(No Model.) 4 Sheets—Sheet 1.

T. S. CRANE.

MACHINE FOR CUTTING BOARDS FROM LOGS.

No. 410,403. Patented Sept. 3, 1889.

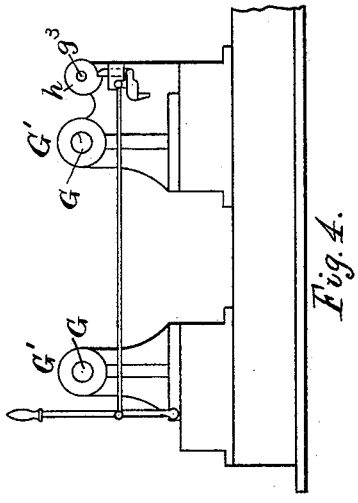

Fig. 4.

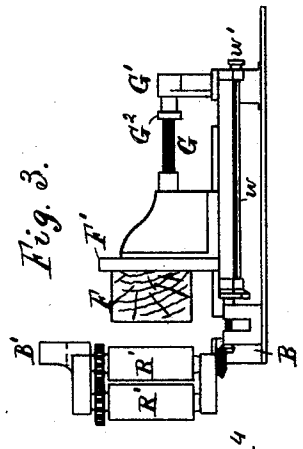

Fig. 3.

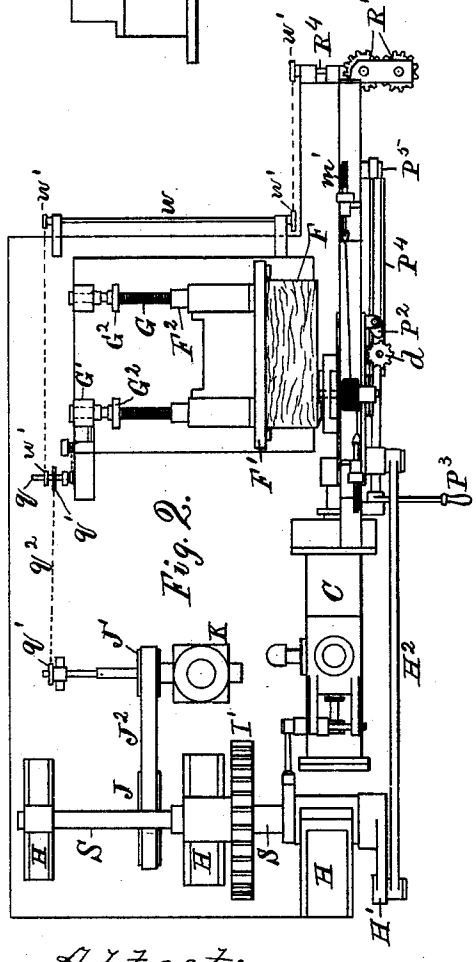

Fig. 2.

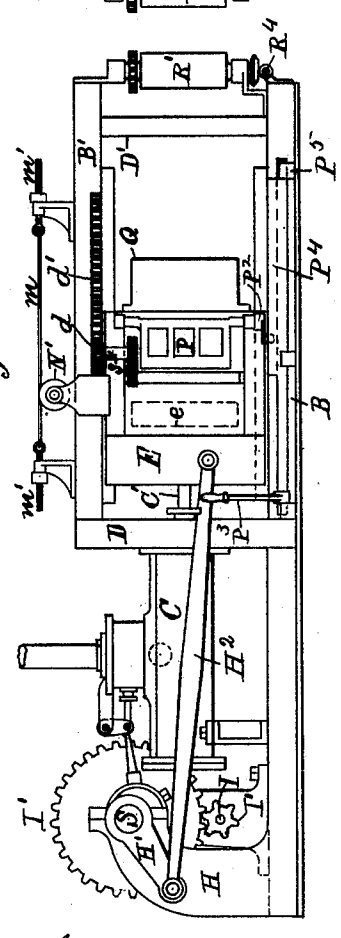

Fig. 1.

Attest:
L. Lee,
F. C. Fischer.

Inventor.
Thomas S. Crane, per
Crane & Mueller, Attys.

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Fig. 5.

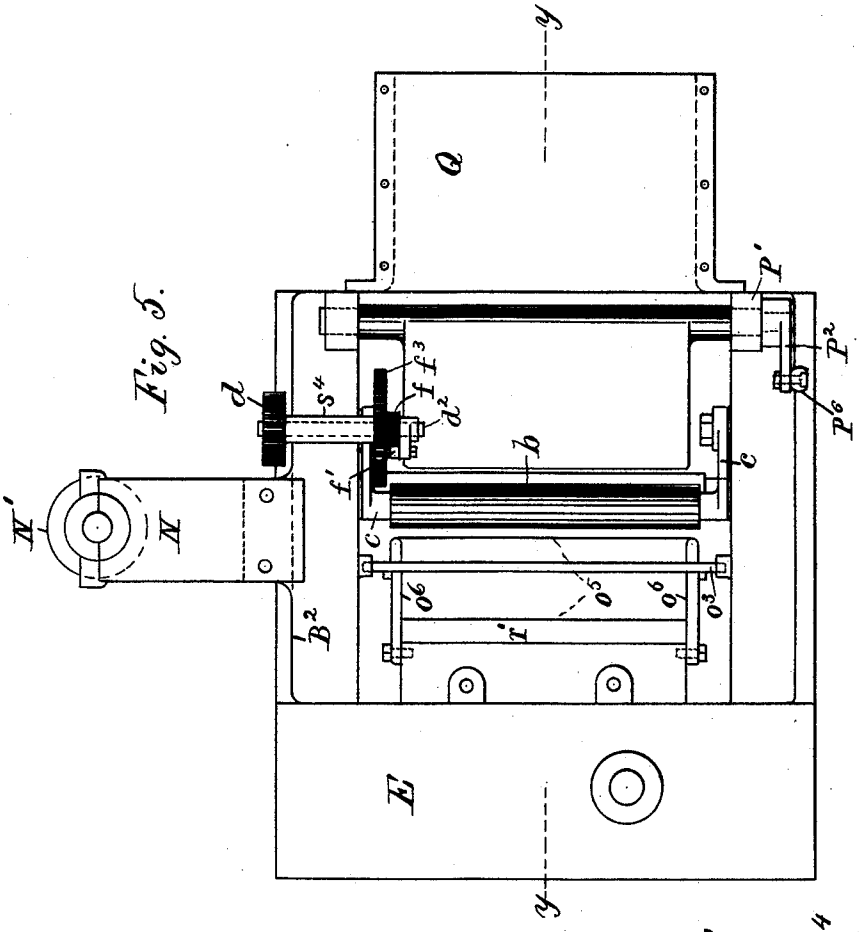
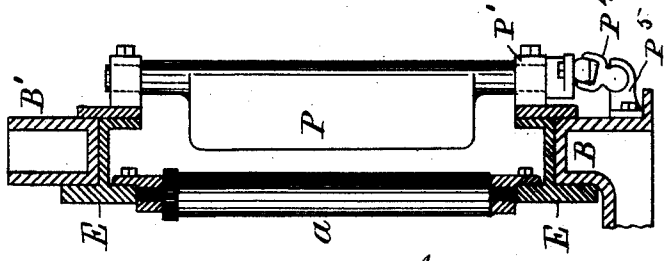


Fig. 6.



Attest:
L. Lee.
F. C. Fischer.

Inventor.
Thomas S. Crane per
Crane & Miller, attys

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Fig. 8.

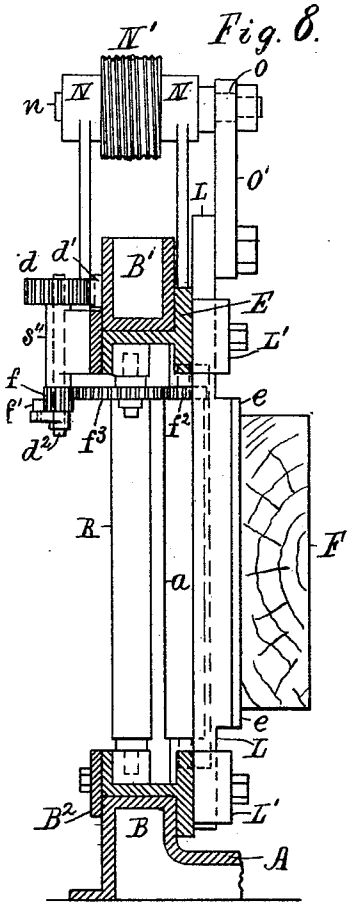


Fig. 7.

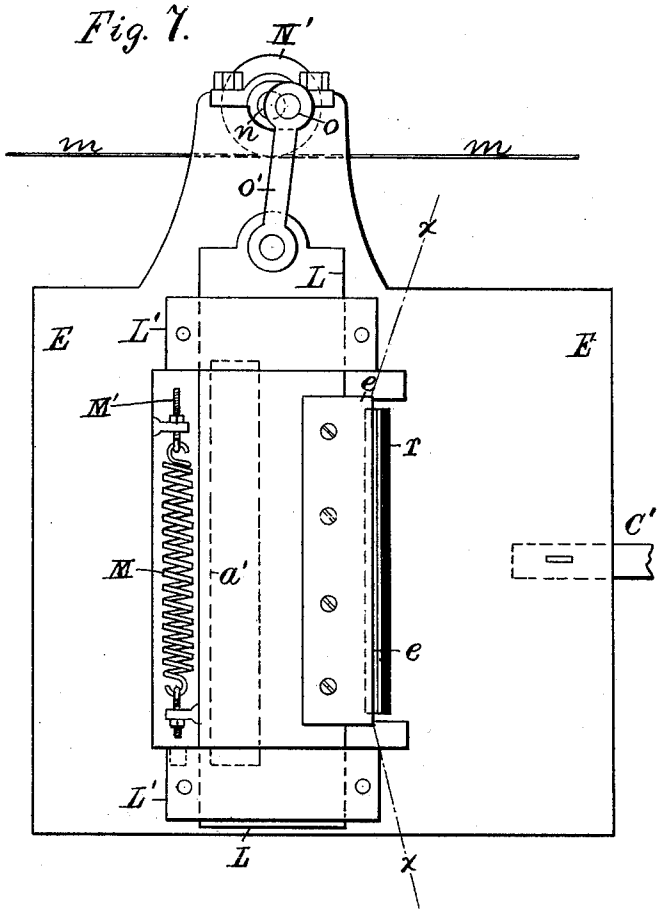
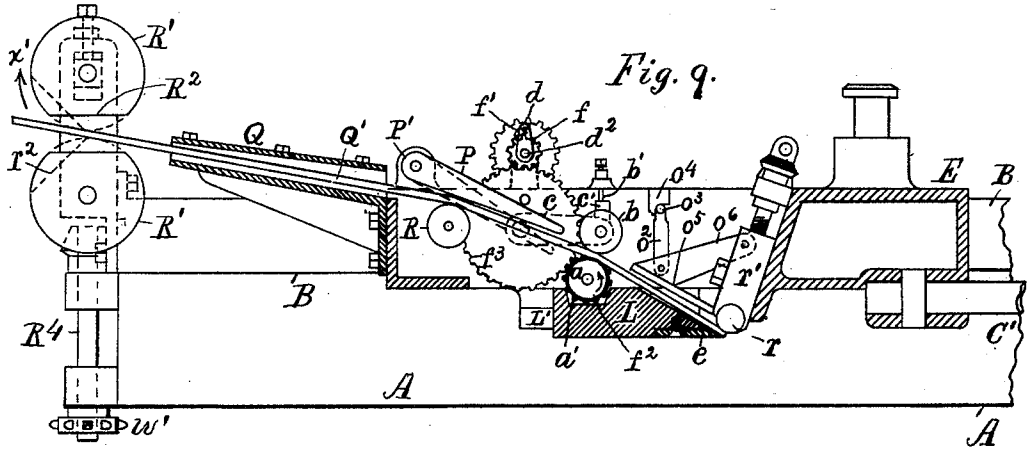


Fig. 9.



Attest:
Lo. Lee.
F. C. Fischer.

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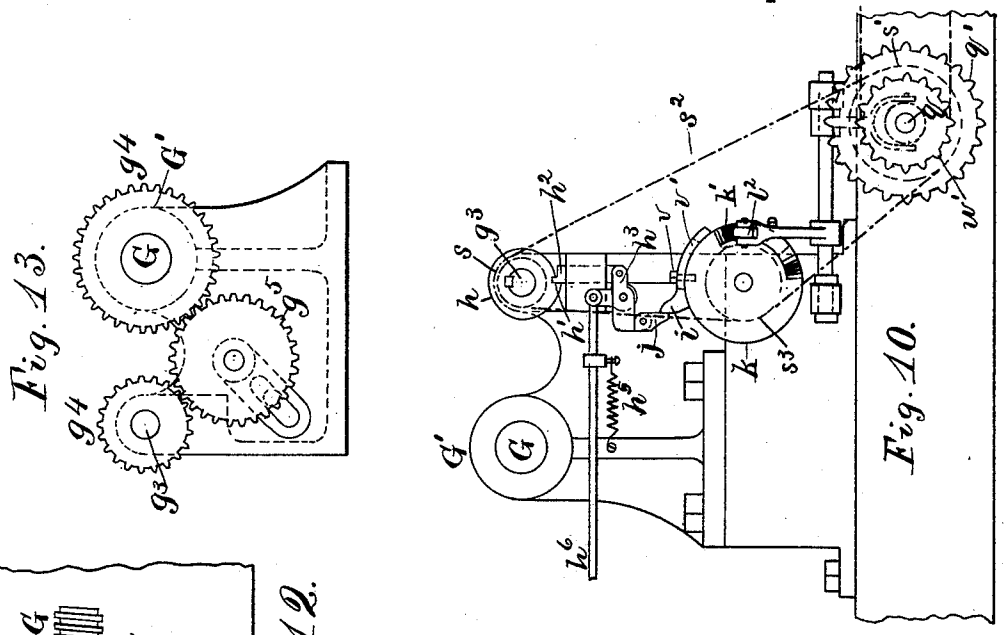

Fig. 10.

Fig. 13.

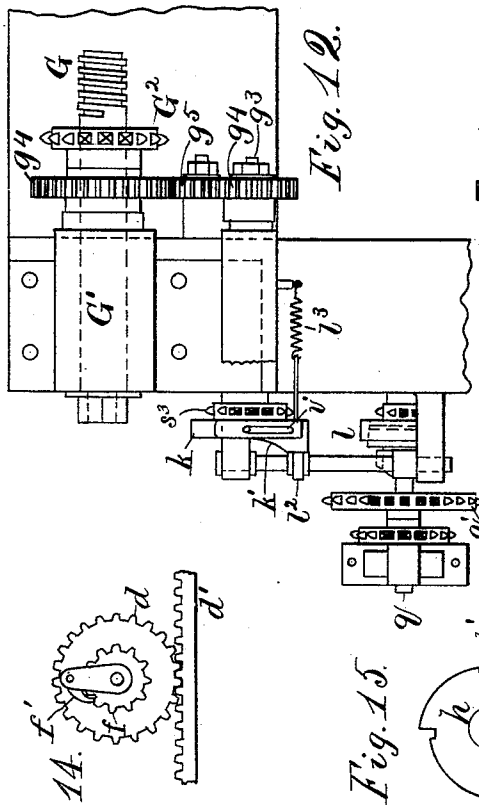

Fig. 12.

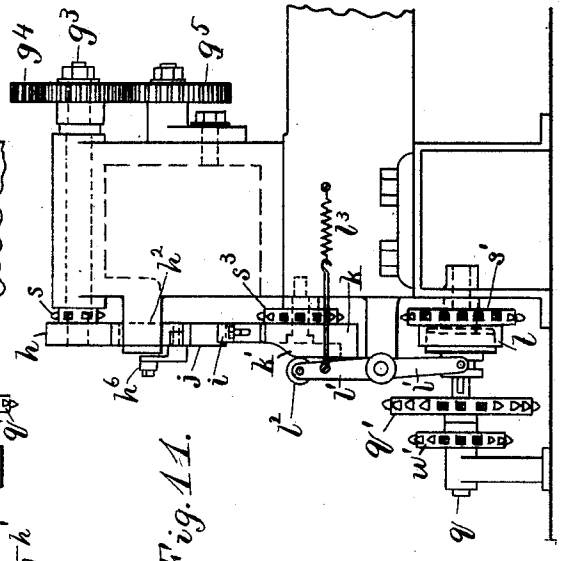

Fig. 11.

Fig. 14.

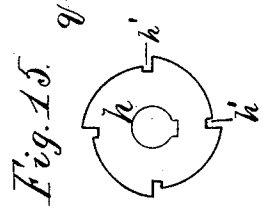

Fig. 15.

Attest:
L. Lee.
F. C. Fischer.

Inventor.
Thomas S. Crane, per
Crane & Mueller, Attys.

UNITED STATES PATENT OFFICE.

THOMAS S. CRANE, OF EAST ORANGE, NEW JERSEY, ASSIGNOR TO EDWARD BRADLEY, OF NEW YORK, N. Y.

MACHINE FOR CUTTING BOARDS FROM LOGS.

SPECIFICATION forming part of Letters Patent No. 410,403, dated September 3, 1889.

Application filed April 20, 1889. Serial No. 307,941. (No model.)

To all whom it may concern:

Be it known that I, THOMAS S. CRANE, a citizen of the United States, residing at East Orange, Essex county, New Jersey, have invented certain new and useful Improvements in Machines for Cutting Boards from Logs, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention relates to a machine for cutting logs directly into boards of any desired thickness by means of a reciprocating knife actuated by a steam-piston, as in my patent, No. 379,451, dated March 13, 1888; and my present improvements consist in means for vibrating the knife longitudinally in its passage through the wood, in means for straightening and delivering the boards from the knife, in means for rotating the feed-screws positively through a definite arc, and in other details of construction hereinafter set forth.

In the annexed drawings, Figure 1 is a front elevation of the machine, and Fig. 2 a plan of the same, the minor details of construction in these figures being omitted on account of the smallness of the scale. Fig. 3 is an elevation of the right-hand end of the machine. Fig. 4 is a rear elevation of the feed-screw bearings, with the latch for the feed-locking devices, upon a larger scale. Fig. 5 is a view of the outer side of the knife-carriage; Fig. 6, a section of the knife-carriage with only the inner delivery-roll and the bender attached thereto and sections of the ways upon which the knife-carriage moves. Fig. 7 is a view of the inner side of the knife-carriage; Fig. 8, a section of the same adjacent to the edge of the knife on line $x\ x$ in Fig. 7, with sections of the ways B B′. Fig. 9 is a longitudinal section on line $y\ y$ in Fig. 5. Fig. 10 is a rear elevation of the feeding devices; Fig. 11, a side view of the same; Fig. 12, a plan of the same, and Fig. 13 a front view of the feed-spindle stand. Fig. 14 is an end view of the ratchet-gearing upon the knife-carriage for actuating the straightening-roll *a;* Fig. 15, an alternative form of locking-cam.

In Figs. 1 and 2, which are drawn upon a very small scale, many of the details are omitted which are shown in the other figures, and in Fig. 4, which represents (also upon a very small scale) the lock for the feed-gearing, many of the details are omitted which are shown in Fig. 10.

A is the bed of the machine, having one of the ways B attached to its front edge.

C is the steam-cylinder, affixed to a post D, which, with a post D′, sustains the upper way B′, between which and the way B the knife-carriage E slides, sustaining the knife *e* in a vertical position.

F represents the log, and F′ the stay-log for carrying the same, mounted upon brackets F^2, which slide upon suitable guides upon the bed A.

Feed-screws G are journaled with thrust-collars in bearings G′, fixed to the bed, and would in practice be connected by a chain applied to the wheels G^2. (Shown only in Fig. 2.)

A crank-shaft S is mounted in posts H upon the bed and connected by a crank H′ and rod H^2 with the knife-carriage E.

An auxiliary shaft I is shown mounted in two of the posts H below the shaft S and connected with the shaft by gears I′. The shaft I is also connected by pulleys J J′ and belt J^2 with an auxiliary engine K, which is also used to drive the feed-gearing and to reverse the feed-screws to retract the stay-log when the knife is stopped. To operate the engine K independently of the knife-carriage, the pulley J′ would be made detachable from the shaft I by any suitable clutch mechanism, which is not shown, as it forms no part of my present invention.

The piston-rod C′ from the cylinder C is attached directly to the knife-carriage E to exert the desired force upon the knife, the stroke of the carriage being regulated by the connecting-rod H^2, as claimed in my patent, No. 379,451, dated March 13, 1888.

In practice the feed is operated alternately with the cutting movement of the knife, and the log is thus successively fed upon the knife and the wood removed from the log in slices of the required thickness.

The knife, as shown in Figs. 7, 8, and 9, is attached to a reciprocating knife-beam L, held movably upon the carriage E by gibs or guides L′, and the weight of the beam is nearly counterbalanced by a spring M, attached at

one end to the carriage and at the other to the beam by adjusting-screws M′.

The ways B B′, as shown in Fig. 8, are of square section, and the knife-carriage consists partly of two T-bars, (lettered E in Fig. 6,) upon which the gibs L′ and other fixtures are secured. The T-bars are held in position upon the ways by gibs B^2 upon the outer side of the same, and bearings N are mounted upon the upper gib and T-bar E at the opposite sides of the upper way B′. These bearings carry a crank-shaft *n*, provided with a worm-drum N′ and with a crank-pin *o*, connected by link *o′* with the knife-beam L. A wire rope *m* is wound once about the drum and has its ends fastened upon the way B′ by adjusting-screws *m′*. The ends of the rope being held stationary, the reciprocation of the knife-carriage moves the drum along the rope, and the drum is thus rotated and the link *o′* and knife-beam vibrated several times during each cutting-stroke of the knife.

The knife is movable transversely to the movement of the knife-carriage, so as to use adjacent to the edge of the knife a presser-roll *r*, adapted to hold the wood from splintering in the cutting operation. Such roll would not operate if placed at any other than a right angle to the movement of the carriage, and the knife cannot, therefore, in conjunction with such roll be placed obliquely to the movement of the carriage to produce a draw cut, as is done in many other classes of cutting-machines. To secure the advantages of a draw cut, I therefore employ the knife-beam reciprocated upon the knife-carriage, and am thus enabled to move the knife-blade longitudinally as its edge is moved transversely through the wood, and therefore cut the wood with the least possible strain or injury.

I have operated a knife in cutting boards an inch thick from the log, but find that the angle of the knife causes the board to curl considerably, and that the last end of the board sticks between the knife and presser-roll. I have therefore provided the straightening devices shown herein, and have provided delivery-rolls intermediate to such devices and the edge of the knife to draw the board from the knife and propel it through the straightening devices on the knife-carriage. The straightening device is shown herein consisting chiefly in several rolls mounted upon the carriage independently of the knife-beam, which latter is thus enabled to vibrate in contact with the wood while the board is moving steadily through the straightening apparatus. The straightening-roll *a* is journaled as close to the edge of the knife as possible, and a recess *a′* is therefore formed in the knife-beam to clear the periphery of the roll. Opposite to the roll *a* a roll *b* is journaled in hinged arms *c* and pressed toward the roll *a* by screw *b′*, operating upon a block of elastic material *c′* to press the rolls *b* and *a* elastically together. The roll *a* is rotated positively to retract the board from the knife by a wheel *d*, mounted in bearing s^4 upon the carriage and rotated in contact with a rack *d′*, fixed upon the way B′, as shown in Figs. 1 and 8.

As the wheel *d* is rotated in opposite directions by the reciprocation of the carriage and it is desirable to turn the roll *a* in one direction only, as indicated by the arrow upon such roll in Fig. 9, I mount a pinion *f* loosely upon the shaft d^2 of the wheel *d* and attach to the shaft an arm carrying a pawl *f′*, which operates in one direction upon the pinion *f*, and thus turns the roll *a* as desired. (See Fig. 14.) The pinion *f* is connected with a cog-wheel f^2 upon the end of the roll *a* by an intermediate gear f^3.

To guide the board, when cut, to the aperture of the rolls *a* and *b*, a shield o^5 is held adjacent to the knife-edge by arms o^6, pivoted upon the carrier *r′* of the presser-roll *r*. The shield is held in its operative position by a yoke o^2, having projecting pins o^3 at the ends, which are engaged when in operation with sockets o^4, suitably formed upon the carriage, as shown in Fig. 9. By moving the pins o^3 to the right to clear their sockets the shield may be turned entirely away from the knife to clean out the cavity in case splinters become lodged therein. The board is thus directed as it moves from the knife through the rolls *a* and *b*, which are not rotated during the cutting-stroke of the knife; but upon the return-stroke of the knife-carriage the roll *a* is suitably rotated and the end of the board remaining near the presser-roll is pulled outward and the board discharged from the carriage.

To straighten the board, it is bent in a curve opposite to that imparted by the knife, which may be effected by means of rollers adjacent to the rolls *a* and *b;* but to accomplish another object I prefer to use a bender in the form of a pivoted plate or shield P, which is hinged in bearings P′ upon the carriage adjacent to the path of the board, and having its free end movable to either side of such path, as is indicated by the full and dotted lines in Fig. 9. Such bender operates to deflect the end of the board Q′ into the desired curve and directs it into the mouth of a delivery trough or channel Q, provided upon the end of the carriage to discharge the board in a given path. When first cutting a rough log, the slabs, which may come of various lengths from the knife, would operate to clog up the channels provided for the passage of the boards, and the bender P is used at such times to throw the slabs or short pieces out of the carriage without bending them and without directing them into the delivery-trough. The delivery-trough is arranged to still further bend the wood by providing a fulcrum-roll R inside the bender P, the wood being bent over such roll by the contact of the forward part of the board with the inside of the trough Q, as shown in dotted lines in

Fig. 9, and the trough thus operating as a straightening agent in relation to the roll R in the same manner as the bender P operates in relation to the roll *a*.

The operator is intended to stand in front of the machine at the left end of the log F, in proximity to the handle P^3, by which the bender P is actuated to throw the slabs or boards out of the knife-carriage when desired. The operator, standing at this point, can see a part of the log as the knife passes over it, and can judge what portion of the log will make perfect boards; and to avoid arresting the machine it is necessary that the bender should be under the control of the operator while the entire carriage is in motion and be capable of movement into the two positions shown in full and dotted lines in Fig. 9. To effect this result, I project the axle of the bender through the lower bearing P′ upon the knife-carriage and provide it with a crank P^2, having an anti-friction roller P^6 upon its crank-pin, as shown in Fig. 5.

I also provide an oscillating shifter P^4, journaled in bearings P^5 upon the way B, and provided with the hand-lever P^3 for oscillating the same at pleasure. The shifter is provided with a groove fitted to the crank-pin roll P^6, the groove being parallel with the path of the carriage and holding the crank and bender in a given position as the shifter may be turned through the whole stroke of the carriage. Fig. 6 shows the shifter and the crank P^2 tipped outwardly, in which position the crank is adapted to hold the bender, as shown in full lines in Fig. 9, to intercept the boards in their passage through the rolls *a* and *b* and to bend the same and divert them into the trough Q. With the shifter in such position, the handle P^3 would be pressed downward, and the weight of the handle would therefore operate to hold the bender P normally in the position to straighten the boards and discharge them through the trough Q and rolls R′. When the operator perceives it necessary to throw the boards or slabs out of the carriage instead of straightening them, the handle P^3 would be raised, which would throw the bender into the position shown in dotted lines in Fig. 9 and accomplish the desired object. The delivery of the cut wood through the straightening device or otherwise would be thus under the control of the operator while the machine is in motion.

The bender and the trough each operate to impart an additional curvature in the wood in a direction contrary to that naturally produced by the bevel of the knife, so that the board is prepared when delivered from the trough to be used immediately or to be stacked up in flat piles for drying, if required.

To prevent the board from sticking in any of the straightening devices or discharge-channel, as the trough Q, and to positively deliver the piece of wood from the carriage before another is cut from the knife, I have provided a pair of rolls R′, mounted independent of the carriage, with the aperture between them in the path of the board as it is discharged from the carriage. These rolls are journaled upon the frame and are so located as to grasp the board when the carriage is at the extreme end of its stroke, and thus prevent the boards from being carried back by the carriage in its cutting movement. The rolls are rotated in the direction of the arrow *x*′, Fig. 9, and are intended to deliver the board positively away from the machine, and to prevent the strain upon the board which would be required to force it between such rolls I preferably form one or both of the rolls of segmental shape with a flat portion R^2 upon one side, which permits the board to pass between the rolls just before the end of the stroke and to be grasped by the further rotation of the rolls, as the roll would be turned around with the flat portion in the position indicated by the dotted lines r^2 before the movement of the carriage was reversed. The board, when gripped by the segmental rolls, is drawn forward from the trough Q as the carriage advances to make a cutting-stroke, and the space between the straightening devices is thus positively cleared for the succeeding board.

To bring the flat portion upon the rolls uniformly into the same position at the extreme end of the stroke, so as to freely admit the board, the rolls R′ are made to rotate once, twice, or any other even number of times for each stroke of the knife by means of the shaft R^4 and suitable connections to the shaft S. Such rotation is shown effected in Fig. 2 through the medium of shafts *w* and *q*, the wheels *w*′, and the gearing between the engine and the crank-shaft.

Heretofore I have used a ratchet moved adjustably over the teeth of a feed-wheel to produce a variable feed for cutting boards of different thicknesses and find that the momentum of the feed-wheel and of the feed-screws attached thereto is liable to turn the screws after the feed-pawl has stopped moving and to thus produce an excessive and irregular feed. I have therefore devised the feed mechanism shown herein, which operates to rotate the feed-screws through an exact arc and to positively lock them at the end of the feeding movement and hold them in a fixed position until again actuated.

It is also necessary to connect the locking mechanism with the screws by gearing adapted to turn the screws through various arcs to cut boards of different thicknesses. The two feed-screws would be connected by a chain (not shown) upon sprocket-wheels G^2, and to effect all these objects I mount a feed-spindle g^3 adjacent to one of the screws and connect it therewith by change-wheels g^4 and an intermediate gear g^5, as is common in such cases. (See Fig. 13.) I provide the end of the feed-spindle with a locking-cam *h*, (shown in Figs. 10 and 11,) formed with one or more notches *h*′, adapted to engage a vibrating

bolt h^2, which thus holds the cam in a fixed position during the cut of the knife.

The feed-spindle is connected by suitable gearing with the auxiliary engine K through the intervention of a friction-clutch l, Figs. 1, 11, and 12, which is adapted to slip when the cam is locked and is in readiness at any moment when the bolt is withdrawn to rotate the spindle and feed-screws. Such rotation of the feed spindle and screws G must be effected quickly while the crank H′ is turning the center preparatory to moving the knife through the log, and where the feed is very fine it is preferable to use a cam with more than one notch, as shown in Fig. 15, and to lock the same at the end of a partial rotation. As the cam is therefore rotated quickly, it is necessary that the bolt should be pressed toward the cam, as by a spring h^5, Fig. 10, and should only be retracted for an instant and then pressed upon the surface of the part to promptly engage the notch h'. To secure this result, the surface of the cam is preferably made of spiral shape, as shown in Figs. 10 and 15, and the bolt is retracted by a lever h^3, provided with a trip j, which is operated upon at the desired point in the stroke by a rapidly-moving dog i.

The shaft q is driven by sprocket-wheels q' and a chain, (indicated merely by a dotted line q^2 in Fig. 2.)

The dog i is fixed by means of a screw v and a slot in its foot v' adjustably upon the rim of a wheel k, which is rotated once for each cut of the knife.

The feed-spindle and shaft q are connected by sprocket-wheels s s', the chain for connecting which is indicated only by the dotted line s^2 in Fig. 10. One portion of this chain is also engaged with one side of a sprocket-wheel s^3 upon the trip-disk k, and operates to rotate the dog i at the desired rate, (once in each reciprocation of the knife,) while it also operates to rotate the feed-spindle at a much quicker rate, owing to the small diameter of the sprocket-wheel s.

The sprocket-wheel s' is fitted to turn loosely upon the shaft q, and is coupled therewith by means of the clutch l.

To obviate the necessity of the friction-clutch l slipping during the major part of the knife's stroke, I provide a clutch lever or levers l', having a roller l^2, pressed by a spring l^3 upon the surface of a cam k', formed upon the trip-wheel k. Such cam holds the clutch engaged while the knife-carriage is turning the end of its stroke, so as to actuate the feed at the desired time, and releases the clutch when the knife begins its cut.

It is immaterial whether the bolt h^2 be tripped by means of a rotating dog or by a reciprocating dog, as the latter would readily clear the trip j upon the return movement of the dog by pivoting the trip as shown in Fig. 10.

This part of my invention consists in tripping the bolt h^2 by a dog actuated in unison with the movements of the knife-carriage, so as to actuate the feed at the desired point in such movement.

Having thus set forth my invention, it will be seen that the feed-screws may be rotated positively through any given arc and locked in that position during the cutting movement of the knife, and that the knife may be reciprocated transversely in relation to the log in its passage through the wood and the wood straightened as it leaves the knife and discharged positively from the knife-carriage in a given path, so that it may be delivered from the machine uniformly at the same point.

The delivery-rolls a and b are applicable to any machine in which a presser is used adjacent to the knife and which is liable to pinch the end of the board and prevent it from falling from the carriage.

It is obvious that any element rotated with the feed-screw would operate as a locking-cam if provided with a suitable projection or notch to engage a movable latch or bolt, and the form of the locking-cam and bolt is therefore immaterial.

I do not make any claim to the use of a presser-roll adjacent to the edge of a knife, as such a combination is not my invention, nor to straightening-rolls upon a knife-carriage, except positively-rotated delivery-rolls be arranged upon the knife-carriage to draw the board from the grip of the presser-roll and knife and propel it through the straightening devices on the carriage.

I am aware that a stationary clamping device in the form of a hinged cam has been used to grip the board projected from the moving knife-carriage; but such cam would not move the board nor clear itself to receive another. I am not, however, aware that any positively-rotated rolls have ever been mounted upon the fixed frame like the rolls R′ and a discharge-channel provided on the reciprocating knife-carriage to guide the boards between the same.

It will be noticed that the rotary motion of the roll a and of the crank-shaft n is derived from the rolling contact of a wheel (upon the knife-carriage) with a stationary fixture upon the frame of the machine. Thus the toothed wheel d, rolling upon the rack d', induces a rotary motion in the roll a, and the grooved drum N′, rolling upon the stationary rope m, induces the rotary motion of the crank-pin o to reciprocate the knife e upon the knife-carriage. It is obvious that either of these mechanisms might be substituted for the other, and it is therefore immaterial what form of wheel be used upon the knife-carriage and what form of stationary fixture be used upon the frame to make a rolling contact therewith.

Having thus set forth my invention, what I claim herein is—

1. In a wood-slicing machine, the combination, with a knife-carriage reciprocated to cut intermittingly, of a reciprocating steam piston-rod attached directly to such carriage, a

knife-beam movable upon the carriage transverse to the piston-rod, and mechanism movable with the carriage for reciprocating the knife-beam, as and for the purpose set forth.

2. In a wood-slicing machine, the combination, with a knife-carriage reciprocated to cut intermittingly, of a reciprocating steam piston-rod attached directly to such carriage, an adjustable presser-roll sustained upon the carriage parallel with the edge of the knife, and mechanism movable with the carriage for reciprocating the knife-beam, as and for the purpose set forth.

3. In a wood-slicing machine, the combination, with a knife-carriage reciprocated to cut intermittingly, of a reciprocating steam piston-rod attached directly to such carriage, an adjustable presser-roll sustained upon the carriage transversely to the path of the carriage, a knife and knife-beam movable upon the carriage parallel with the presser-roll, and mechanism movable with the carriage for reciprocating the knife-beam, as and for the purpose set forth.

4. In a wood-slicing machine having a reciprocating knife-carriage with the edge of the knife in a vertical position, the combination, with a presser-roll upon the carriage sustained transversely to the path of the carriage, of a knife and knife-beam movable vertically parallel with the presser-roll, and a spring to counterbalance the weight of the knife-beam, substantially as herein set forth.

5. In a machine having a reciprocating knife-carriage, the combination, with the carriage, of a knife and knife-beam movable thereon and a rotating shaft journaled in bearings upon the knife-carriage and provided with a crank and connections to the knife-beam to reciprocate the latter, as and for the purpose set forth.

6. In a machine having a reciprocating knife-carriage movable upon a frame having parallel ways, the combination, with the carriage, of a knife and knife-beam movable thereon, a rotating shaft journaled in bearings upon the carriage, a crank upon the shaft, and connections to the knife-beam to reciprocate the same, and a wheel upon the shaft making a rolling contact with a stationary fixture upon the frame to rotate the crank, substantially as herein set forth.

7. In a wood-slicing machine, the combination, with the knife and an adjustable presser sustained adjacent to the same, of straightening rolls or devices upon the carriage and delivery-rolls *a* and *b*, rotated upon the carriage for drawing the board from the grip of the knife and presser and propelling it through the straightening devices, substantially as herein set forth.

8. In a wood-slicing machine, the combination, with the knife and an adjustable presser sustained adjacent to the same, of straightening rolls or devices upon the carriage and delivery-rolls *a* and *b*, arranged between the straightening devices and the edge of the knife and rotated upon the carriage for drawing the board from the grip of the knife and presser and propelling it through the straightening devices, substantially as herein set forth.

9. In a wood-slicing machine having a reciprocating knife-carriage, the combination, with the knife, of delivery-rolls mounted upon the knife-carriage for drawing the board from the knife, a discharge-channel to direct the board from the carriage in a given path, and a movable plate upon the knife-carriage adapted to throw the board from the carriage or into such discharge-channel, as and for the purpose set forth.

10. In a wood-slicing machine having a reciprocating knife-carriage, the combination, with the knife, of delivery-rolls mounted upon the knife-carriage for drawing the board from the knife, a discharge-channel to direct the board from the carriage in a given path, and rolls upon the frame adjacent to the carriage at the end of its stroke to draw the board from such discharge-channel by their rotation, substantially as herein set forth.

11. In a wood-slicing machine having a reciprocating knife-carriage, the combination, with the knife, of delivery-rolls mounted upon the knife-carriage for drawing the board from the knife, discharge mechanism, as the trough Q, to discharge the board from the carriage in a given path, and rolls upon the frame to take the board from such discharge mechanism, one or more of such rolls being segmental in form to clear the board in a given position and rotated an even number of times for each stroke of the knife, substantially as herein set forth.

12. In a wood-slicing machine, the combination, with the knife and the stay-log, of a feed-screw, a locking-cam rotated with the same and held in a fixed position during the cut of the knife, a bolt or latch for holding the same from rotating, and a dog operated to retract the bolt at each movement of the knife, substantially as herein set forth.

13. In a wood-slicing machine, the combination, with the knife and the stay-log, of a feed-screw, a feed-spindle adjacent to the same, change-wheels for connecting the screw and spindle, and a locking-cam rotated with the same and held in a fixed position during the cut of the knife, and a spring-bolt applied to the cam and actuated substantially as herein set forth.

14. In a wood-slicing machine, the combination, with the knife and the stay-log, of a feed-screw, a locking-cam rotated with the same, a bolt or latch for holding the same from rotating, a friction-clutch having one part rotated continuously, another part connected by suitable gearing with the locking-cam and operating to rotate the same when engaged, a clutch-lever for engaging the friction-clutch to drive the locking-cam, and

means, as the cam k', for actuating the clutch-lever once for each stroke of the knife, as and for the purpose set forth.

15. In a wood-slicing machine, the combination, with a reciprocating knife-carriage, of a knife, an adjustable presser sustained adjacent to the same, delivery-rolls upon the carriage for drawing the board from the grip of the knife and presser, and a wheel upon the carriage connected with such rolls and making a rolling contact with a stationary fixture upon the frame to rotate such rolls, substantially as herein set forth.

16. In a wood-slicing machine, the combination, with a reciprocating knife-carriage, of a knife, an adjustable presser sustained adjacent to the same, delivery-rolls upon the carriage for drawing the board from the grip of the knife and presser, a wheel upon the carriage making a rolling contact with a stationary fixture upon the frame, and a pawl-and-ratchet connection from such wheel to the delivery-rolls to actuate the same in one direction only, substantially as herein set forth.

17. In a wood-slicing machine, the combination, with a reciprocating knife-carriage, of a knife, an adjustable presser sustained adjacent to the same, delivery-rolls upon the carriage for drawing the board from the grip of the knife and presser, a toothed wheel upon the carriage meshing with a stationary rack upon the frame, and a pawl-and-ratchet connection from such wheel to the delivery-rolls to actuate the same in one direction only, substantially as herein set forth.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

THOMAS S. CRANE.

Witnesses:
L. LEE,
H. J. MILLER.