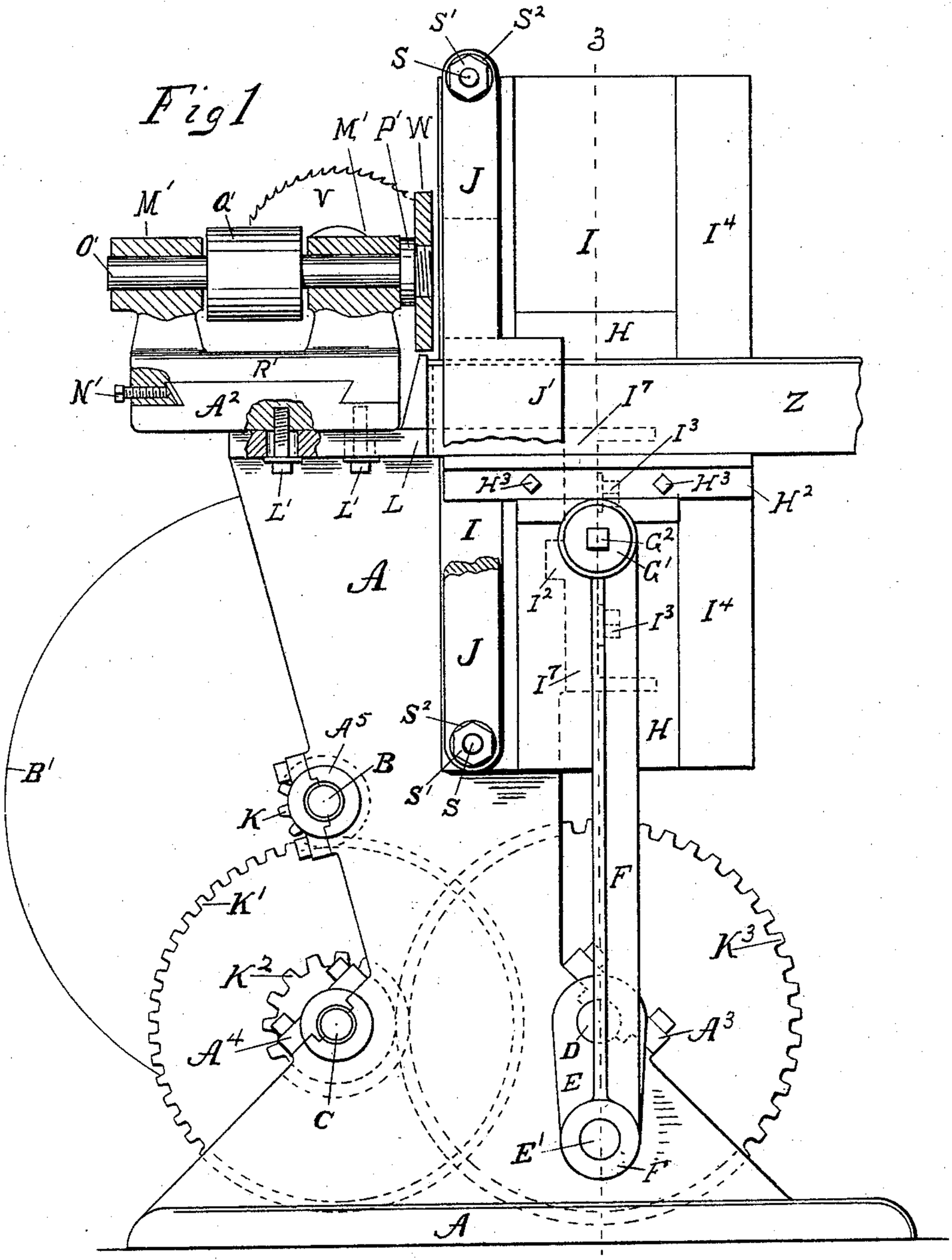
(No Model.) 3 Sheets—Sheet 1.

W. S. SHERMAN.

TONGUE AND GROOVE MACHINE.

No. 580,606. Patented Apr. 13, 1897.

Fig 1



Witnesses
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C. N. Bendrick.

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(No Model.) 3 Sheets—Sheet 2.

W. S. SHERMAN.

TONGUE AND GROOVE MACHINE.

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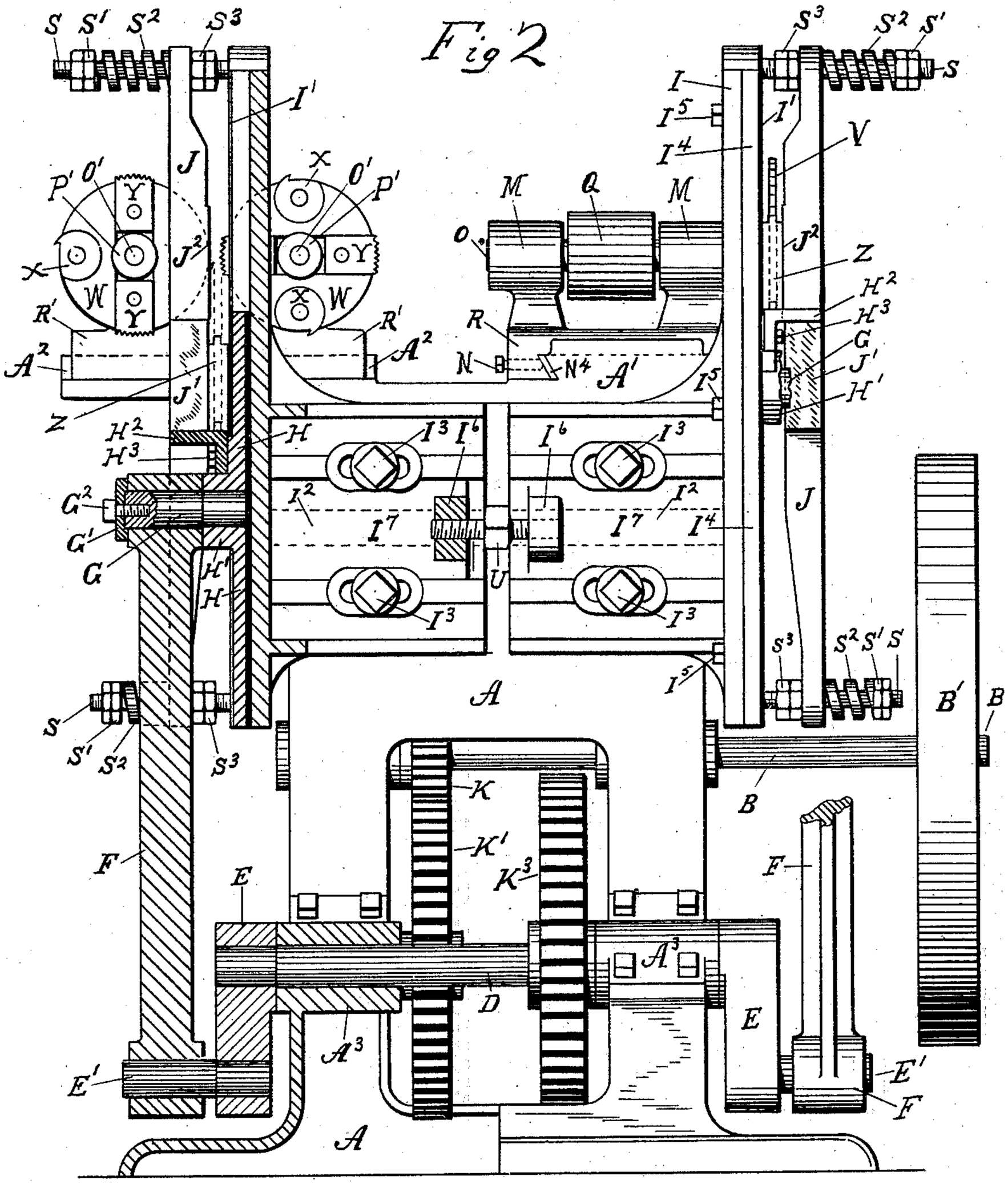
Fig 2



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(No Model.)

3 Sheets—Sheet 3.

W. S. SHERMAN.

TONGUE AND GROOVE MACHINE.

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Fig 4

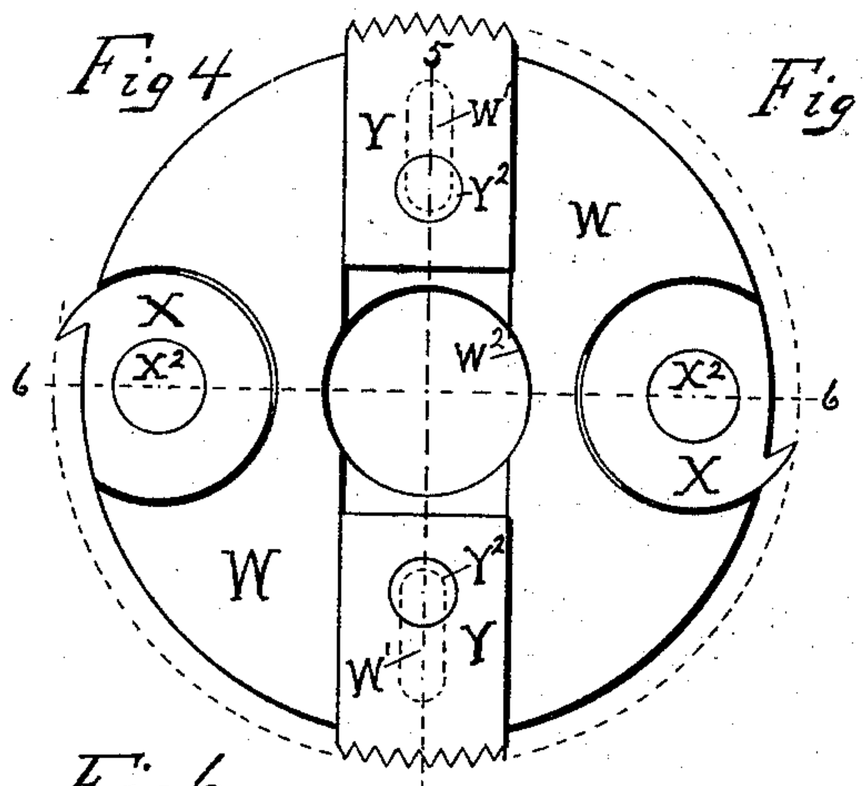


Fig 5

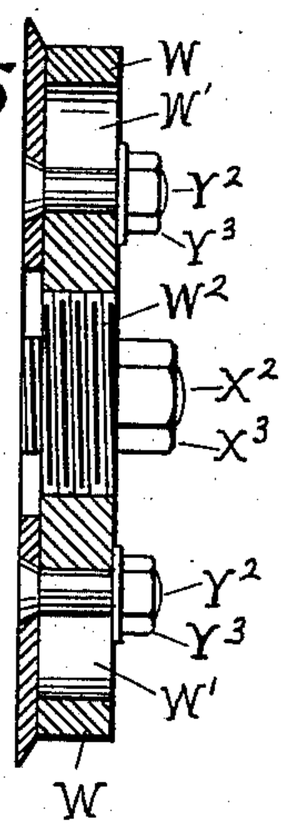


Fig 7

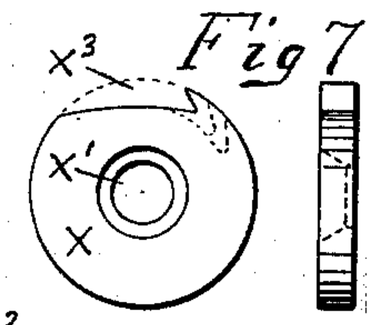


Fig 8

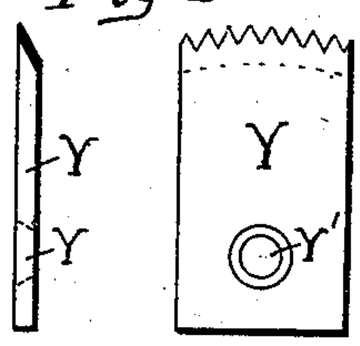


Fig 6

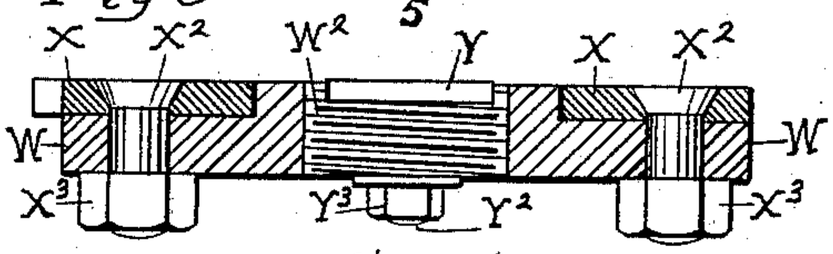
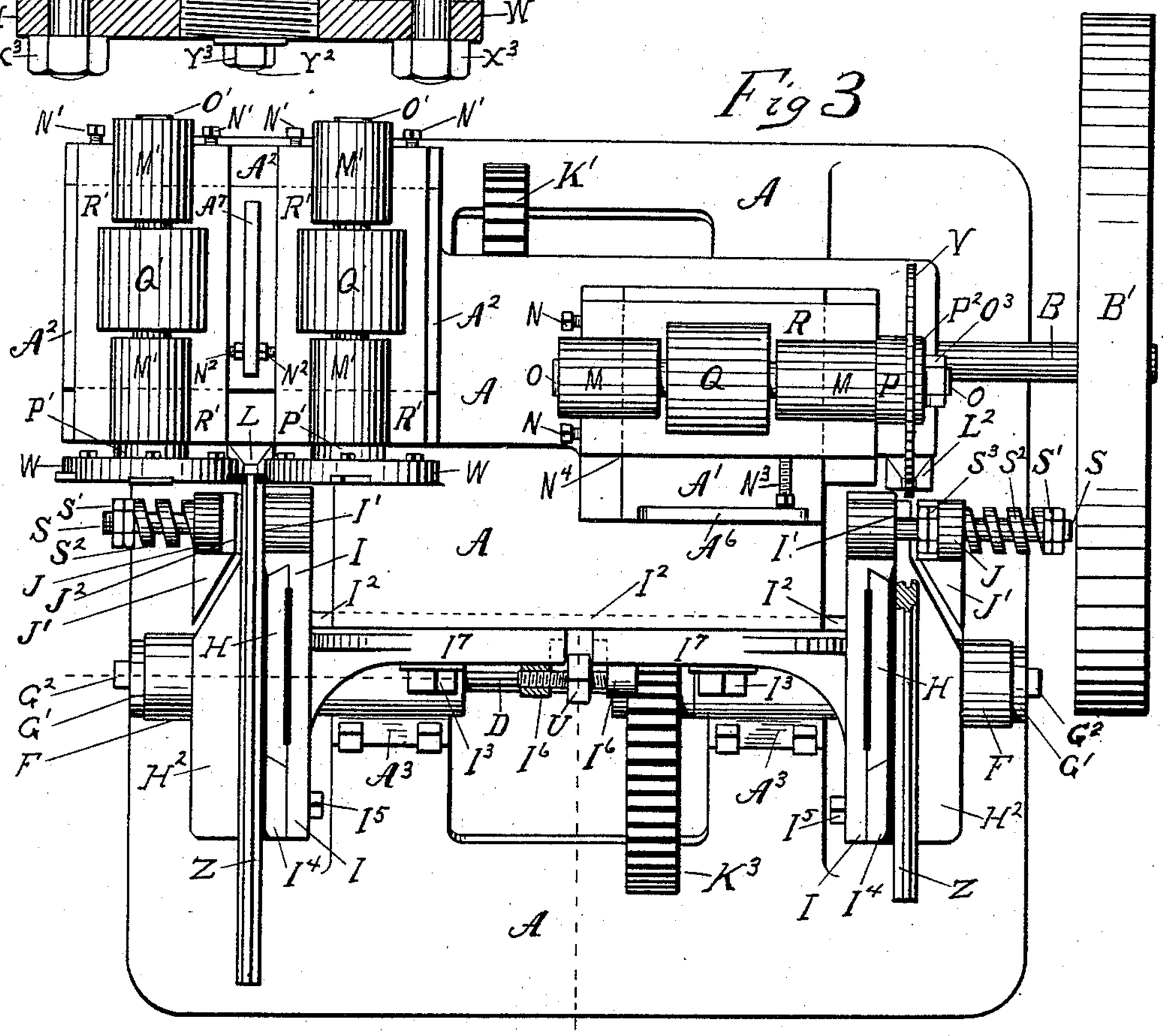


Fig 3



Witnesses

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UNITED STATES PATENT OFFICE.

WILLIS S. SHERMAN, OF MILWAUKEE, WISCONSIN.

TONGUE-AND-GROOVE MACHINE.

SPECIFICATION forming part of Letters Patent No. 580,606, dated April 13, 1897.

Application filed July 11, 1895. Serial No. 555,652. (No model.)

To all whom it may concern:

Be it known that I, WILLIS S. SHERMAN, of Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented new and useful Improvements in Tongue-and-Groove Machines, of which the following is a description, reference being had to the accompanying drawings, which are a part of this specification.

This invention covers improvements on the machine for which Letters Patent No. 538,130 were issued to me on April 23, 1895.

The object of the present invention is to better the construction and increase the efficiency of the machine by improving features and details of the mechanism.

The invention consists of the parts and combination of parts hereinafter described and claimed, or their equivalents.

Figure 1 is an elevation of the left side of the machine, parts, however, being broken away and other parts being in section. Fig. 2 is a front elevation of the machine, parts being broken away and relatively disarranged for the purposes of illustration and other parts, particularly at the left of a vertical central line, being in section. Fig. 3 is a top plan of the machine, some parts, however, being omitted to better show the operative parts of the machine. Fig. 4 is a front view of the tongue-cutting cutter-head. Fig. 5 is a transverse section of the tongue-cutting cutter-head on line 5 5 of Fig. 4. Fig. 6 is a transverse section of the tongue-cutting cutter-head on line 6 6 of Fig. 4. Figs. 7 and 8 are respectively front and edge views of cutters on the tongue-cutting cutter-head.

A is the base or frame, which is of suitable size and construction to properly support the operative parts of the machine. A driving-shaft B, a crank-shaft D, and an intermediate gear-shaft C are journaled in the frame. The driving-shaft B is provided with a pulley B′, through which motion is communicated to the shaft from any convenient source of power by means of a belt (not shown) running thereon.

The driving-shaft B is provided with a pinion K, which meshes with a spur-toothed wheel K′ on the shaft C, and a pinion K^2 on shaft C meshes with spur-toothed wheel K^3 on crank-shaft D.

The shaft D has a crank E at each end, and a pitman F connects the crank-wrists E′ severally to a vertically-reciprocating slide H, conveniently, by means of a stud-pin G, fixed in the slide. A cap G′, secured to the end of the pin G by screw G^2, retains the pitman movably on the stud-pin.

In Fig. 2 the pitman F at the right is shown as broken off and as being, with the crank E′, to which it is attached, at the limit of its travel downwardly, while the stud-pin G above (to which this pitman is attached when in use) is, with the table H^2 adjacent thereto, shown as being at a medial point of their travel. This relative disarrangement of parts was adopted in the drawings as permissible for showing the different positions of the tables H^2 in their travel.

The vertical edges of each slide H are preferably beveled, forming a dovetail construction in cross-section, whereby the slides are fitted, retained, and travel vertically in suitable ways therefor in upright plates I, secured to the frame A. A beveled gib I^4, secured by holding-screws I^5 adjustably to the plate I at one edge of each slide H, forms the bearing therefor at that edge and may be adjusted to take up wear. The rearwardly-projecting flange or tongue I^7 of the T-formed plates I are provided with horizontally-disposed elongated slots, through which bolts I^3 pass and turn into the frame, whereby the plates are secured adjustably to the frame. The plates are adjustable toward and from each other laterally by means of the reversely-threaded screw U, turning through the ears I^6 on the tongues I^7. Horizontally-disposed ribs I^2 on the tongues I^7 enter grooves therefor in the frame A and support the plates adjustably thereon.

A horizontally-disposed shelf or table H^2 is secured to the side of each slide H conveniently by means of screws H^3 through a vertically-disposed flange of the table, turning into the slide H. The tables H^2 are the supports on which a board or strip of flooring is rested and on which it is carried upwardly past and thereby fed to the cutters hereinafter described.

Near to and just in front of the cutters at each side of the machine the upright plate I has a vertical face I′, adapted to receive

against it and support the board movably at one side edgewise. Directly opposite this bearing-surface I′ and complementary thereto at a little distance therefrom is a yielding presser-bar J, adapted to hold the board with sufficient force, but yieldingly, up to the bearing-surface I′. These presser-bars J are severally of such length vertically that they extend to a distance above and below the cutters and at each end are secured to the plate I by stud-bolts S, fixed in the plate I, which bolts pass loosely through the bar J and are provided with sets of nuts S′ and S^3, the nuts S^3 being on the inside to limit the movement adjustably of the bar toward the bearing-surface I′ and the nuts S′ being outside the bar at a distance therefrom to adjust the compression of springs S^2, interposed between them and the bar, and also to limit the movement of the bar outwardly away from the bearing-surface I′. The bars J are severally provided with a smooth and substantially vertical bearing-surface J^2 in front of the cutters and opposite the bearing-surface I′ on the plates I. This bearing-surface J^2 terminates at a point a little above and a little below where the strip is acted on by the cutters, and the face of the bar J above and below the surface J^2 is cut away somewhat, so as to provide greater space between the bar and the plate that the board or strip may be readily inserted below and withdrawn after it has been carried up past the cutters. A forwardly-projecting beveled part J′, Fig. 3, on each of the bars J serves as a guide for directing the entrance of the board or strip between the bar and the plate.

In practice the bar J is first adjusted so as to be parallel with the plate I, at such distance therefrom that the surface J^2 is as far away from the surface I′ as equals the thickness of the material Z, and the upper nuts S^3 are then moved inwardly a little on the pins S, so that the surfaces I′ and J^2 will, by reason of the then slight inward tilt of the bar, be a little nearer each other than equals the thickness of the material, whereby, when the material is forced up between them, the material or strip will be held firmly against the surface of the plate I, thereby, notwithstanding slight differences of thickness of boards or strips, holding the smooth or top surface of the board truly and firmly against the surface I′, thus providing for cutting a tongue or groove at a regular and predetermined distance from the top surface of the board. It must also be understood that in practice the springs S^2 at the respective ends of the bar J are of equal strength, and as the bearing-surface J^2 is preferably nearer one end of the bar than the other end when the material is forced upwardly between this surface J^2 and the plate I that normally only the upper end of the bar J will swing away from the plate I, the loose connection at the other end of the bar serving merely as a hinge to permit such movement.

It will be seen that the vertically-moving slides H, with their tables H^2 and related mechanisms, are in duplicate, one set at each side of the machine, and it must be understood that at one side of the machine the board or strip is pushed into the machine over the table H^2 and is fed by the vertically-moving slide H to tongue-cutting cutters, and at the other side the other end of the board or strip is similarly fed to a groove-cutting cutter.

For cutting the groove in one end of the material or strip I employ a suitable circular saw V. This saw is fixed on an arbor O conveniently by being put on the arbor against a boss or collar P and being held thereto by the loose ring-collar P^2, secured in place by the nut O^3 turning on the arbor. The arbor O is journaled in boxes M, fixed on or integral with the bed-piece R, which piece is fitted on a dovetailed member A′ of the frame A. The bed-piece R is adjustably and detachably secured on the dovetailed member A′ by the holding-screws N turning through the bed-piece against a gib or bearing-piece N^4, interposed between the bed-piece and the member A′. The saw or grooving-cutter V is located directly in rear of a table H^2 and opposite the space between a plate I and a bar J, the exact distance of the saw from the plane of the bearing-surface I′ being secured by adjustment of the screw U, that is adapted to move the plate I laterally. A stop L^2, secured on the member A′ below the saw V, receives the strip or material against it and thus limits the depth of the groove to be cut in the strip. The depth of this groove is regulated by adjustment of the position of the bed-piece R by means of the screw N^3, that turns into the bed-piece and bears against a rib A^6 on the member A′. The saw V can be removed for sharpening or to be replaced by another saw readily by releasing the screws N, sliding the bed-piece R rearwardly away from the stop-block L, and removing the nut O^3 and collar P^2. The arbor O is provided with a pulley Q for communicating motion thereto by a belt from any convenient source of power. For cutting the tongue on the other end of the board or strip I employ cutters mounted on revolving cutter-heads W W opposite each other. The heads W W are mounted detachably one on each of the arbors O′, which are journaled parallel to each other in boxes M′ M′ on the two bed-pieces R′ R′, adjustably fitted on the dovetailed member A^2 of the frame A, and are held releasably thereto by the screws N′ N′, advisably turning against an interposed gib-piece. The positions of the bed-pieces R′ R′ relative to each other and to the bearing-surface I′ of the plate I are regulated laterally by the screws N^2 N^2, severally turning into a bed-piece R′ and bearing against the rib A^7 on the member A^2. The arbors O′ are provided with pulleys Q′ for driving them.

The heads W W are each provided with two

sets of cutters duplicate of and complementary to each other on the two heads. One set of cutters is composed of the oppositely-disposed flat blades Y Y, each having a saw-toothed arc edge projecting slightly beyond the perimeter of the head W. These blades or parting-cutters Y Y are fitted in suitable recesses or a diametrical channel across the surface of the head and are held adjustably thereto by countersunk bolts Y^2, passing through radially-elongated slots W′ in the head and secured thereto by nuts Y^3, turning on the bolts against the heads. These cutters Y Y are adapted to cut across and part the grain of the material or strip in advance of the clearing or tongue-forming cutters, thus forming the shoulder or relish on the strip or board.

The other set of cutters, being the material-removing or tongue-forming cutters X X, consist of stocks, preferably of disk form, a portion of which at the circumference is removed, forming tangential projections having knife-edges adapted to cut circumferentially. These disks or cutters or secured to the head by countersunk bolts X^2, provided with nuts X^3, and are so disposed on the heads that the knife-edges project beyond the perimeter of the head, whereby they are adapted to cut into and remove portions of the material held thereto as the head revolves. These heads are secured to their arbors O′ O′ conveniently by turning them by screw-thread onto the sleeves P′ P′, which are shrunk onto the arbors. The heads W W are so disposed relative to a plate I that the strip or material bearing against the surface I′ and shoved past the bar J is in the vertical plane between the cutter-heads W W. The heads W W can be readily removed from their arbors O′ O′ for sharpening the cutters or for replacing them with others by releasing the screws N′ and sliding the bed-pieces R′ R′ severally laterally on the member A^2 sufficiently far that the heads can be unscrewed from the sleeves P′ without contacting with other parts of the machine normally in front of them. A stop L, secured adjustably by screws L′ L′ on the member A^2, is adapted to receive the end of the strip and regulate and determine the length of the tongue to be cut on the strip.

As it is desirable that there shall be a slight undercut of the strip at one end from the surface that is to form its outer face, the arbors O′ O′ are advisedly disposed at a slightly-oblique angle to the plane of the bearing-face I′ of the plate I adjacent thereto, and to secure this position of the arbors the dovetail bearing-surfaces of the member A^2 are longitudinally correspondingly oblique transversely to the plane of the bearing-surface of the plate I. As this undercut is very slight the obliquity of the longitudinal direction of the dovetailed surfaces therefor is not shown in the drawings, as it is too slight to be illustrated in drawings of the scale of those herewith.

In practical operation the attendant, resting one end of a strip, as of flooring, on the table H^2, pushes it between a plate I and the adjacent bar J against the stop L, when the table is going down or is at its lowest limit of travel, and holds it there while the table goes up, actuated by a pitman F, and as it goes up between the bearing-surfaces I′ and J^2 and passes the saw or the cutters a groove or a tongue is cut in or on the strip, and thereupon the strip being raised above the bearing-face J^2 of the bar J is readily withdrawn and the other end of the strip is similarly presented to the cutter or cutters at the other side of the machine and the complementary groove or tongue is similarly formed.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a tongue-and-groove or analogous machine, the combination with a reciprocating material-supporting table, of a stationary material-supporting plate, and a yielding material-supporting bar opposite thereto, substantially as described.

2. In a tongue-and-groove or analogous machine, the combination with the frame, of an elongated stationary material-supporting plate, an elongated yielding material-supporting bar opposite to and extending in the same direction with the plate and movable from and toward the plate in a plane at a right angle to the surface thereof, and a material-supporting table reciprocable in the space between said plate and said bar, substantially as described.

3. In a machine of the character described, the combination of a stationary material-supporting plate having an elongated bearing-surface to receive thereagainst and support the material, an elongated yielding material-supporting bar extending in the same direction and opposite the bearing-surface of the material-supporting plate and yielding from and pressing toward the plate at a right angle thereto, studs fixed in the plate projecting therefrom through the bar in and at right angles to the plane of the extension of the path of the material and on which the bar moves toward and from the plate, and a material-supporting table reciprocable alongside of the plate and in the space between the plate and the yielding bar, substantially as described.

4. In a tongue-and-groove or analogous machine, the combination with a single reciprocating material-supporting table, of a stationary material-supporting plate elongated in the direction of the motion of the material-supporting table, a bar opposite the stationary material-supporting plate, studs fixed in the plate extending through the bar on which the bar near its extremities is movable at a right angle thereto toward and from the plate, springs holding the bar yieldingly toward the plate, and nuts on the studs limiting the movement of the bar toward the plate and holding the springs against the bar, the table being so disposed as to reciprocate in the

space between the bar and the plate, substantially as described.

5. In a tongue-and-groove machine, the combination with the frame, of a stationary material-supporting plate having an elongated bearing-surface and ways therein parallel with said bearing-surface for a movable table, means substantially as described for securing said plate adjustably on the frame, a material-supporting table reciprocable on the ways in said plate, and means for reciprocating said table.

6. The combination with the frame, of bed-pieces R' R' adjustable on the frame, parallel arbors carrying complementary cutter-heads mounted on the bed-pieces, an intermediate stop or rib A' on the frame, and regulating-screws interposed between the bed-pieces and the stop, substantially as described.

7. In a tongue-and-groove or analogous machine, the combination with the frame, of reciprocating material-supporting tables, substantially duplicate material-supporting plates secured adjustably but otherwise non-movably to the frame and having therein the bearings of said reciprocating tables, and a reversely-threaded screw turning into adjacent parts of the plates and adapted to adjust the plates toward or from each other, either by moving both plates on the frame or by moving one plate only, as set forth.

8. The combination with the frame, and two vertically-reciprocating material-supporting tables actuated by a common shaft, of corresponding sets of non-reciprocable devices adapted to support the material in position while it is being fed to cutters on and with the movement of the tables, and cutters or sets of cutters at the rear of each set of material-supporting devices, substantially as described.

9. The combination with the frame, of a vertically-disposed non-reciprocating material-supporting plate and complementary bar opposite thereto, a material-supporting table reciprocable vertically in the space between the plate and complementary bar, opposite and complementary cutter-heads at the rear of the material-supporting plate and bar, and a stop to receive the end of material and regulate the extent of the material presented to the cutters, substantially as described.

10. In a tongue-and-groove machine, the combination with the frame, of a plate having a material-supporting bearing-surface, and a bar opposite thereto yielding therefrom and pressing thereto at a right angle to the plate having a bearing-surface nearer to one end thereof than to the other end, and means substantially as described securing the bar at points in the extension of the plane of the path of the material and adjacent to the plate yieldingly so that the material for which the machine is adapted being forced between its bearing-surfaces and the plate will cause it to yield at that end nearest to the bearing-surface only.

11. In a tongue-and-groove machine, the combination with a fixed plate having a longitudinal material-supporting bearing-surface, of a pressure-bar held yieldingly near to opposite and substantially parallel with the longitudinal bearing-surface on said plate, and an inclined guide on the bar projecting laterally from the bar opposite the plate adapted to receive and guide the end of the material being thrust endwise into the space between the plate and the pressure-bar, substantially as described.

12. The combination of an elongated material-supporting plate having a straight longitudinal bearing-surface, studs fixed in the plate one near each end thereof and projecting therefrom in the line and on the side of the bearing-surface, a complementary material-supporting bar having a flat bearing-surface nearer one end of the bar than the other but opposite the bearing-surface on the plate, said bar being movable on said studs toward and from the plate, at a right angle thereto and means to retain the bar yieldingly adjacent to the plate, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIS S. SHERMAN.

Witnesses:
C. T. BENEDICT,
ANNA V. FAUST.