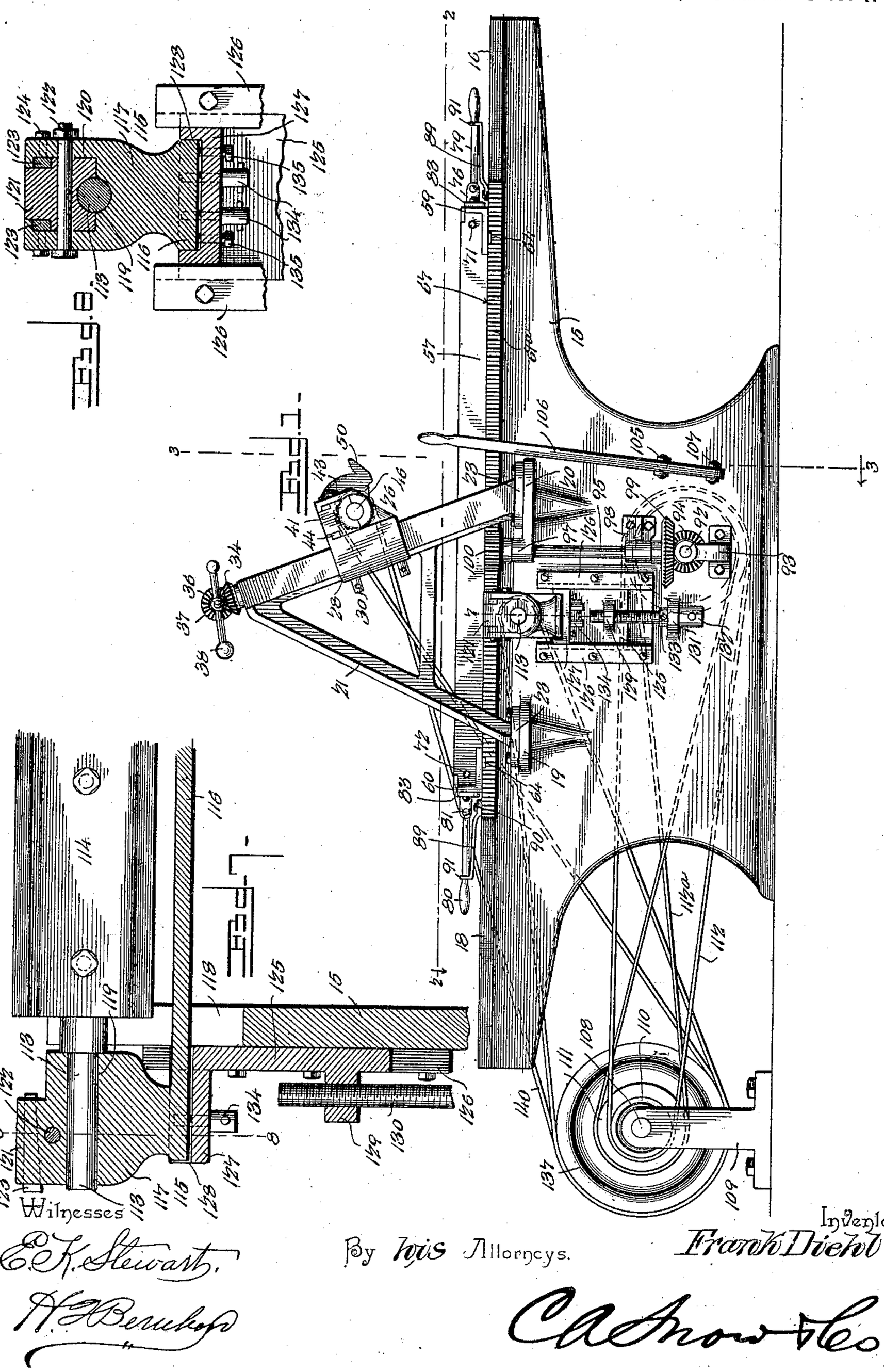
No. 652,387. Patented June 26, 1900.

F. DIEHL.

WOODWORKING MACHINE.

(Application filed July 25, 1899.)

(No Model.) 3 Sheets—Sheet 1.



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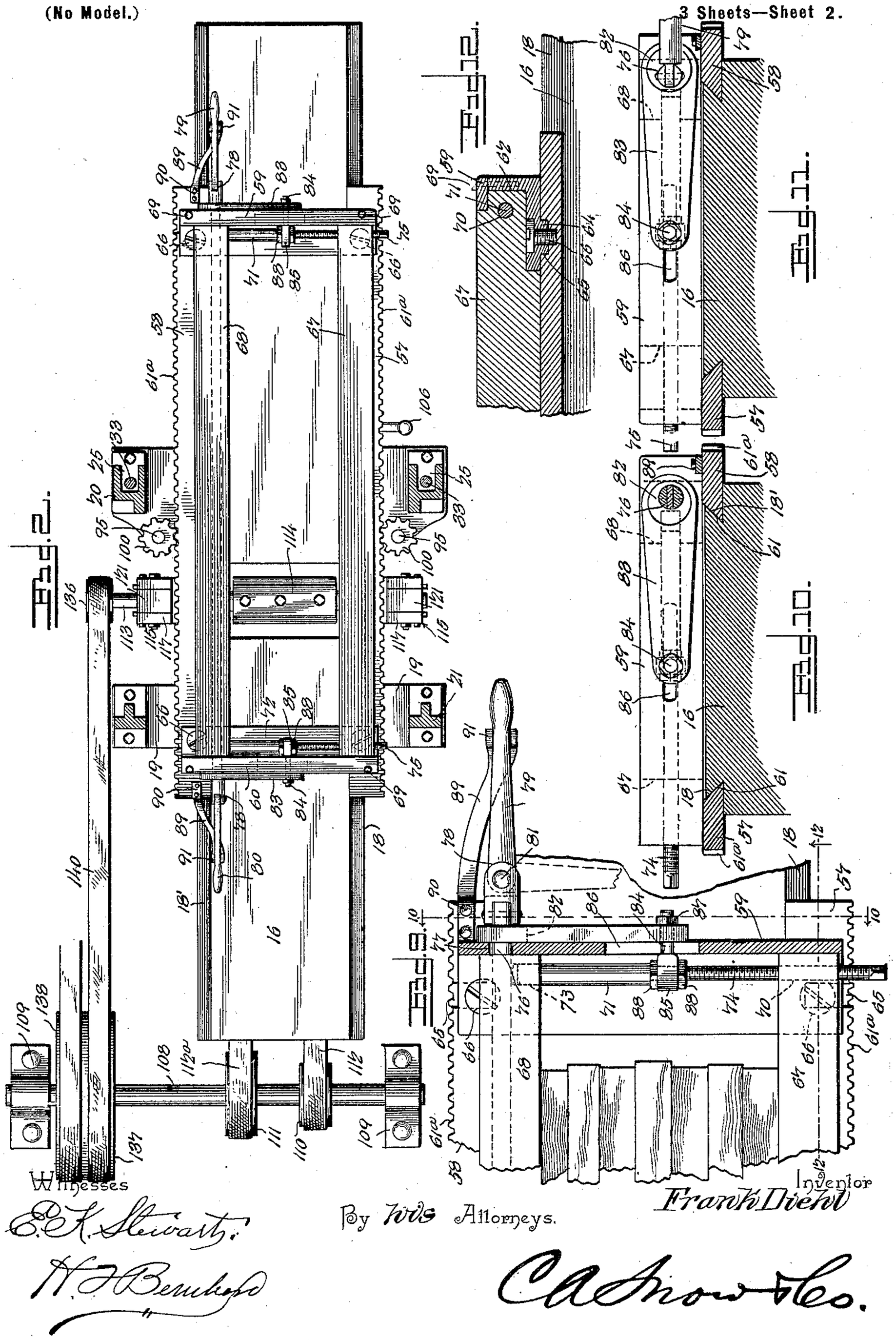

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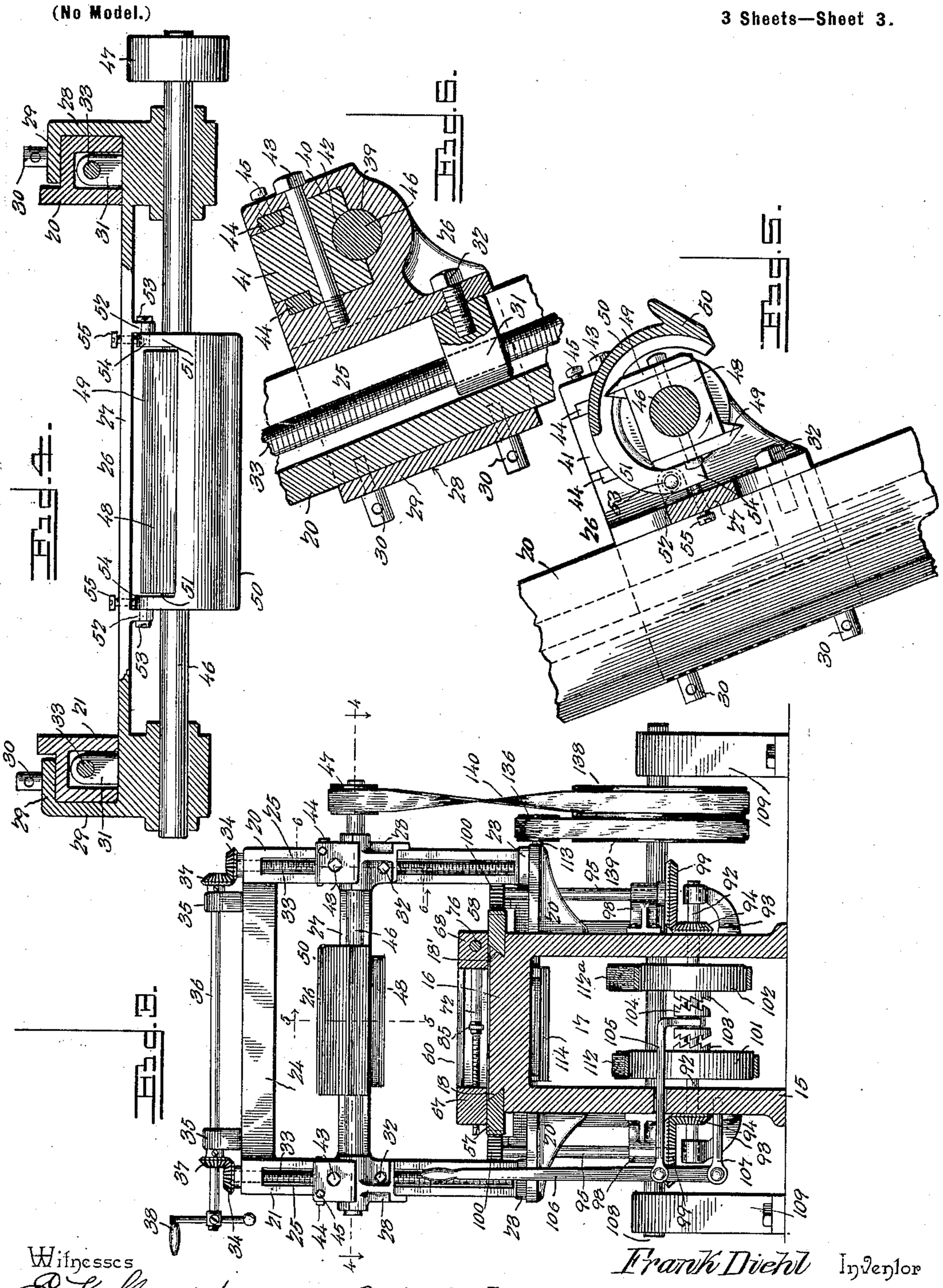

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UNITED STATES PATENT OFFICE.

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WOODWORKING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 652,387, dated June 26, 1900.

Application filed July 25, 1899. Serial No. 725,073. (No model.)

To all whom it may concern:

Be it known that I, FRANK DIEHL, a citizen of the United States, residing at Sheboygan, in the county of Sheboygan and State of Wisconsin, have invented a new and useful Woodworking-Machine, of which the following is a specification.

My invention relates to improvements in woodworking-machines of that class known technically as "stock-jointers;" and the primary purpose is to arrange the several elemental parts for service in a manner to operate on the upper and lower edges of the "stock" or work.

A further object of the invention is to provide a work-carriage with a clamping mechanism adapted to laterally confine the work or stock for free access by the cutter-head, such clamping mechanism being operable manually at either end of the carriage and also readily adjustable to confine work of varying widths within the carriage.

A further object is to provide an improved means for the propulsion of the work-carriage in either direction, such carriage-propulsion means being reversible by the shiftable movement of conveniently-arranged levers.

A further object of the invention is to provide simple and efficient means for adjusting the upper cutter-head with relation to the work-carriage, said cutter-head being supported by devices which insure its adjustment with a view to minimizing torsional strain on the shaft, and such devices also sustain a chip-breaker in operative and adjustable relation to the upper cutter-head.

A further object is to provide means for securing nicety in the adjustment of the lower cutter-head, whereby it may be raised or lowered, according to the thickness of the stock or work, the bearings for the cutter-shaft of said lower head being adjustable independently to insure alinement thereof for said shaft to be driven with a minimum torsional strain.

With these ends in view the invention consists in the novel combination of mechanisms, in the subcombination of parts, and in the peculiar construction and arrangement of devices, which will be hereinafter fully described and claimed.

To enable others to understand the invention I have illustrated a preferred embodiment thereof in the accompanying drawings, forming a part of this specification, and in which—

Figure 1 is a side elevation of a woodworking-machine constructed in accordance with my invention and showing the upper cutter-head raised to an inoperative position with relation to the work on the slidable carriage preparatory to lowering said upper cutter-head for service. Fig. 2 is a horizontal sectional plan view, the plan of the section being through the brackets which sustain the upper cutter-carriage and indicated by the dotted line 2 2 of Fig. 1, representing the work-carriage, the lower cutter-head, and several accessory parts of the machine in plan. Fig. 3 is a vertical transverse sectional elevation on the plane indicated by the dotted line 3 3 of Fig. 1 looking in the direction indicated by the arrow. Fig. 4 is an enlarged sectional plan view on the plane indicated by the dotted line 4 4 of Fig. 3 through the housing forming parts of the carriage for the upper cutter-head, the chip-breaker being shown in plan as partially concealing the upper cutter-head. Fig. 5 is an enlarged vertical sectional view on the plane indicated by the dotted line 5 5 of Fig. 3, illustrating the upper cutter-head and a pivoted chip-breaker in close relation to said cutter-head. Fig. 6 is an enlarged vertical sectional view on the line 6 6 of Fig. 3, illustrating the detailed construction of one housing and bearing for the upper cutter-shaft, as well as one feed-screw and traveling nut, by which the upper cutter-carriage may be adjusted. Fig. 7 is an enlarged vertical sectional view on the line 7 7 of Fig. 1, illustrating a part of the stand, the lower cutter-carriage, and the means for supporting and adjusting said cutter-carriage. Fig. 8 is a vertical transverse section through a housing on the lower cutter-carriage for supporting the shaft of the lower cutter-head, said view being a section on the line 8 8 of Fig. 7. Fig. 9 is an enlarged sectional plan view of one end of the traveling work-carriage with the clamping mechanism thereon, a fragment of the stock or work being represented as confined between the members or jaws of the clamp. Fig. 10 is a sectional elevation on the plane indicated by the dotted line 10 10 of Fig. 9 looking in the

direction indicated by the arrow and showing the cam-shaft adjusted to hold the movable jaw or member of the clamp firmly against the stock or work. Fig. 11 is a view similar to Fig. 10 with the cam-shaft reversed to move one jaw or member of the clamp away from the other jaw to release the stock or work. Fig. 12 is a vertical detail fragmentary section on the line 12 12 of Fig. 9 and showing the means for uniting the cross-rail to the side rail of a work-carriage, also representing one of the jaws or members of the clamp fitted in the cross-rail.

The same numerals of reference are used to indicate like and corresponding parts in each of the several figures of the drawings.

15 designates a stand or base, which is preferably cast in a single piece of metal of such size and dimensions as to support the several elemental parts of the whole machine. This stand provides a horizontal bed 16, which extends the full length of said stand for the reception and guidance of the traveling work-carriage, which is adapted to slide back and forth for the presentation of the stock or work in operative relation to the upper and lower cutter-heads. I prefer to construct the stand with an opening 17 at one end thereof, as clearly shown by the transverse sectional view of Fig. 3, said opening providing a space for the free travel of the belts that propel the carriage-feed mechanism. The bed 16 on the stand or base has longitudinal recesses produced in its opposite side edges in order to form the longitudinal guideways 18 18′, said guideways extending the full length of the bed and disposed parallel to each other to insure the free travel of the work-carriage, the guideways having undercut edges, as clearly shown by Figs. 3, 10, and 11. The bed or stand 15 is furthermore provided on each side thereof with a pair of bracket-lugs 19 20, which are cast as integral parts of the bed and are disposed in the same horizontal plane and below the guideways 18 18′, said bracket-lugs extending outwardly from the bed, as shown by Fig. 3, to support the annular brackets 20 21, on which is slidably confined the cutter-carriage for the upper cutter-head.

Each angular bracket is cast in a single piece of metal with downwardly-diverging members united by a cross-bar, and the members of each bracket are provided at their lower ends with feet 23. The two brackets are assembled relatively to the bed for the feet thereof to rest upon the bracket-lugs 19 20, and said brackets are made fast with the stand or base by bolts, which pass through the feet of the bracket-lugs, as shown by Fig. 1, whereby the brackets are supported in parallel relation to each other on opposite sides of the stand. The brackets are united at their upper ends by a bridge-piece 24, (see Fig. 3,) which is fastened to the brackets in any approved way and serves to stay them, so as to make the brackets maintain their parallel relation, whereby a firm and rigid support is provided for the slidable cutter-carriage 26. The brackets each have one leg thereof provided with a longitudinal channel or groove 25, (see Figs. 2, 4, and 6,) said channels of the brackets accommodating the feed-screws by which the cutter-carriage 26 may be raised or lowered to present the upper cutter-head in operable relation to the work on the traveling work-carriage.

The cutter-carriage 26 consists of a cross-bar 27 and the housings 28, said cross-bar and housings being preferably cast in a separate piece of metal, although this is not essential. (See Fig. 4.) The cross-bar 27 is arranged to span the space between the channel legs of the angular brackets 21 22, against which legs said cross-bar of the cutter-carriage is adapted to bear laterally, and the housings 28, which form parts of this cutter-carriage, are flanged, as at 29, to embrace the rear sides of the channeled legs, whereby the cutter-carriage is slidably confined on said channeled legs of the brackets to make the carriage assume a truly horizontal position with respect to the bed at all points of its adjustment. The flanges 29 of the cutter-carriage carry the binding-screws 30, which may be released from engagement with the angular brackets previous to adjustment of the cutter-carriage; but after the carriage has been lowered to present the upper cutter-head in proper relation to the stock on the traveling work-carriage these binding-screws should be tightened against the angular brackets for the purpose of holding the cutter-carriage firmly in place. To the housings 28 of the cutter-carriage 26 are secured the traveling nuts 31, which are fastened in place on said cutter-carriage by the bolts 32, (see Fig. 6,) said nuts extending into the channels 25 of the angular brackets. A pair of feed-screws 33 are arranged longitudinally in the channels 25 of the angular brackets, so as to have threaded engagement with the nuts 31 of the cutter-carriage 26, said feed-screws being properly journaled in the channeled legs of the angular brackets, (see Fig. 3,) so as to have their upper ends extend above the bridge-piece 24. To these extended ends of the feed-screws are secured the beveled gear-pinions 34, and in bearings 35 of this bridge-piece is journaled an adjusting-shaft 36, the latter being provided with beveled gears 37 and with a hand-crank 38 at one end thereof. The shaft 36 is arranged for its beveled gears 37 to mesh with the beveled pinions 34 on the feed-screws, said shaft adapted to be rotated by hand through the medium of the crank 38 for the purpose of simultaneously rotating the two feed-screws 33, which through the traveling nuts 31 serve to raise or lower the slidable cutter-carriage on the angular brackets 21 22.

Each housing 28 of the slidable cutter-carriage 26 is provided with a recess 39, which constitutes the half of one bearing for the shaft of the upper cutter-head, said housing being also provided with a slot 40, preferably

of square form, above the bearing-recess 39. In this angular slot of each housing 28 is snugly fitted a cap-box 41, the lower side of which is recessed, as at 42, said cap-box being secured, as will presently appear, in the slot of the housing to present its recess 42 in a position coincident with the recess 39, and the two recesses in the housing and the cap-box thereof provide a journal-bearing which receives one end of the shaft that carries the upper cutter-head, it being understood that the cutter-carriage 26 is provided at each end with the housings and cap-boxes for the proper support of the cutter-head shaft. The cap-box 41 for each housing is secured in place by means of a bolt 43, which passes through suitable openings in the sides of the housing and in the cap-box above its recess 42, and to contribute to the security of attachment of this cap-box to the housing I employ the keys or wedges 44, which are driven tightly into suitable grooves provided in the cap-box, so as to engage with flanges on the housing. (See Fig. 6.) Each key is prevented from displacement in the housing by a binding-screw 45, and thus the keys are held in place to assist the bolt in preventing the cap-box from working loose in the housing.

The shaft for the upper cutter-head is indicated at 46, (see Figs. 3 to 6, inclusive,) said shaft being arranged transversely across the machine and journaled in the bearings provided for its reception on the cutter-carriage 26. One end of the shaft protrudes beyond the carriage and one bearing thereon for the reception of a pulley 47, adapted to be driven by a belt from the counter-shaft, as will hereinafter appear. The cutter-head 48 may be of any suitable construction so as to be secured to the shaft 46 in a position between the housings 28 and in advance of the cross-bar 27 of the cutter-carriage, said cutter-head having the knives 49 secured thereto by any approved means—as, for example, by the bolts illustrated by Fig. 5. In connection with the upper cutter-head and the carriage 26 therefor I employ the chip-breaker 50, the same being cast in a single piece of metal and adjustably mounted on the cutter-carriage 26 so as to overhang and partly house or inclose the cutter-head 48. This chip-breaker is of segmental or curved construction, and at its rear end it is formed with the arms 51, which extend downwardly, so as to overlap the lugs 52 on the cross-bar 27 of the cutter-carriage. The arms 51 of the chip-breaker are pivoted at 53 to the lugs 52, so as to provide the extensions or heels 54, said extensions projecting below the pivots 53 and being engaged by the adjusting-screws 55, which are mounted in threaded openings provided in the cross-bar 27 of the cutter-carriage. The free end of the arched chip-breaker extends below and in advance of the cutter-head 48, while the heels of the chip-breaker are engaged by the adjusting-screws 55, said chip-breaker being pivoted at a point between its free end and the points of engagement of the screws 55 with the heels thereof. It is evident that the chip-breaker is free to oscillate or give within certain limits under the pressure of the chips of wood which may be cut from the stock or work by the knives on the revoluble cutter-head 48, and the relation of the free end of this chip-breaker to the cutter-head may be varied by proper adjustment of the screws 55.

From the foregoing description, taken in connection with Figs. 1 and 3 of the drawings, it will be seen that I employ angular brackets on opposite sides of the fixed stand and the path of the work-carriage, each angular bracket consisting of diverging legs, which are bolted firmly to lugs on one side of the stand. The slidable cutter-carriage is supported on corresponding channeled legs of these brackets, and the revoluble cutter of this cutter-carriage is adapted to be presented in operative relation to the work clamped on the work-carriage. The angular construction of the brackets having the diverging legs is advantageous because the strain due to the resistance encountered by the cutter with the work is distributed by and between the legs of the brackets, so that the bolts which hold the brackets to the stand are not liable to work loose and disarrange the position of the brackets, the cutter-carriage, and the cutter supported over the work-carriage. It will also be seen that I employ a chip-breaker which is supported wholly by the cutter-carriage, so that it may be adjusted with the cutter-carriage, and thereby arranged at all times in operative relation to the upper cutter-head irrespective of any elevation or depression which may be given to this cutter-carriage and the head mounted thereon, and at the same time this chip-breaker has associated therewith adjusting-screws by which the position of the chip-breaker relative to the cutter-head may be varied. This is due to the fact that the chip-breaker has arms which are pivoted on the cutter-carriage and are engaged by adjusting-screws having threaded engagement with the cutter-carriage, the weight of the chip-breaker serving to throw the arms into contact with the adjusting-screws, so that the chip-breaker is free to move or yield under the resistance or pressure of the chips severed from the work by the action of the cutter, thus making the chip-breaker yieldable to automatically clear the space between the cutter and the segmental chip-breaker. The free edge of the chip-breaker, as shown by Fig. 5, is provided with a lip, which is inclined to the curvature of the body of said chip-breaker, and this inclined lip presents a deflecting surface adapted to primarily throw the chips away from the cutter-head, so that the chips will be prevented from entering the space between the segmental chip-breaker and the cutter-head.

I will now proceed to describe the construction of the traveling work-carriage and the clamping mechanism which is mounted there-

on, said work-carriage adapted to travel endwise on the horizontal bed 16, between the pair of brackets 21 22 and below the upper cutter-head 48. The carriage proper consists of the side rails 57 58 and the cross-rails 59 60, said cross-rails being firmly united, as will presently appear, to the side rails in order to produce a substantial construction of a skeleton work-carriage adapted to support the work-clamp, which confines the stock or work in proper position within the carriage to expose said stock or work to access by the upper and lower cutter-heads. The side rails 57 58 of the work-carriage are beveled at their inner edges, as at 61, to conform accurately to the contour of the ways 18 18′ on the horizontal bed 16, and said side rails of the work-carriage are fitted snugly in said guideways, so as to direct the work-carriage to movement in a rectilinear path longitudinally of the bed, thus overcoming any tendency of the carriage to partake of lateral or sidewise play. Said side rails of the work-carriage are furthermore provided on their external exposed edges with a continuous series of gear-teeth 61ª, forming racks longitudinally of the carriage throughout the length thereof, (see Fig. 2,) with which racks are adapted to engage pinions on vertical shafts, that may be propelled alternately in the opposite directions for moving the work-carriage back and forth, as will presently appear. The cross-bars 59 60 of the work-carriage are arranged at the respective ends of the side rails 57 58 and at right angles thereto, so as to span the space between said side rails. Each cross-bar is a single piece of metal, angular in cross-section, as shown more clearly by Fig. 12, and said cross-bar forms a guideway 62 transversely across the carriage. The lower flange or web of each angular cross-bar is seated upon the two side rails 57 58, at the ends thereof, said lower flange having a lug 64, which enters a cavity 65 in each side rail. I prefer to fasten each cross-bar 59 or 60 to the end portions of the side rails 57 58 by means of screws 66, which pass through the lower flange of the cross-bar and the lug 64 thereof, so as to enter one rail and to lie flush with the upper face of the lower web or flange of said cross-bar, all as clearly shown by Fig. 12, thus making provision for slidably fitting the ends of the clamping bars or jaws to the cross-bars of the work-carriage. The two-part clamp, which is mounted on the work-carriage to travel therewith and is adapted for holding the stock or work which is to be subjected to the action of the upper and lower cutter-heads, consists, primarily, of bars 67 68, which are arranged in parallel relation and are mounted slidably on the cross-bars of the work-carriage. The bars 67 68 of the clamp extend, preferably, the full length of the work-carriage, said clamping-bars having their end portions fitted in the transverse guideways 62, provided by the angular cross-bars 59 and 60 of said work-carriage. One bar 68 of the clamp is confined in a fixed position at one side of the carriage and which fixed position is preferably secured by means of rock-shafts 76, passed through a longitudinal perforation in said clamp-bar and through registering perforations in the cross-bars 59 and 60 at the ends of the work-carriage, the object and uses of said shaft being hereinafter more fully described.

The clamp-bar 68 occupies a fixed relation to the carriage and the work, and it is provided in its ends with transverse openings 73. (See dotted lines in Fig. 9.) Within the inclosure of the work-carriage and transversely across the said carriage are arranged the spindles 71 and 72, which are disposed in close relation to the cross-bars 59 and 60 and occupy a horizontal position parallel thereto, said spindles being threaded for a portion of their lengths, as shown at 74, and unthreaded the remaining portion, the extremities of the unthreaded portions lying loosely within the opening 73 and within which they are longitudinally movable in the manipulation of the clamping mechanism, hereinafter described.

The clamp-bar 67 has its ends fitted slidably in the transverse guideways of the cross-bars 59 and 60, formed by the overhanging separable flanges thereof, (shown in Fig. 12,) so as to be movable in said bars laterally with respect to the clamp-bar 68 and parallel with the latter at all points of its adjustment. The threaded lengths of the horizontal spindle are in engagement with threaded openings 70 in the movable clamp-bar 67, so that the angular tenons 75 of the spindles will project from the outside of said movable clamp-bar to be readily accessible to the operator. It will thus be seen that the spindles are fitted slidably in the clamp-bar 68 and have threaded engagement with the clamp-bar 67. The rock-shaft 76, above referred to, passes longitudinally through the bar 68 and is journaled in suitable bearings 77 on the work-carriage at one side thereof. This rock-shaft occupies a horizontal position and extends the full length of the carriage and has its ends protruding beyond the bar 68 and cross-bars 59 and 60. Each end portion of this rock-shaft is forked or bifurcated, as at 78, and in said forked ends of said rock-shaft are fitted the adjusting handle-bars 79 80, which are disposed beyond the opposite ends of the work-carriage, as clearly represented by Fig. 2. Each handle-bar is connected with one end of the rock-shaft by the pin or bolt 81, which extends through the forked end of the rock-shaft and the handle-bar, so as to lie at right angles to the axis of said shaft, and thus each handle-bar is connected with the rock-shaft in a manner to be turned to a position at right angles to the shaft or to lie in alinement therewith. It is evident that either handle may be moved on the fulcrum-pin 81 to assume a position at right angles to the shaft, as indicated by dotted lines in Fig. 9, in order

that the operator may easily turn the shaft in its bearings by applying a pressure to the handle-bar; but at the same time this handle-bar may be turned on its pivot to assume a position in alinement with the longitudinal axis of the rock-shaft, as shown by full lines in Figs. 2 and 9, for the purpose of engaging the free end of the handle with a locking-spring 89. The rock-shaft carries the eccentrics 82, which occupy corresponding positions on the shaft and are made fast therewith, so as to turn when rocking adjustment is given to the shaft by one or the other of the handle-bars 79 80. With these eccentrics are engaged the links 83, the latter having their otherwise-free ends connected by slidable bolts 84 to the spindles 71 72. Each link 83 is disposed in a substantially-horizontal position alongside of and parallel to one of the cross-bars of the work-carriage, the outer end portion of each link being provided with an opening of such diameter as to snugly receive one of the eccentrics 82. (See Figs. 10 and 11.) Each slidable bolt 84 has an eye 85, adapted to receive the threaded part of one spindle 71 or 72, said bolt 84 being fitted slidably in a slot 86, provided in a cross-rail 59 or 60 of the carriage. The bolt has a threaded end which passes loosely through an opening in the inner end of the link 83, a nut 87 being screwed on said threaded end of the bolt 84 in order to confine the link and bolt in proper relation and to pivotally connect the link to the spindle through the medium of a slidable bolt.

The eye-formed end 85 of each slidable bolt is fitted loosely on the threaded part of one spindle 71 or 72; but the bolt and spindle are prevented from sliding with relation one to the other by means of nuts 88, which are screwed on the threaded part of the spindle on opposite sides of the eye end 85 of said bolt. From the foregoing description, taken in connection with Figs. 1, 9, 10, and 11, it will be understood that the rock-shaft is provided with eccentrics that are closely embraced be a pair of links 83 at the respective ends of the work-carriage and that the bolts 84 are attached to the spindles and connected pivotally to the links for the purpose of connecting the spindles through the bolts and links with the eccentrics on the rock-shaft, said bolts being free to slide in the slots 86, provided in the cross-rail of the work-carriage. The operator may adjust either handle-bar on its fulcrum-bolt to a position at right angles to the axis of the rock-shaft, as shown by dotted lines in Fig. 9, and the handle-bar may then be turned in an inward direction for the purpose of rocking the shaft to make its eccentrics give an inward thrust to the links 83, thereby moving the bolts 84 and the spindles 71 72 in a direction to draw the clamp-bar 67 toward the clamp-bar 68 for confining the stock or work between the two clamp-bars. In like manner a reverse movement may be given to the adjusting-handles to reverse the throw of the eccentrics on the rock-shaft and move the links, bolts, and spindles in an outward direction, so as to force the clamp-bar 67 away from the clamp-bar 68 to release the work or stock for removal from the machine, and in this manipulation of the clamp-bar 67 by the described mechanism it is maintained by the cross-bars of the carriage and by the spindles in parallel relation to the fixed clamp-bar 68. As the threaded spindles play loosely in the fixed clamp-bar and have threaded engagement with the movable clamp-bar, the operator may apply a wrench or other implement to the angular tenons 75 of the spindles for the purpose of rotating the latter to adjust the movable clamp-bar 67 with relation to the fixed clamp-bar 68 in order to vary the space between the two clamp-bars to suit the width of the work, and in this manipulation of the screw-spindles they rotate in the nuts 88, so as to vary the distances between the slidable bolts 84 and the movable clamp-bar 67, said slidable bolts always remaining in position to travel in the slots of the cross-bars on the ends of the carriage.

To hold the rock-shaft against rotation and releasing the movable clamp-bar 67, I provide locking-springs 89 at the respective ends of the carriage for the purpose of engaging with the pivoted handle-bars 79 80. Each locking-spring 89 has one end thereof fastened, as at 90, to the end of the carriage, said spring extending beyond the end of the carriage and provided at its free extremity with a clip or yoke 91, which lies in the plane of the longitudinal axis of the rock-shaft and in such relation to the handle-bar as to engage therewith. The handle-bars are designed to normally engage with these locking-springs, and when one handle-bar is turned at right angles to the rock-shaft the other handle remains in engagement with the clip of its locking-spring, so that said engaged handle-bar will turn in the clip of the spring on the axial turning of the shaft. When either handle-bar is turned at right angles to the shaft and said bar is shifted one way or the other to force the handle-bar in one direction or the other to operate the movable clamp-bar through the described train of connections, the operative handle-bar may be turned on its pivot-bolt 81 to a position in line with the shaft, and thus said handle-bar may be engaged with its proper locking-spring for the purpose of holding the shaft in its adjusted position and prevent releasing the movable clamp-bar. The provision of the independently-pivoted handle-bars at the opposite ends of the work-carriage provides for convenience in the manipulation of the clamp by the operator no matter what position the carriage may occupy on the bed of the stand, and as the handle-bar, which may remain in its lowered position and in engagement with the locking-spring, is adapted to turn in the yoke or clip of said spring it is evident that the clamp may be manipulated to release the

work without requiring the handle-bar which may lie adjacent to the upper cutter-head to be operated by the attendant, so that the work-clamp may be manipulated without exposing the operator to danger of injury from the revoluble cutter.

I will now proceed to describe the reversible carriage-feeding mechanism by which the traveling motion may be given to the work-carriage for it to pursue a rectilinear path on the bed. A horizontal driving-shaft 92 is arranged in a transverse position across the stand below the bed, the end portions of said shaft being journaled in bearings 93, which are bolted to the outside of the bed. (See Fig. 3.) The driving-shaft carries the beveled gears 94, adapted to propel the vertical shafts 95 96, which are disposed on the outside of the bed in the vertical plane of the shaft 92, each vertical shaft having its upper portion journaled in an arm 97, which is fast with the stand, while its lower portion is journaled in a bracket 98, bolted to the stand, as shown by Fig. 1. The lower ends of the vertical shaft are provided with the beveled gears 99, which mesh with the beveled pinions 94 on the horizontal shaft 92, and gear-pinions 100 are secured to the upper ends of these vertical shafts in positions to mesh with the racks 62, provided by the side bars of the carriage. Mounted idly on the horizontal shaft 92 in the space between the sides of the hollow base or stand 15 are the pulleys 101 102, each provided with a clutch face or section 103, and between these pulleys is disposed a shiftable clutch 104, that is keyed to the shaft 92 to rotate therewith. A shipper-rod 105 passes through a suitable opening in one side of the stand for the inner end of said rod to have loose engagement with a grooved portion of the clutch 104, the outer end of said shipper-rod being pivoted to an upright lever 106, which has its lower end fulcrumed to an arm 107 on the stand or base. This lever is disposed in a position convenient to the attendant for the purpose of shifting the clutch into engagement with one pulley and free from engagement with the other pulley on the shaft 92, and thus either pulley may be made fast with said shaft for the purpose of driving the vertical shafts in either direction to propel the carriage backward or forward, as may be desired. The counter-shaft 108 is journaled in proper bearings of stands 109, which may be fixed to the floor beyond one end of the base 15, said counter-shaft being driven from a line-shaft, a motor, or other suitable source of power. Pulleys 110 111 are made fast with this counter-shaft in alinement with the pulleys 101 102 on the carriage-driving shaft 92, and these pulleys are connected in pairs by the straight and cross belts 112 112ª, whereby the pulleys on the carriage-driving shaft may be rotated in opposite directions.

It is to be observed that a slidable work-carriage has its side bars engaged at their inner edges with the guideways in the horizontal stationary bed of the fixed stand and that the outer edges of the carriage-rails have racks which are engaged by pinions on the upper ends of the vertical shafts 95, the latter being mounted on opposite sides of the stand, so as to lie in the same transverse vertical plane of the carriage and to engage with the racks on the opposite side rails thereof. This relation of the parts is important in a wood-working-machine having a long traveling work-carriage, because the two vertical shafts 95 are driven at corresponding speed and engage with opposite sides of the work-carriage, so as to propel the latter in a rectilinear path and without causing the side rails thereof to have a tendency to bind against the guideways on the horizontal bed, whereby ease and freedom of travel are given to the carriage, so that it will pursue a truly-rectilinear path.

I will now proceed to describe the lower cutter-head and the means for supporting and adjusting the same, reference being had more particularly to Figs. 1, 2, 7, and 8. The shaft 113 is arranged in a horizontal position transversely across the stand in a plane below the traveling work-carriage, and to this shaft is firmly secured the lower cutter-head 114, which may be of any suitable construction. Said shaft 113 is mounted in an adjustable carriage 115, said carriage consisting of the cross-bar 116 and housings 117, one of which housings is shown quite clearly by Figs. 7 and 8. The carriage for the lower cutter-head has its cross-bar extended through and arranged to be moved vertically in slots 118, which are provided in the sides of the base or stand, the shaft of the lower cutter-head also extending through said slots. The housings 117 on the carriage for the lower cutter-head are similar to the housings on the carriage for the upper cutter-head, each housing 117 having a shaft-recess 119 and a slot 120. The cap-bearing 121 is fitted in this slot for the recess in its lower edge to coincide with the recess 119, thus forming a shaft-bearing for the cutter-shaft 113. A bolt 122 passes through the housing and cap-bearing, and keys 123 are inserted between a flange of the housing and the cap-bearing, said keys being prevented from displacement by the binding-screws 124. On the sides of the stand or base 15 are arranged the vertically-adjustable slides 125, each of which is confined in a pair of guide-plates 126, which are bolted to the stand in parallel relation to receive one slide 125. The upper end of each slide is provided with an outwardly-extending horizontal arm 127, in the upper face of which is a recess 128, adapted to receive the cutter-carriage for the lower head 114, each slide being furthermore provided near its lower end with an interiorly-threaded lug 129. A vertical adjusting-screw 130 is arranged to have threaded engagement with this lug 129, the lower end of said screw passing through a fixed lug 131, on the outside of the stem. The lower extremity of the

adjusting-screw has the head 132 provided with suitable openings adapted to receive a pin by which the operator may conveniently turn the screw, said head adapted to ride against the lower face of the lug 131. A collar 133 is made fast with the screw at a point above the head, and this collar and head are adapted to ride against the lug 131, so as to support the screw therein and prevent said screw from having endwise movement, whereby the screw may be rotated to raise or lower the slide through the medium of the lug 129. The cutter-carriage 115 is seated in the recess 128 of the slide, so that the carriage and the lower cutter-head will be raised or lowered by adjustment of the slides 125 through the medium of the screws 130; but I have also provided means for adjusting the carriage independently of the slides, so that the shaft 113 and lower cutter-head may be made to occupy a truly-horizontal position, so as to compensate for any variation given to the carriage by the independent operable screws 130. The carriage 115 and its housings are secured to the slides 125 by the screws 134, and this carriage may be adjusted in the recess-seat 128 of the slide by the adjusting-screws 135, said screws 134 and 135 having threaded engagement with the arm 127 of the slide.

The shaft 113 of the lower cutter-head is provided with a pulley 136, that is disposed in alinement to the pulley 137 on the counter-shaft, said pulleys 136 and 137 being connected by an endless belt 139. Another pulley 138 is also secured to the counter-shaft in alinement with the pulley 47 on the shaft of the upper cutter-head, and these pulleys 137 and 138 are connected operably by an endless crossed belt 140. (See Fig. 3.)

The operation may be described as follows: Assuming that the cutter-heads have been properly adjusted according to the thickness of the stock or work on which they are to operate and that the carriage is at one end of the bed, the operator adjusts the stock or work between the bars or jaws 67 68 of the clamp. Either handle-bar may be grasped and turned at right angles to the rock-shaft to operate the links and slidable bolts for moving the spindles in a direction to draw the member 67 against one side of the stock or work, and thereby confine the latter between the two bars of the clamp, after which the handle should be depressed and turned on its fulcrum-bolt for engagement with the clip of the locking-spring. The operator now shifts the lever 106 to move the clutch into the engagement with one pulley on the shaft 92, and motion is thus transmitted from the counter-shaft through one belt to drive the shaft 92 in one direction, thereby rotating the shafts 95 96, which, through the spur-gear pinions and racks, propel the carriage longitudinally of the bed in order to carry the work past the cutter-heads, which are driven by the belt connections with the counter-shaft. After the carriage has advanced far enough to move the stock or work beyond the cutters the lever 106 may be reversed to shift the clutch to an idle position between the pulleys on the shaft 92, thus permitting the carriage to remain at rest for the operator to remove the stock from the clamp on said carriage, and the lever 106 may then be again manipulated to throw the clutch into gear with the other pulley on the shaft 92 for driving the latter in a reverse direction, and thus rotate the shafts 95 96 in a direction to return the carriage to its normal position.

Changes may be made in the form and proportion of some of the parts, while their essential features are retained and the spirit of the invention is embodied. Hence I do not desire to be limited to the precise form of all the parts as shown, reserving the right to vary therefrom.

Having thus described the invention, what I claim is—

1. In a woodworking-machine, the combination with a work-carriage, a cutter-carriage adjustable relatively thereto, and a cutter mounted in said cutter-carriage, of a segmental chip-breaker yieldably hung on the cutter-carriage and arched over said cutter, said chip-breaker being free to yield in an upward and backward direction relative to said cutter and normally lowered by gravity to its opposite position, and means for arresting the drop of the chip-breaker to variable positions, substantially as described.

2. The combination with a cutter-head, of a chip-breaker disposed over said cutter-head and pivotally supported on one side of an adjusting-screw to engage the heel of said chip-breaker, extended below the said pivotal support thereof, substantially as described.

3. In a woodworking-machine, the combination with a cutter-carriage and a revoluble cutter-head therein, of a segmental chip-breaker arched over the cutter-head and pivotally connected at its heel only to the cutter-carriage for its unconfined edge to drop downwardly and forwardly with relation to the cutter, and means engaging with the pivoted heel of said chip-breaker to vary the position thereof with relation to the cutter-head, substantially as described.

4. In a woodworking-machine, the combination with a stationary bed, and a work-carriage thereon, of a cutter-carriage, a cutter-head mounted in said cutter-carriage, a curved chip-breaker provided with arms which are pivoted at points intermediate of their length to the cutter-carriage, whereby the chip-breaker is supported wholly by the cutter-carriage, adjusting-screws engaging with the heels of the pivoted chip-breaker to limit the play thereof and to adjust the same relative to the cutter-head and the cutter-carriage, and means for adjusting the cutter-carriage vertically with relation to the path of the work-carriage, substantially as described.

5. In a woodworking-machine, the combination of a cutter-carriage provided with the slotted and flanged housings, the cap-boxes insertible in said housings by an endwise adjustment and forming therewith alined journal-bearings, keys inserted between the flanged housings and the cap-boxes, bolts supported in the housings and binding against the cap-boxes, clamping-screws binding against the keys, and a cutter-shaft mounted in the bearings provided by the housings and cap-boxes, substantially as described.

6. In a woodworking-machine, the combination of a hollow stand provided with a flat stationary bed having the parallel guideways in its opposite edges, a horizontally-arranged work-carriage having its parallel side rails slidably fitted at their inner edges in the guideways and each provided with a rack on its outer edge, a horizontal driving-shaft mounted in the stand or base below the bed, vertical shafts journaled in the stand on opposite sides thereof and geared at their lower ends to the driving-shaft and at their upper ends to the racks of the carriage, and a reversible driving mechanism contained partly within the stand and below the bed and arranged in operative relation to the driving-shaft, substantially as described.

7. In a woodworking-machine, the combination of an open rectangular work-carriage having transverse parallel guides at the ends thereof, the longitudinal clamp-bars at the sides of said open carriage, means for holding one of said clamp-bars in fixed relation to the carriage, a rock-shaft journaled on the carriage parallel to the other movable clamp-bar, transversely-arranged adjusting-spindles having threaded connection with the movable clamp-bar and confined loosely in the fixed clamp-bar, and operative connections between the rock-shaft and said spindles, substantially as described.

8. In a woodworking-machine, the combination of a work-carriage, the clamping-bars, one fixed and one movable, on the sides of the carriage, adjusting-screws in the movable clamping-bar, traveling nuts on said adjusting-screws and in guides with which said carriage is provided, the rock-shaft, mounted in the carriage, and having the eccentrics, and the links engaging and operated by said eccentrics and connected to the traveling nuts, substantially as described.

9. In a woodworking-machine, the combination of an open work-carriage, the longitudinal clamp-bars mounted on said carriage with the sides thereof, a rock-shaft journaled on said carriage and provided with the eccentrics, the independent handle-bars pivoted to the respective ends of the rock-shaft and each adapted to be turned to a position at right angles to or in alinement with said rock-shaft, operative connections between the rock-shaft and the movable clamp-bar, and locking devices attached to the carriage for engagement by the handle-bars, said locking devices arranged for the handle-bars to be engaged therewith only when the handle-bars are in line with the rock-shaft and each locking device having a clasp which permits the handle-bar to turn therein when the shaft is turned on its axis, substantially as described.

10. In a woodworking-machine, the combination of a work-carriage, the fixed and movable clamping-bars arranged within the sides of the carriage, a rock-shaft journaled on the carriage at one side thereof, the adjusting-handles pivoted to opposite ends of the rock-shaft, the yieldable locking-arms attached to opposite ends of the carriage to lie in the horizontal plane thereof, and each arm provided with a yoke or clip for engagement by one handle-bar when the latter is turned in alinement with the rock-shaft, and connections between the rock-shaft and the movable clamping-bar, substantially as described.

11. In a woodworking-machine, the combination with a work-carriage, and fixed and movable clamping-bars arranged longitudinally thereon, of a rock-shaft provided with eccentrics, spindles connected to the movable clamping-bar and slidably guided on said carriage, links fitted to the eccentrics of the rock-shaft, slidable bolts attached to the spindles and pivoted to the links, and means for rocking said shaft, substantially as described.

12. In a woodworking-machine, the combination with a carriage, of fixed and movable clamping-bars mounted longitudinally thereon, threaded spindles connected with the movable clamp-bar and fitted slidably in the fixed clamp-bar, slidable bolts loosely fitted on the spindles and confined against independent movement thereon by suitable nuts, a rock-shaft, links connected with said rock-shaft and said bolts, and means for turning the rock-shaft, substantially as described.

13. In a woodworking-machine, the combination of a work-carriage having its cross-bars provided with longitudinal slots, a clamping-bar fixed to said carriage, a movable clamping-bar slidably confined by the cross-bars on the carriage, spindles connected to the movable clamp-bar and fitted slidably in the fixed clamp-bar, bolts attached to said spindles and fitted slidably in the slots of the work-carriage, a rock-shaft, links actuated by said shaft and pivoted to said bolts, and means for turning the shaft, substantially as described.

14. In a woodworking-machine, the combination with a base having vertical guides, of adjusting-slides in said guides, and means for independently adjusting said slides, the latter being further provided with recesses on their upper sides, a cutter-carriage seated in the said recesses of said slides, and adjusting and securing screws to secure and adjust said cutter-carriage with relation to said slides, substantially as described.

15. In a woodworking-machine, the combination with a stand or base having a bed, of

a horizontal cutter-carriage below the bed and provided at its ends with the slotted housings, cap-boxes fitted in said housings and forming therewith journal-bearings, bolts and keys for making the cap-boxes fast with the housings, a cutter-head having its shaft journaled in said bearings, the individually-adjustable slides mounted on the stand and having recessed arms in which is seated the cutter-carriage, and screws engaging the recessed arms of the slides and the end portions of the cutter-carriage to adjust the latter independently of the adjustment afforded by the slides, substantially as described.

16. In a woodworking-machine, the combination of a stand or base having the vertical slots, 118, and the guideways in the vertical planes of said slots, the slides confined in said guideways and having the threaded lugs and the recessed arms, feed-screws mounted on the stand and engaging with the threaded lugs of the slides to adjust the latter independently, a cutter-carriage fitted in said slots of the stand and seated in the recessed arms of the slides, fastening and adjusting screws supported by the arms of the slides and engaging with the cutter-carriage to adjust the latter independently of the adjustment afforded by the slides, and a lower cutter-head mounted in said carriage, substantially as described.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

FRANK DIEHL.

Witnesses:

HENRY WALVOORD,

ANDREW GILBERTSON.