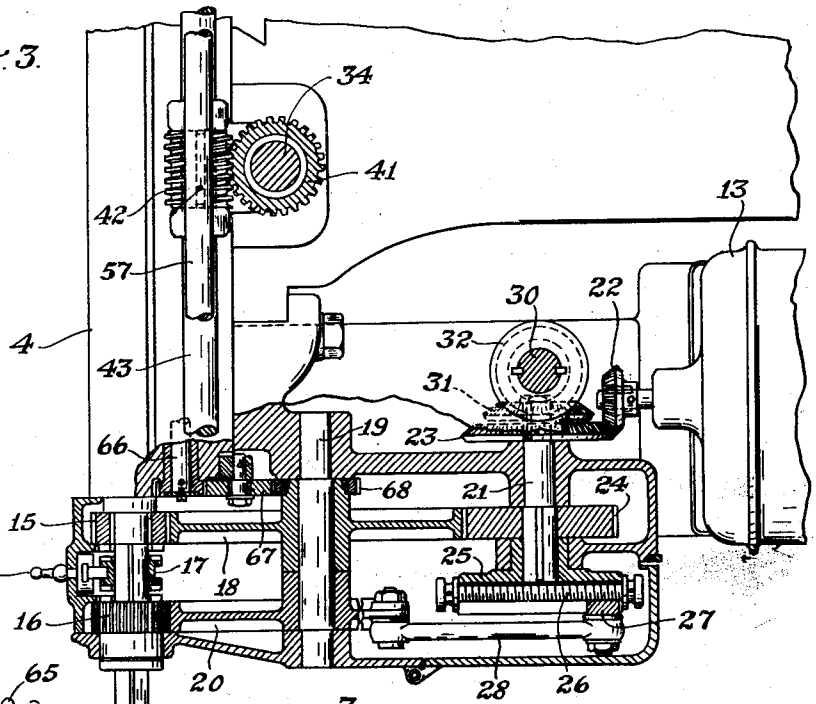


Fig. 5.

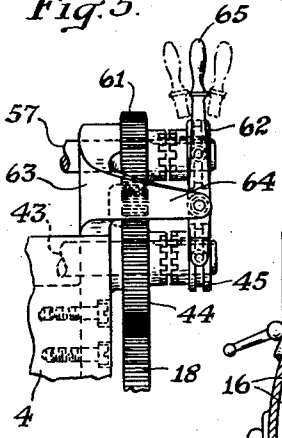
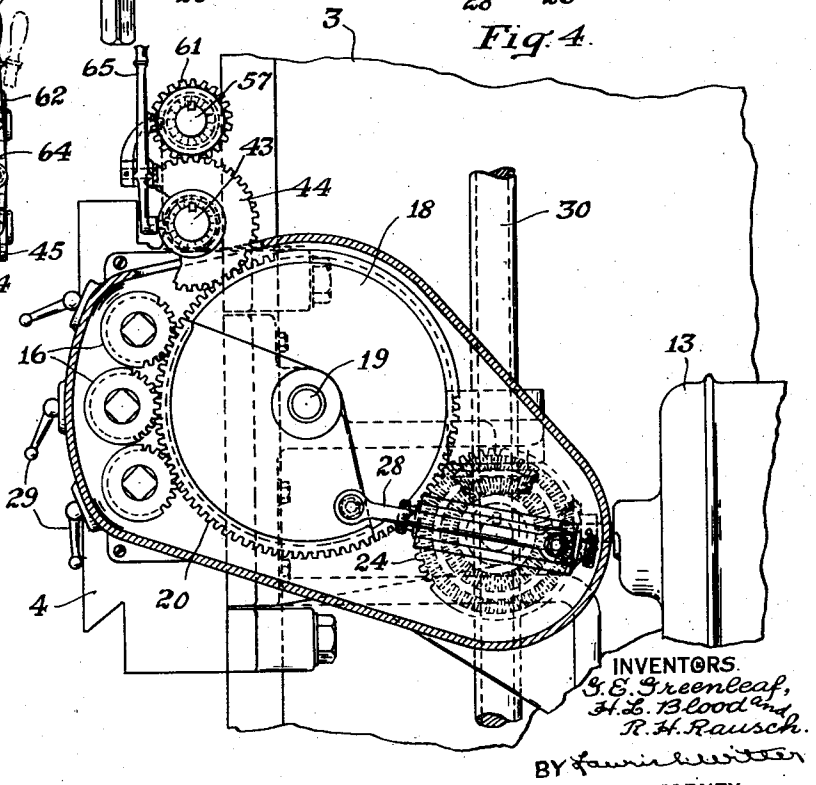


Fig. 4.



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Fig. 6.

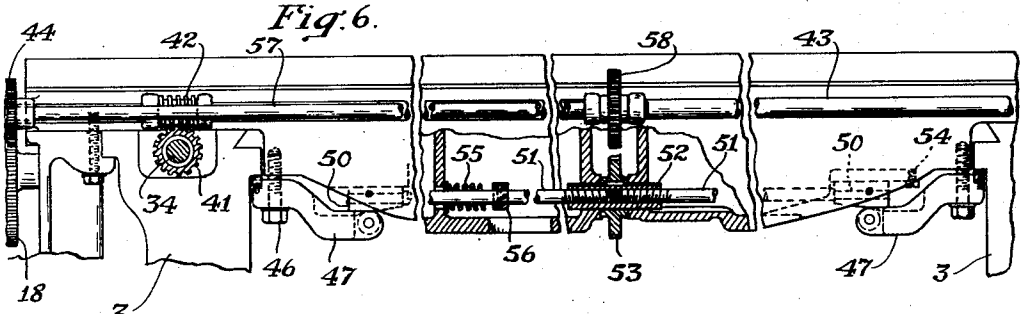


Fig. 7.

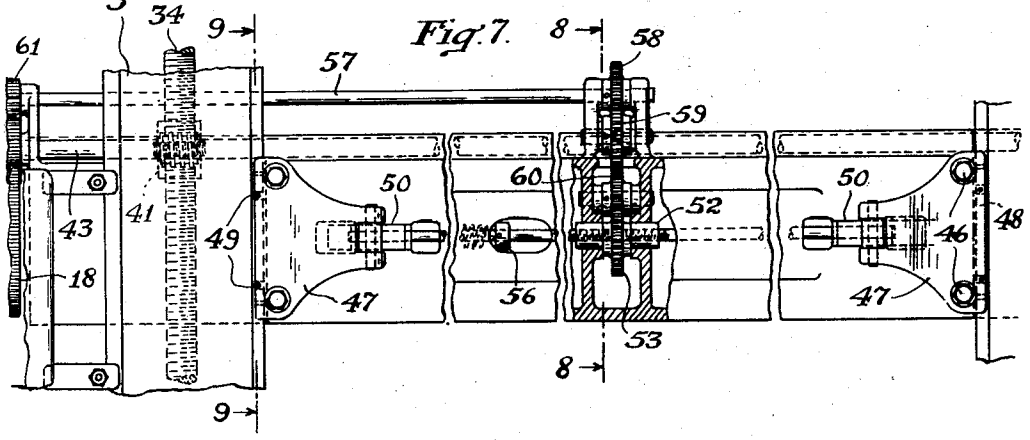


Fig. 8.

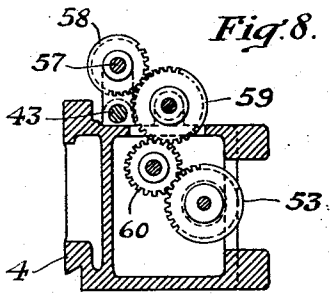
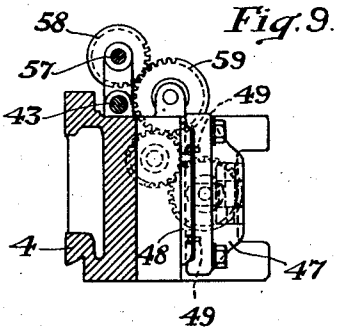


Fig. 9.



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Patented Oct. 13, 1925. 1,556,784

UNITED STATES PATENT OFFICE.

GEORGE E. GREENLEAF, OF PLAINFIELD, HAROLD L. BLOOD, OF NORTH PLAINFIELD, AND ROSWELL H. RAUSCH, OF PLAINFIELD, NEW JERSEY, ASSIGNORS TO NILES-BEMENT-POND COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

TOOL-OPERATING MECHANISM.

Application filed June 7, 1923. Serial No. 643,944.

To all whom it may concern:

Be it known that we, GEORGE E. GREENLEAF, HAROLD L. BLOOD, and ROSWELL H. RAUSCH, citizens of the United States, and residents, respectively, of Plainfield, in the county of Union and State of New Jersey, of North Plainfield, in the county of Somerset and State of New Jersey, and Plainfield, in the county of Union and State of New Jersey, have invented certain new and useful Improvements in Tool-Operating Mechanism, of which the following is a specification.

This invention relates to planers and like machines and particularly to mechanism for operating the tools and tool supports thereof. Such machines ordinarily comprise a work table and one or a pair of uprights adjacent the table. A cross rail is mounted on the uprights and tool heads may be supported on the cross rail and on the uprights beneath the rail. The first said heads are ordinarily termed the "rail heads" and the second said heads are ordinarily termed the "side heads."

Specifically, our present invention relates to mechanism for elevating and clamping the rail on the said upright or uprights and for feeding and traversing the tool heads. The primary object of the invention is to provide an improved mechanism for performing these functions.

It is an object of the present invention to provide in a planer, a motor, and mechanism operated thereby for intermittently feeding the tools in synchronism with the reciprocation of the work table, for traversing the tools continuously, for moving the cross rail on the uprights and for clamping the rail to the uprights, the motor preferably being mounted on the cross rail.

It will be understood that while all the said functions may be most conveniently performed from the motor, it may in some instances be desirable to perform only certain of such functions therefrom. Accordingly, another object of our invention is to combine the use of a motor with a planer or like machine in the manner above stated for performing only certain of the said functions as may be desired.

Another object of our invention is to provide an improved mechanism for clamping the said cross rail to the uprights of the planer or like machine, such clamping operation preferably being performed through our improved mechanism from the same motor which operates to elevate the cross rail.

With the above and other objects in view, our invention consists in the features of construction and operation set forth in the following specification and illustrated in the accompanying drawings. In such drawings annexed hereto and forming a part of this specification, we have shown one form of our invention embodied in a planer but it will be understood that the invention can be otherwise embodied and that the drawings are not to be construed as defining or limiting the scope of the invention, the claims appended to this specification being relied upon for that purpose.

Referring to the figures of the drawings:

Figure 1 is a side elevation of a planer embodying our invention.

Fig. 2 is a front elevation thereof.

Fig. 3 is an enlarged fragmentary plan view partially in section of one end of the cross rail.

Fig. 4 is an end elevation thereof.

Fig. 5 is a detail front view of certain clutch mechanism shown in Fig. 4.

Fig. 6 is a fragmentary plan view of the cross rail shown in Fig. 2.

Fig. 7 is a rear elevation thereof.

Fig. 8 is a cross sectional view thereof taken on line 8—8 of Fig. 7.

Fig. 9 is a cross sectional view taken on line 9—9 of Fig. 7.

The mechanism shown in the accompanying drawings is similar in many respects to that shown in Patents Nos. 1,299,192 and 1,350,540 and reference may be made to such patents for mechanism within itself outside the scope of our present invention and not therefore fully described in this application. In such drawings, 1 indicates the bed of a planer having a work table 2 slidably mounted thereon and a pair of uprights 3 respectively at opposite sides of the table. A cross rail 4 is mounted to slide vertically on the uprights and is adapted to slidably support a pair of tool head saddles 5 and 6 thereon. A side head saddle 7 is supported on one upright beneath the cross rail. The table 2 is adapted to be reciprocated from a motor 8 and such reciprocation is automatically controlled by a pilot switch 9 operated by table dogs 10 and 11. This mecha-

nism and its operation are fully described in the above cited patents. The movements of the table may be controlled manually by means of a pendant switch 12 which is described in detail in Reissue Patent No. 14,540 dated October 22, 1918.

An electric motor 13 is mounted on a rearwardly extending bracket on the cross rail and, as illustrated in the drawings, this motor is adapted to feed and traverse the tool supports, to move the cross rail on the uprights and to clamp the cross rail to the uprights. The mechanism cooperating with the motor for performing these functions will now be described.

Two threaded shafts or screws 14 are provided on the cross rail for respectively moving the tool saddles 5 and 6 therealong and a splined shaft 14ª is provided for moving the tools vertically in the usual manner. The front end of each screw shaft has loosely mounted thereon a pinion 15 and a ratchet pinion 16, a clutch 17 splined to each shaft between such pinions being adapted to operatively connect either pinion with its shaft. The pinions 15 are adapted to be driven from a gear 18 loose on a shaft 19 and in mesh with the three pinions 15. The ratchet pinions 16 are adapted to be driven from a gear segment 20 also loose on the shaft 19 and in mesh with the three ratchet pinions 16. The gears 18 and 20 are driven from a parallel shaft 21 driven from the motor 13 through bevel gears 22 and 23. A gear 24 on the shaft 21 meshes with the gear 18 whereby to directly drive the same and the pinions 15 when the motor is rotated. The gear segment 20 is driven from the shaft 21 by a crank mechanism comprising a head 25 keyed to the shaft, a diametrically arranged screw 26 in the head, a nut 27 on the screw and a link 28 connecting the nut with the gear segment. By this mechanism, the gear segment is oscillated when the motor is rotated. The extent of such oscillation may be adjusted by rotating the screw 26. The clutches 17 may be shifted by handles 29 to connect any one of pinions 15 and 16 with its shaft.

The side head 7 is adapted to be fed and traversed in the same manner from a vertical feed shaft 30 driven from the motor through bevel gears 31 and 32, gear 31 being keyed to the shaft 21 and gear 32 being in mesh therewith and splined to the vertical shaft 30. A bevel gear nut 33 journaled in the head 7 is in threaded engagement with one of the screws 34 hereinafter described for elevating the cross rail. A shaft 35 in the head 7 has a bevel gear thereon in mesh with the bevel gear nut 33, the shaft extending through a slot 35ª in the upright. A parallel shaft 36 is driven by bevel gears 37 from the shaft 30 and operates to drive the shaft 35 continuously through the gearing 38 or intermittently through a crank mechanism 39, a clutch 40 serving to operatively connect either drive to the shaft 35. This mechanism is substantially the same as that described above and is furthermore described in the said Patent No. 1,299,192.

The cross rail 4 is supported on the uprights by means of a pair of nuts 41 journaled in the rail and respectively threadedly engaging a pair of screws 34 non-rotatably mounted in the uprights. The nuts are provided with worm teeth thereon engaged by worms 42 on a shaft 43 extending along the rail. A gear 44 loose on the front end of this shaft is in mesh with the before mentioned gear 18. A clutch 45 is provided for operatively connecting the gear 44 to the shaft 43. The gear 18 is driven from the motor 13 and, through the mechanism described, the nuts may therefore be driven from the motor 13 in either direction to elevate or lower the cross rail.

Clamping mechanism for the cross rail is provided as follows: Pivoted to the rail adjacent each upright by means of bolts 46 is a clamping element 47. The short arm of each clamping element extends over a projecting portion of the adjacent upright and engages the bevelled ends of a clamping plate 48. This plate is loosely mounted within the clamping element by means of pins 49 and the engagement of the element with the bevelled ends of the plate assures an even clamping pressure on the uprights. A sliding wedge 50 is adapted to operate each clamping element to perform the clamping operation. The wedges are operated by rods 51 connected thereto and threadedly engaged within a rotary sleeve 52. The sleeve is adapted to be rotated by a gear 53 splined thereto, the sleeve being freely slidable axially within the gear. Outward movement of one wedge in the unclamping operation is limited by a stop pin 54 and outward movement of the other wedge, beyond the unclamping position, is resisted by a spring 55, the spring being mounted on the wedge rod between a rib of the cross rail and a collar 56 pinned to the rod.

Extending along the cross rail above and parallel with the rail elevating shaft 43 is a shaft 57. A gear 58 on the inner end of this shaft is operatively connected to the gear 53 by means of two idler gears 59 and 60. A gear 61 loose on the front end of the shaft is in mesh with the gear 44. A clutch 62 is provided for operatively connecting the gear 61 to its shaft 57. An operative connection is therefore established from the motor 13 to the gear 53 whereby to perform the clamping operation.

The front ends of shaft 43 and 57 are supported in a bracket 63 bolted to the end of the cross rail. A forwardly extending arm 64 is provided thereon for pivotally

supporting a clutch operating lever 65. This lever is connected to the clutches 45 and 62 respectively at opposite sides of the pivotal point of the lever. Such arrangement provides means for shifting the clutches and positively assures that when either clutch is in the engaged position, the other clutch will be in the disengaged position, thus preventing the simultaneous engagement of these clutches and possible damage to the machine.

A shaft 66 extending along the cross rail is adapted to be operated from the gear element 18 through two gears 67 and 68. This shaft is adapted to lift the tools out of engagement with the work upon the reverse or non-cutting stroke of the work table. This mechanism is not within itself a part of the present invention and therefore need not be further described herein.

As fully described in the aforesaid patents, there is provided in conjunction with the feed motor 13 a transfer switch 69. For normal operation of the feed motor to effect intermittent feeding of the tools, the transfer switch 69 is placed in its upper position, as shown in Fig. 1, and for operating the motor continuously to effect transversing of the tools, the switch is placed in its downward position. During the normal operation of the machine, the feed motor is controlled by the pilot switch 9 to rotate intermittently in synchronism with the table reciprocation to effect the feeding of the tools. A limit switch indicated at 70 and fully described in Patent No. 1,350,540 is adapted to limit the rotation of the feed motor at each feeding movement thereof. When it is desired to traverse the tools, the switch 69 is placed in its downward position whereupon the motor 13 may be operated continuously in either direction, the controlling means therefor being the pilot switch 9.

The operation of the machine is as follows: To start the reciprocation of the work table, the operator grasps one of the arms 9^a and rotates the pilot switch 9. The motor 8 thereupon moves the table in one direction until one of the table dogs engages its arm 9^a and rotates the pilot switch in the opposite direction. Such operation reverses the motor which then drives the table in the opposite direction. When the transfer switch 69 is in the upper position illustrated in Fig. 1, the feed motor 13 is automatically controlled by the pilot switch 9. Each time the pilot switch reverses the main motor, it also reverses the feed motor. The rotation of the feed motor however in both directions is limited by the limit switch 70.

To perform feeding operations, the clutches 17 are engaged with the ratchet pinions 16 on the shafts it is desired to operate and the screw 26 is adjusted to give the feeding stroke desired. The elevating and clamping clutches 45 and 62 are of course in the inoperative position illustrated in Fig. 5. With the parts in these positions, it is obvious that the tools will be automatically fed the desired amount during each successive non-cutting interval in the operation of the machine.

When it is desired to traverse the tools or tool saddles continuously by power, the transfer switch 69 is moved to its downward position. This operation renders both the main motor and the automatic stop mechanism for the feed motor inoperative and therefore places the feed motor directly under the control of the pilot switch 9. The feed motor can now be operated continuously in either direction as desired by manually moving the pilot or reversing switch 9. By engaging the clutches 17 with the pinions 15 on the shaft it is desired to operate, the tools and saddles may now be traversed continuously in either direction to effect preliminary adjustments thereof.

While the above operations have been described in connection with the tools and tool supports on the cross rail, it should be clearly understood that the same operations and functions apply in like manner to feed and traverse the side head.

When it is desired to move the cross rail on the uprights, the clutches 17 and 40 are placed in the neutral position and the clutch 45 is engaged with its gear 44. The elevating nuts 41 may now be continuously rotated from the motor 13 in either direction to elevate or lower the cross rail on the uprights.

After adjusting the cross rail to the desired position, the same may be clamped to the uprights by means of the motor 13 as follows: The lever 65 is moved to disengage the clutch 45 and engage the clutch 62. The motor 13 and gear 53 may now be rotated in a direction to draw the wedges inwardly and force the clamping elements 47 into clamping engagement with the uprights. As before stated, the threaded sleeve 52 is freely slidable axially in its bearings whereby both wedges are drawn inwardly with equal force and thereby assure an equal clamping action on both uprights. To unclamp the rail, the motor is rotated in the opposite direction whereby the rods 51 and wedges 50 are forced outwardly. The stop screw 54 limits the outward movement of one wedge and the spring 55 resists the outward movement of the other wedge beyond its unclamping position. These stop means assure the release of both clamping wedges in the unclamping operation.

What we claim is:

1. In a planer or the like, the combination of a base, a reciprocating work table mounted thereon, two uprights respectively at op-

posite sides of the table, a cross rail mounted to slide vertically on the uprights over the table, a tool support movably mounted on the rail, a motor, and mechanism operated by the motor for intermittently feeding the tool support synchronously with the table reciprocation, for traversing the tool support continuously, for moving the rail on the uprights and for clamping the rail to the uprights.

2. In a planer or the like, the combination of a base, a reciprocating work table mounted thereon, two uprights respectively at opposite sides of the table, a cross rail mounted to slide vertically on the uprights over the table, a tool support movably mounted on the rail, a tool support on one upright beneath the rail, a motor, and mechanism operated by the motor for intermittently feeding the tool supports synchronously with the table reciprocation, for traversing the tool supports continuously, for moving the rail on the uprights and for clamping the rail to the uprights.

3. In a planer or the like, the combination of a base, a reciprocating work table mounted thereon, two uprights respectively at opposite sides of the table, a cross rail mounted to slide vertically on the uprights over the table, a tool support movably mounted on the rail, a motor, a gear adapted to be oscillated by the motor synchronously with the table reciprocation, mechanism operated from the gear for intermittently feeding the tool support, a gear adapted to be continuously rotated by the motor, and mechanism operated from the last named gear for traversing the tool support continuously and for moving the rail on the uprights.

4. In a planer or the like, the combination of a base, a reciprocating work table mounted thereon, two uprights respectively at opposite sides of the table, a cross rail mounted to slide vertically on the uprights over the table, a tool support movably mounted on the rail, a motor, a gear adapted to be oscillated by the motor synchronously with the table reciprocation, mechanism operated from the gear for intermittently feeding the tool support, a gear adapted to be continuously rotated by the motor, and mechanism operated from the last named gear for traversing the tool support continuously, for moving the rail on the uprights, and for clamping the rail to the uprights.

5. In a planer or the like, the combination of a base, a reciprocating work table mounted thereon, two uprights respectively at opposite sides of the table, a cross rail mounted to slide vertically on the uprights over the table, a tool support movably mounted on the rail, a motor on the rail, and mechanism operated by the motor for intermittently feeding the tool support synchronously with the table reciprocation and for traversing the tool support continuously.

6. In a planer or the like, the combination of a base, a reciprocating work table mounted thereon, two uprights respectively at opposite sides of the table, a cross rail mounted to slide vertically on the uprights over the table, a tool support movably mounted on the rail, a motor on the rail, a gear adapted to be oscillated by the motor synchronously with the table reciprocation, mechanism operated from the gear for intermittently feeding the tool support, a coaxial gear adapted to be continuously rotated by the motor, and mechanism operated from the last named gear for traversing the tool support continuously.

7. In a planer or the like, the combination of a base, a reciprocating work table mounted thereon, two uprights respectively at opposite sides of the table, a cross rail mounted to slide vertically on the uprights over the table, a tool support movably mounted on the rail, a motor on the rail, and mechanism operated by the motor for intermittently feeding the tool support synchronously with the table reciprocation, for traversing the tool support continuously and for moving the rail on the uprights.

8. In a planer or the like, the combination of a base, a reciprocating work table mounted thereon, two uprights respectively at opposite sides of the table, a cross rail mounted to slide vertically on the uprights over the table, a tool support movably mounted on the rail, a motor on the rail, a gear adapted to be oscillated by the motor synchronously with the table reciprocation, mechanism operated from the gear for intermittently feeding the tool support, a gear adapted to be continuously rotated by the motor, and mechanism operated from the last named gear for traversing the tool support continuously and for moving the rail on the uprights.

9. In a planer or the like, the combination of a base, a reciprocating work table mounted thereon, two uprights respectively at opposite sides of the table, a cross rail mounted to slide vertically on the uprights over the table, a vertically extending screw adjacent each upright, rotary nuts supporting the rail and threadedly engaging the screws, a shaft extending along the rail and operatively connected to the nuts, a tool support movably mounted on the rail, a screw extending along the rail and operatively connected to the support, a motor on the rail, mechanism operated by the motor for intermittently rotating the rail screw to feed the support synchronously with the table reciprocation, a gear adapted to be continuously rotated by the motor, and mechanism operated from the gear for rotating the rail screw to traverse the tool support continu-

ously and for rotating the rail shaft to move the rail on the uprights.

10. In a planer or the like, the combination of a base, a reciprocating work table mounted thereon, two uprights respectively at opposite sides of the table, a cross rail mounted to slide vertically on the uprights over the table, a tool support movably mounted on the rail, a motor on the rail, and mechanism operated by the motor for intermittently feeding the tool support synchronously with the table reciprocation, for traversing the tool support continuously and for clamping the rail to the uprights.

11. In a planer or the like, the combination of a base, a reciprocating work table mounted thereon, two uprights respectively at opposite sides of the table, a cross rail mounted to slide vertically on the uprights over the table, clamping means on the rail adjacent each upright for clamping the rail to the uprights, a shaft extending along the rail and operatively connected to the clamping means, a tool support movably mounted on the rail, a screw extending along the rail and operatively connected to the support, a motor on the rail, mechanism operated by the motor for intermittently rotating the screw to feed the support synchronously with the table reciprocation, a gear adapted to be continuously rotated by the motor, and mechanism operated from the gear for rotating the screw to traverse the tool support continuously and for rotating the shaft to operate the clamping means.

12. In a planer or the like, the combination of a base, a reciprocating work table mounted thereon, two uprights respectively at opposite sides of the table, a cross rail mounted to slide vertically on the uprights over the table, a tool support movably mounted on the rail, a motor on the rail, and mechanism operated by the motor for intermittently feeding the tool support synchronously with the table reciprocation, for traversing the tool support continuously, for moving the rail on the uprights and for clamping the rail to the uprights.

13. In a planer or the like, the combination of a base, a reciprocating work table mounted thereon, two uprights respectively at opposite sides of the table, a cross rail mounted to slide vertically on the uprights over the table, a tool support movably mounted on the rail, a motor on the rail, mechanism operated by the motor for intermittently feeding the tool support synchronously with the table reciprocation, a gear adapted to be continuously rotated by the motor, and mechanism operated from the gear for traversing the tool support continuously, for moving the rail on the uprights and for clamping the rail to the uprights.

14. In a planer or the like, the combination of a base, a reciprocating work table mounted thereon, two uprights respectively at opposite sides of the table, a cross rail mounted to slide vertically on the uprights over the table, means including a shaft extending along the rail for moving the rail on the uprights, means including a second shaft extending along the rail for clamping the rail to the uprights, a tool support movably mounted on the rail, a screw extending along the rail and operatively connected to the support, a motor on the rail, mechanism operated by the motor for intermittently rotating the screw to feed the support synchronously with the table reciprocation, and mechanism operated by the motor for continuously rotating the screw and the two said shafts for traversing the tool support continuously, for moving the rail on the uprights and for clamping the rail to the uprights.

15. In a planer or the like, the combination of a base, a reciprocating work table mounted thereon, means for reciprocating the table, an upright on the base at one side of the table, a cross rail mounted to slide vertically on the upright and extending horizontally over the table, a tool support movably mounted on the rail, a motor, and mechanism operated by the motor for intermittently feeding the tool support synchronously with the table reciprocation, for traversing the tool support continuously, for moving the rail on the upright, and for clamping the rail to the upright.

16. In a planer or the like, the combination of a base, a reciprocating work table mounted thereon, means for reciprocating the table, an upright on the base at one side of the table, a cross rail mounted to slide vertically on the upright and extending horizontally over the table, a tool support movably mounted on the rail, a motor on the rail, and mechanism operated by the motor for intermittently feeding the tool support synchronously with the table reciprocation and for traversing the tool support.

17. In a planer or the like, the combination of a base, a reciprocating work table mounted thereon, means for reciprocating the table, an upright on the base at one side of the table, a cross rail mounted to slide vertically on the upright and extending horizontally over the table, a motor on the rail, and mechanism operated by the motor for intermittently feeding the tool support synchronously with the table reciprocation, for traversing the tool support continuously and for moving the rail on the upright.

18. In a planer or the like, the combination of a base, a reciprocating work table mounted thereon, means for reciprocating the table, an upright on the base at one side of the table, a cross rail mounted to slide

vertically on the upright and extending horizontally over the table, a tool support movably mounted on the rail, a motor on the rail, and mechanism operated by the motor for intermittently feeding the tool support synchronously with the table reciprocation, for traversing the tool support continuously and for clamping the rail to the upright.

19. In a planer or the like, the combination of a base, a reciprocating work table mounted thereon, means for reciprocating the table, an upright on the base at one side of the table, a cross rail mounted to slide vertically on the upright and extending horizontally over the table, a tool support movably mounted on the rail, a motor on the rail, and mechanism operated by the motor for intermittently feeding the tool support synchronously with the table reciprocation, for traversing the tool support continuously, for moving the rail on the upright and for clamping the rail to the upright.

In testimony whereof, we hereto affix our signatures.

GEORGE E. GREENLEAF.
HAROLD L. BLOOD.
ROSWELL H. RAUSCH.