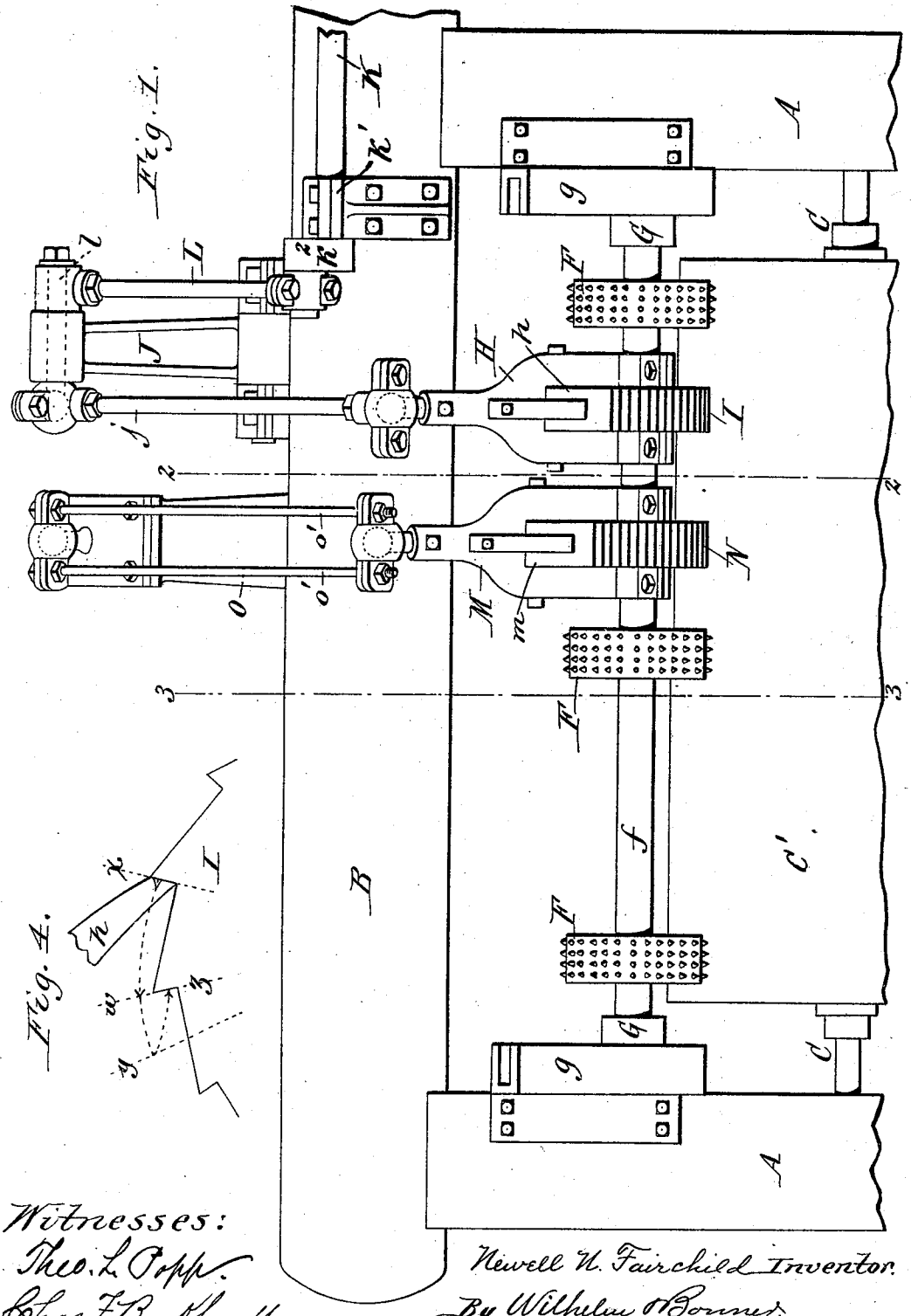
(No Model.) 3 Sheets—Sheet 1.

N. N. FAIRCHILD.

HOOP CUTTING MACHINE.

No. 568,435. Patented Sept. 29, 1896.



Witnesses:
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(No Model.) 3 Sheets—Sheet 2.

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Fig. 3.

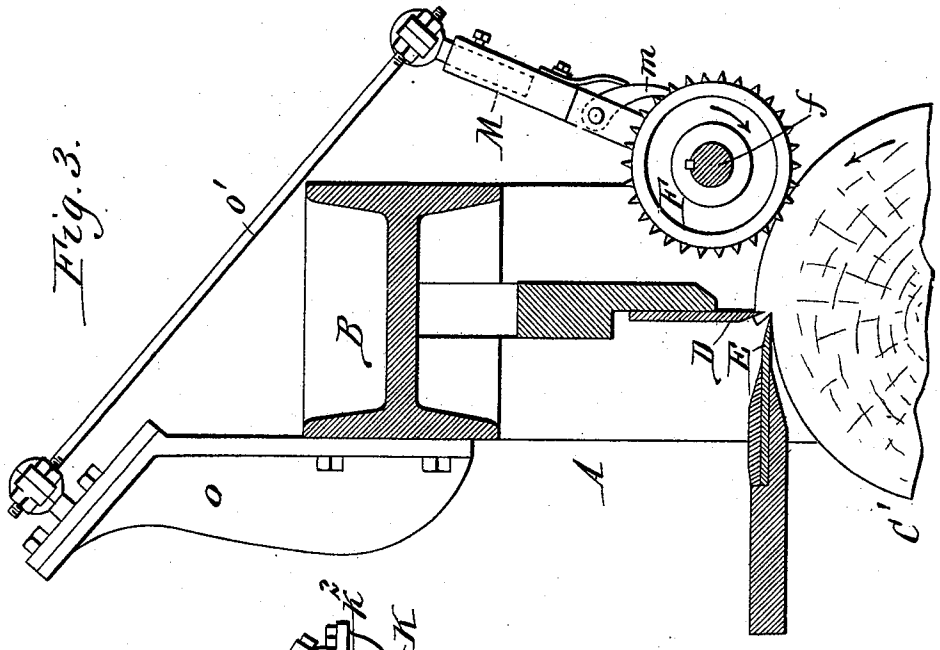
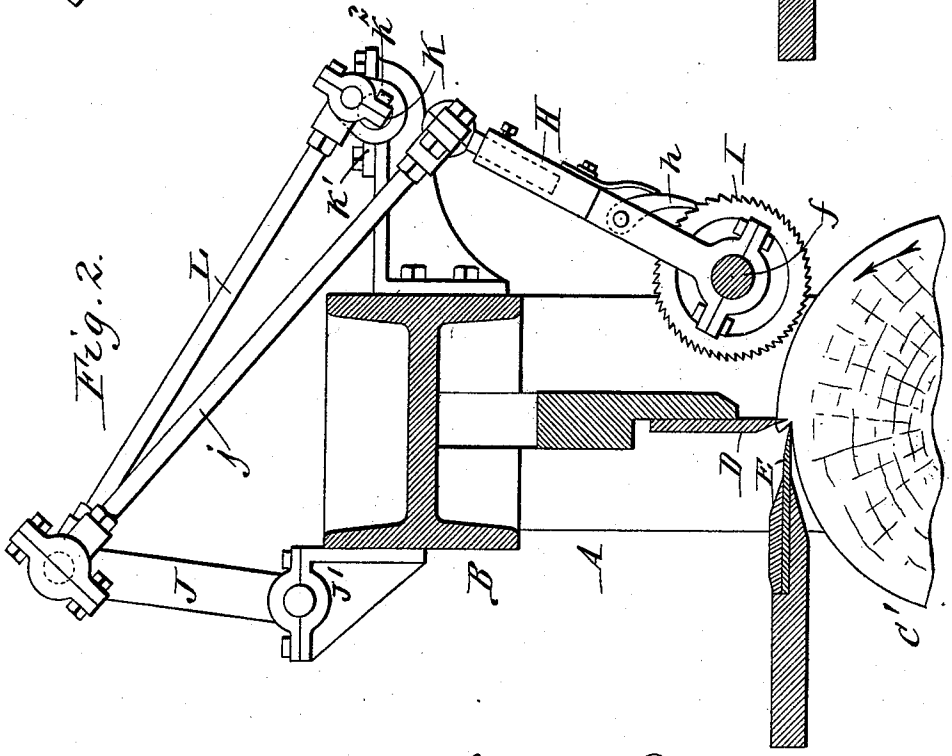


Fig. 2.



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N. N. FAIRCHILD.

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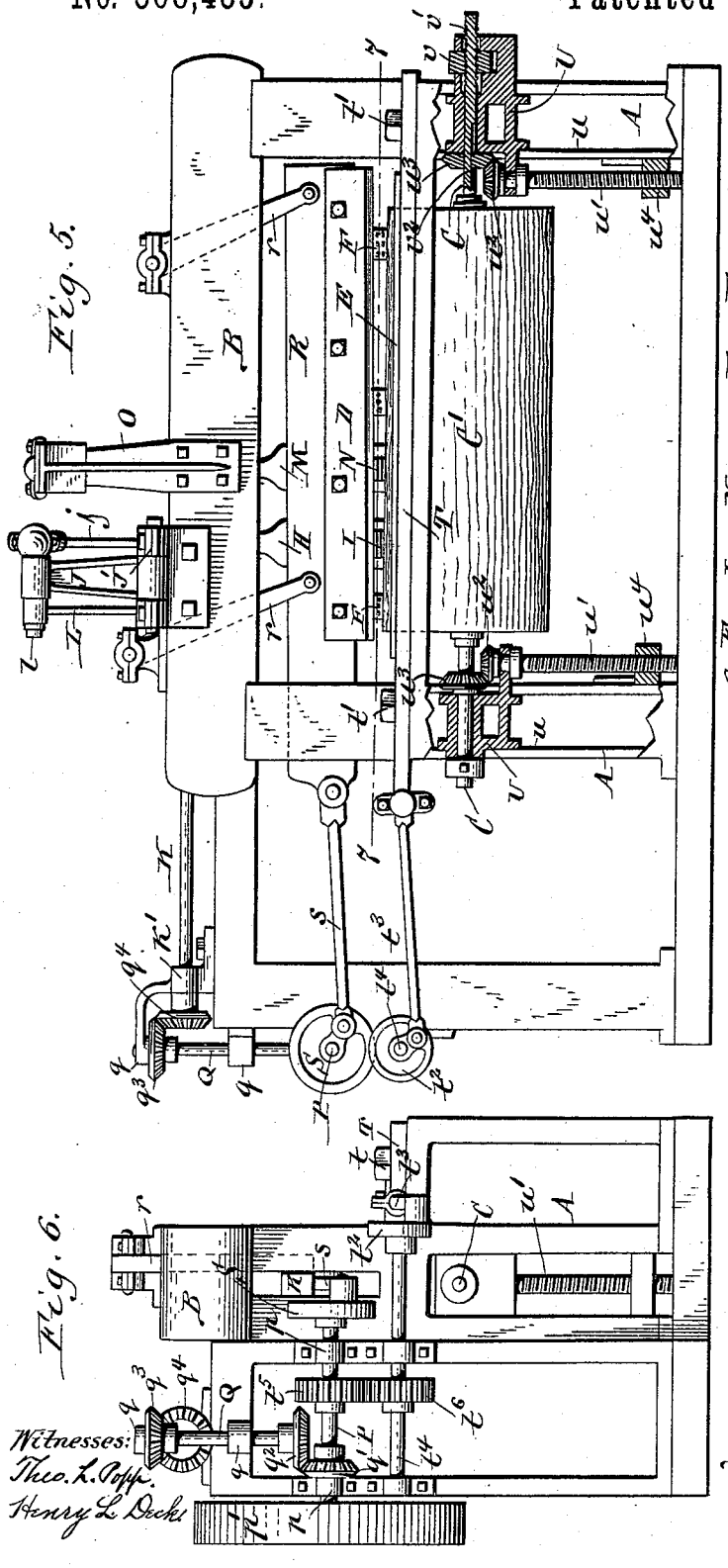

Fig. 5.

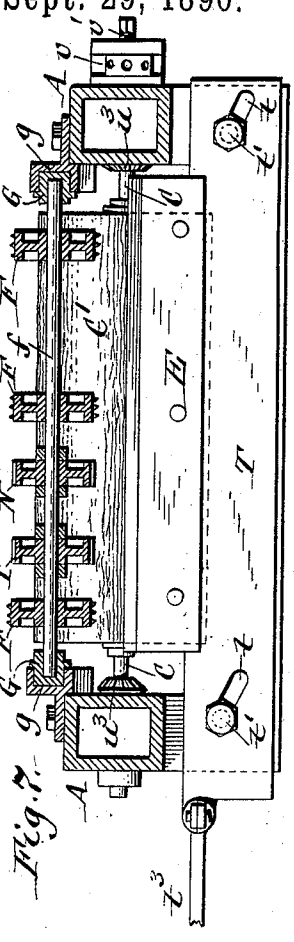

Fig. 7.

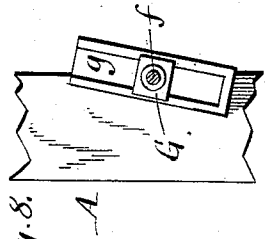

Fig. 8.

Fig. 6.

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UNITED STATES PATENT OFFICE.

NEWELL N. FAIRCHILD, OF WYANDOTTE, MICHIGAN, ASSIGNOR TO D. H. BURRELL & CO., OF LITTLE FALLS, NEW YORK.

HOOP-CUTTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 568,435, dated September 29, 1896.

Application filed October 16, 1894. Serial No. 526,021. (No model.)

To all whom it may concern:

Be it known that I, NEWELL N. FAIRCHILD, a citizen of the United States, residing at Wyandotte, in the county of Wayne and State of Michigan, have invented a new and useful Improvement in Hoop-Cutting Machines, of which the following is a specification.

This invention relates to the feed mechanism of that class of machines for cutting barrel-hoops from the surface of a log which contain reciprocating knives to which the log is fed by turning the log, the feed mechanism being provided with intermittently-moving feed-wheels which impinge against the surface of the log and so turn the same. In some machines of this character the feed-wheels have heretofore been intermittently rotated by a ratchet mechanism which was moved forwardly by a cam and backwardly by a spring, which was compressed during the forward movement of the cam. This construction is undesirable for several reasons—for instance, because the feed mechanism is liable to be operated irregularly by reason of lost motion, which results in the production of hoops of unequal thickness, and because considerable power is required for compressing the spring.

The object of my invention is to produce a feed mechanism for this class of machines which is free from these objectionable features and which is simple and compact in construction.

In the accompanying drawings, consisting of three sheets, Figure 1 is a fragmentary rear elevation of a hoop-cutting machine provided with my improved feed mechanism. Figs. 2 and 3 are vertical cross-sections in lines 2 2 and 3 3, Fig. 1, respectively. Fig. 4 is a diagram illustrating the movement of the feed-pawl with reference to the teeth of the feed-ratchet. Fig. 5 is a sectional front elevation, on a reduced scale, of a hoop-cutting machine provided with my improvements. Fig. 6 is an end elevation thereof. Fig. 7 is a horizontal section in line 7 7, Fig. 5. Fig. 8 is a fragmentary transverse section showing the manner of guiding the bearing of the vertically-movable feed-shaft.

Like letters of reference refer to like parts in the several figures.

A A represent the two uprights or standards of the main frame, and B the horizontal beam connecting the upper ends of the same.

C C represent the horizontal centering spindles or mandrels, which are capable of rotary and vertical movement in the standards, and which support the log C′ at its ends.

D represents the radially-moving knife, and E the tangentially-moving knife, whereby each hoop is severed from the log.

F represents the rotary feed-wheels, arranged in rear of the knives and provided with peripheral spurs which engage with the surface of the log and turn the same intermittently for feeding the log toward the knives in the direction of the arrow in Fig. 2. These feed-wheels are mounted on a feed-shaft *f*, which is arranged parallel with the log at a short distance above the upper rear portion thereof and journaled with its ends in sliding bearings G. The latter are guided in ways *g*, secured to the standards, and permit the feed-shaft and feed-wheels to descend toward the center of the log as its diameter is gradually reduced by cutting off hoops from its surface and also permit each end of the feed-shaft to rise and fall independently of the other as the feed-wheels adjust themselves to irregularities in the surface of the log.

H represents the feed-lever, pivoted with its lower end on the feed-shaft and provided with a pawl *h*, which engages with a ratchet-wheel I, secured to the feed-shaft.

J represents a rock-arm pivoted with its lower end in bearings J′, secured to the beam at the front thereof, and *j* is a connecting-rod connected at its ends by ball-and-socket joints with the upper ends of the feed-lever and rock-arm.

K represents the horizontal driving-shaft of the feed mechanism, journaled in bearings *k*′, arranged on the main frame in rear of the beam, and provided at its inner end with a crank k^2, by which the feed-lever is actuated. This crank is connected with the upper end of the rock-arm J by a connecting-rod L, which extends on one side of the rock-arm, while the connecting-rod *j* stands on the other side thereof, both being connected to the rock-arm by the same bolt or pin *l*.

The driving-shaft of the feed mechanism

makes the same number of revolutions which the main driving-shaft of the machine makes, by which the knives are actuated, and the rotary movement of the feed driving-shaft produces an oscillating movement of the feed-lever by the crank, rock-arm, and connecting-rods.

M represents a detent-arm mounted loosely with its lower end on the feed-shaft and provided with a detent-pawl *m*, which engages with a ratchet-wheel N, secured to the feed-shaft.

O is a bracket secured with its lower end to the top of the beam, and *o'* are connecting-rods which are connected at their ends by ball-and-socket joints with the upper ends of the detent-arm and the bracket. After the feed-shaft and feed-wheels have been turned forward by the feed-lever the shaft and feed-wheels are held against backward movement with said lever by the pawl of the detent-arm engaging with the detent ratchet-wheel. The feed-shaft and its feed-wheels tilt in adjusting themselves to any unevenness of the surface of the log. The ball-and-socket connection of the rods connecting the detent-arm with the bracket and the feed-lever with the rock-arm prevent these parts from becoming cramped when either end of the shaft moves up or down independently of the other.

The movement of the feed driving-shaft is so timed that it makes one complete revolution during one complete cycle of operations of the hoop-cutting machine. The cutting and feeding operations are performed by the machine in the usual way in such manner that the radial cut of the hoop is effected during the first third of the revolution of said shaft, the tangential cut during the next third of the revolution, and that during the last third of a revolution both the radial and tangential knives are out of engagement with the log, and the turning and feeding of the same are effected for bringing the log in position for cutting the next hoop.

In order to prevent the constantly-moving crank from turning the log during its period of rest, which covers about two-thirds of a revolution of the feed driving-shaft, the crank and connecting parts are so timed and proportioned that the pawl of the feed-lever is idle during the first and second thirds of the revolution of the driving-shaft and effective during the last third of a revolution. This is accomplished by giving the crank a throw sufficiently in excess of what is necessary to move the feed-pawl forward and backward one tooth of the feed ratchet-wheel to produce this result. During the time that the radial knife effects its cut the feed-pawl moves backward the extent of one tooth, or from *x* to *w* in Fig. 4. During the time that the tangential knife effects its cut the feed-pawl continues to travel backward over a portion of the next tooth, but not far enough to take into this tooth, from *w* to *y*, and then moves forward idle from *y* to *z*, when the tangential knife has cleared the log. The feed-pawl then strikes the tooth, and during the last portion of its forward movement, from *z* to *x*, remains in engagement with the tooth and turns the feed ratchet-wheel the extent of one tooth. In other words, while the feed driving-shaft is making the first and second thirds of its revolution the feed-pawl is making its entire backward movement and the idle portion of its forward movement, and during the third or last portion of the revolution of the feed driving-shaft the feed-pawl is active and turns the log.

The driving mechanism, whereby the cutters and the feed mechanism are operated at the proper time to produce the above-described result, may be of any suitable construction, the preferred means (shown in the drawings) being constructed as follows:

P represents the main driving-shaft, which is journaled transversely in bearings *p*, arranged at one end of the main frame, and provided at its rear end with a driving-pulley *p'*. Motion is transmitted from the main shaft to the feed-shaft K by an upright shaft Q, journaled in bearings *q* on the main frame and connected at its lower end with the main shaft by a pair of bevel gear-wheels q' q^2 and connected at its upper end with the feed-shaft by a pair of bevel gear-wheels q^3 q^4, as represented in Fig. 6.

The upper or radial knife D is secured to a supporting bar or plate R, which is supported by a pair of links *r*, pivoted with their lower ends to the bar R and journaled with their upper ends in bearings mounted on the beam B, as represented in Fig. 5. Upon moving the radial knife and its supporting-bar lengthwise its supporting-links carry the same toward and from the surface of the log for producing a radial shearing cut. This lengthwise movement of the radial knife is effected by means of a crank-disk S, secured to the front end of the main shaft and connected with the radial-knife-supporting bar by a connecting-rod *s*, as shown in Fig. 5.

The lower or tangential knife E is secured to a horizontal bar or plate T, which rests upon the main frame in front of the standards A A and which is guided in oblique ways, so that upon reciprocating the bar T lengthwise the lower knife will be moved toward and from the log for producing the tangential cut in the surface of the log. These oblique ways may be made in any suitable and well-known manner, a simple construction for this purpose consisting of oblique slots *t*, formed in the lower knife-supporting bar, and bolts *t'*, secured to the main frame and engaging with the slots of said bar, as shown in Fig. 7. The lengthwise-reciprocating movement of the lower knife-supporting bar is produced by a crank-disk t^2, connected by a rod t^3 with one end of said bar. This crank-disk is secured to the front end of a counter-shaft t^4, which is journaled lengthwise below the main shaft

in bearings on the main frame and which is driven from the main shaft by a pair of gear-wheels t^5 t^6.

The centering-spindles C are operated for centering the log and are automatically raised for carrying the log gradually toward the knives as the hoops are cut away from the surface thereof by the following mechanism: U represents vertically-movable carriages in which the spindles are journaled and which slide in vertical ways u, formed on the standards A. u' represents feed-screws whereby the carriages are raised and lowered. Each of these feed-screws is provided at its upper end with a bevel gear-wheel u^2, which meshes with a bevel gear-wheel u^3, secured to the adjacent spindle. The upper portion of each feed-screw is journaled in a bearing in the adjacent carriage, but compelled to move vertically therewith, while its lower externally-screw-threaded portion engages with a stationary screw-nut u^4, secured to the lower portion of the standard. Upon turning the log forwardly by means of the feed-wheels F for presenting a new portion of the log to the knives the rotation of its spindles is transmitted to the feed-screws by the bevel gear-wheels, which causes the feed-screws to work against the screw-nuts and lift the log, thereby causing the hoops to be cut off from the log in a spiral path from the outer side of the log toward the center thereof. One of the centering-spindles is capable of axial movement toward and from the other spindle for centering the log in any usual and well-known manner. As shown in Fig. 5, this adjustment is effected by an adjusting screw-nut v, arranged upon a screw-threaded portion v' of the adjustable spindle and held in the carriage against lengthwise movement with the spindle, so that upon turning the adjusting-screw the spindle will be moved lengthwise in the carriage. The bevel gear-wheel of the adjustable spindle is held against lengthwise movement therewith, but compelled to turn therewith, by a key or spline v^2, engaging with with a longitudinal groove in the adjustable spindle.

I claim as my invention—

1. In a hoop-cutting machine, the combination with a radial knife and a tangential knife and mechanism whereby said knives are caused to cut successively, of a feed-shaft provided with feed-wheels which impinge against the log and with a ratchet-wheel, a feed-lever provided with a pawl which engages with said ratchet-wheel, and a driving-crank connected with said feed-lever and imparting to the same a backward movement in excess of one tooth and a subsequent idle forward movement during the cutting periods of both knives and a forward feed movement during the period in which both knives are disengaged from the log, substantially as set forth.

2. In a hoop-cutting machine, the combination with the feed-shaft provided with feed-wheels which impinge against the log and with a ratchet-wheel, of a feed-lever mounted loosely on said shaft and provided with a pawl which engages with said ratchet-wheel, a driving-shaft arranged above said feed-shaft and parallel therewith, a crank mounted on said driving-shaft, a rock-arm arranged in rear of the feed and driving shafts, a connecting-rod extending from said driving-crank rearwardly to said rock-arm, and a connecting-rod extending from said rock-arm forwardly to said feed-lever, substantially as set forth.

Witness my hand this 4th day of October, 1894.

NEWELL N. FAIRCHILD.

Witnesses:
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G. W. MARTIN.