No. 620,533. Patented Feb. 28, 1899.

W. BARTH.

MACHINE FOR SHEARING RAILROAD TIES.

(Application filed Feb. 28, 1898.)

(No Model.) 5 Sheets—Sheet 1.

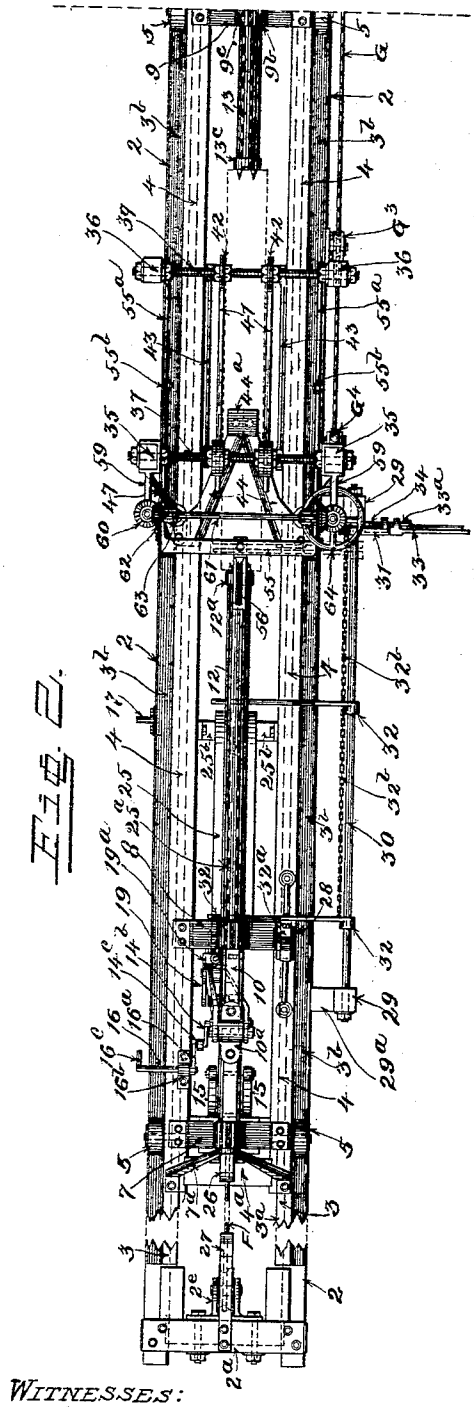


Fig. 2.

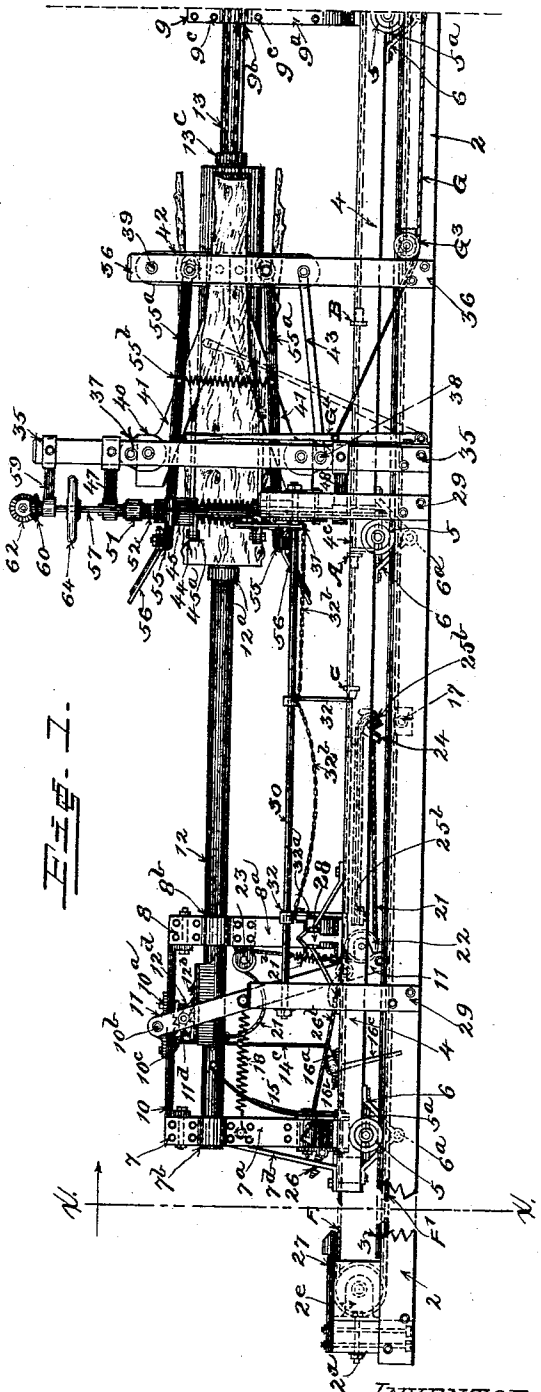


Fig. 1.

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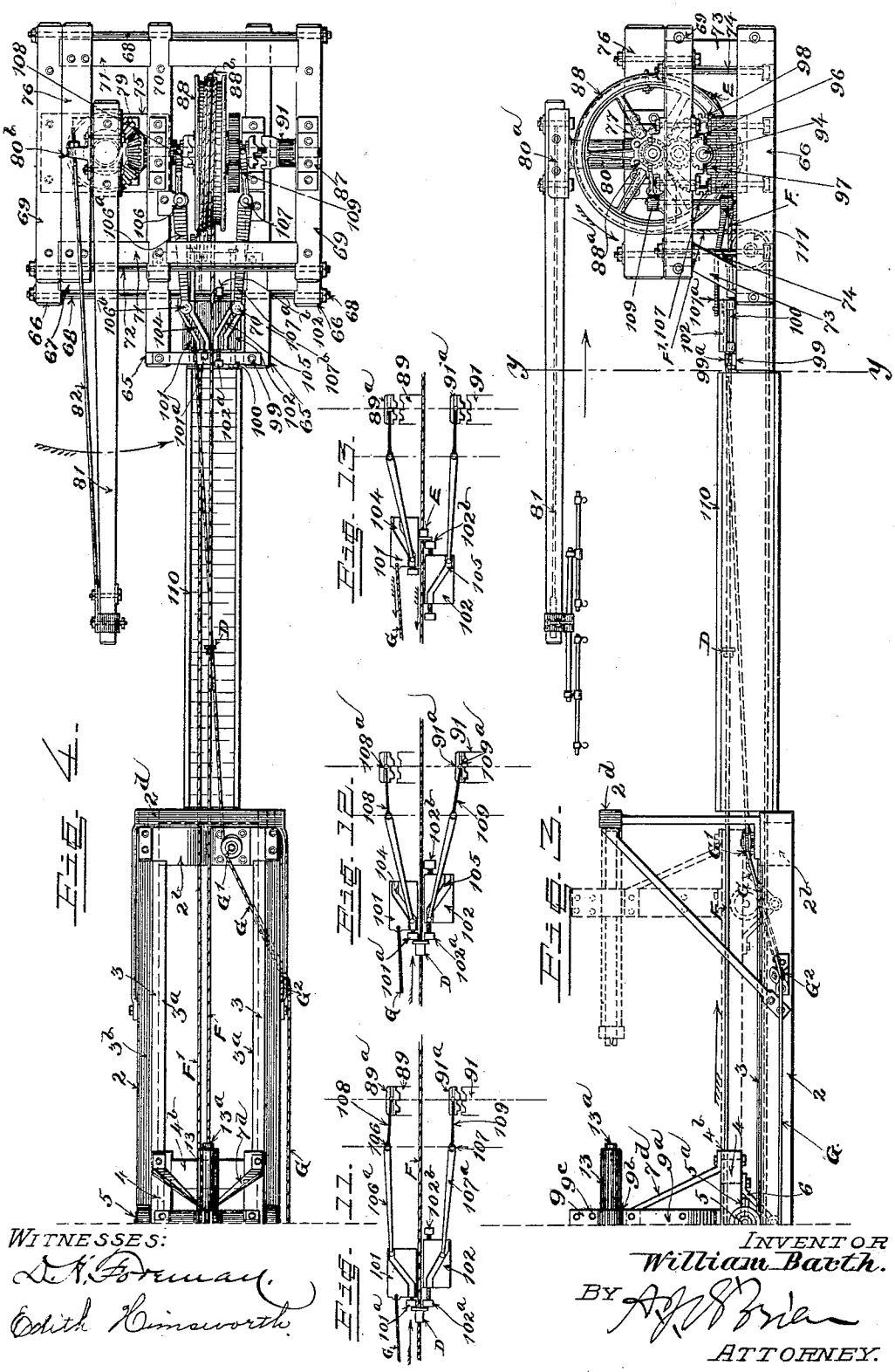
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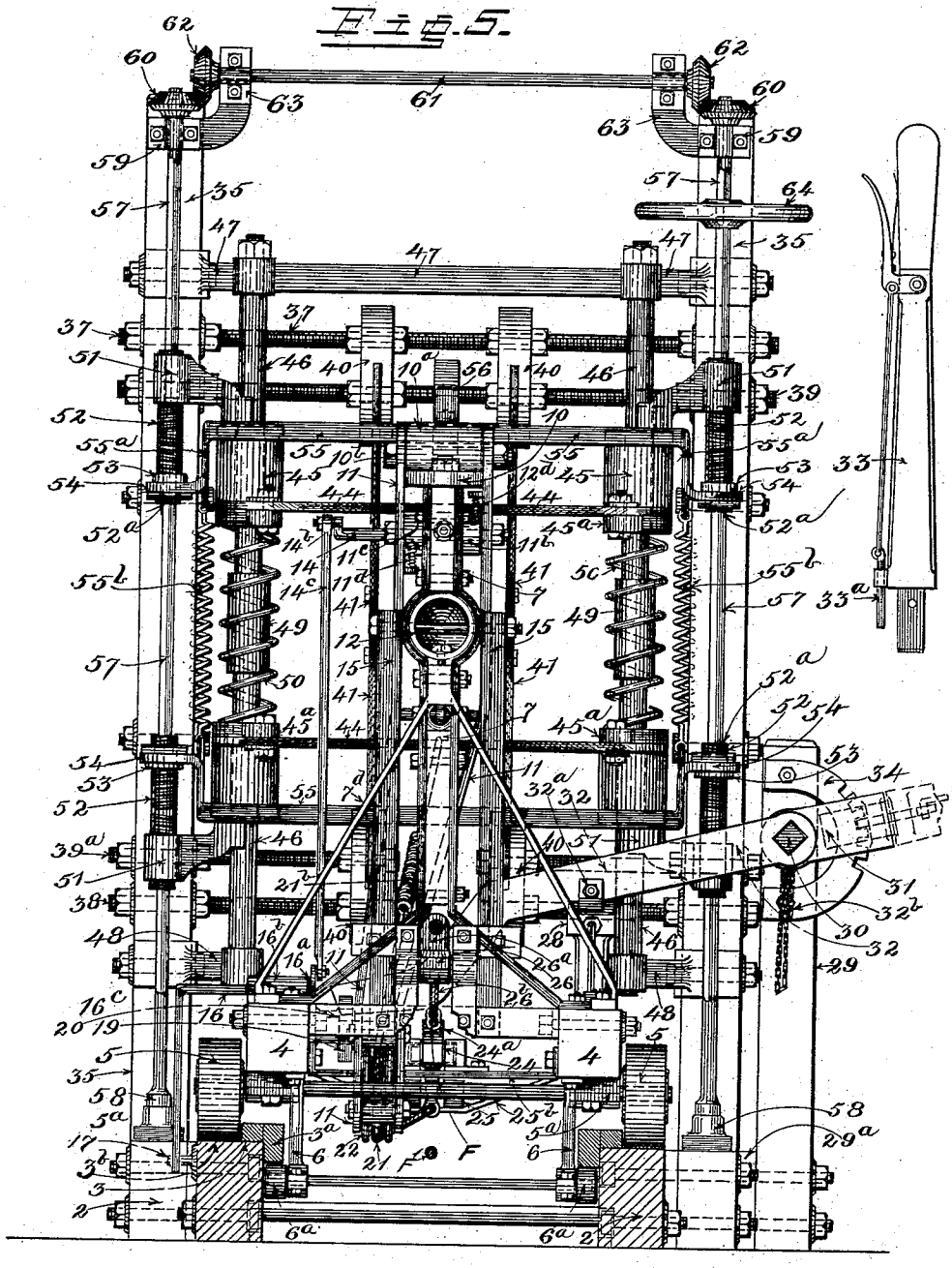
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Fig. 5.



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FIG. 7.

FIG. 5.

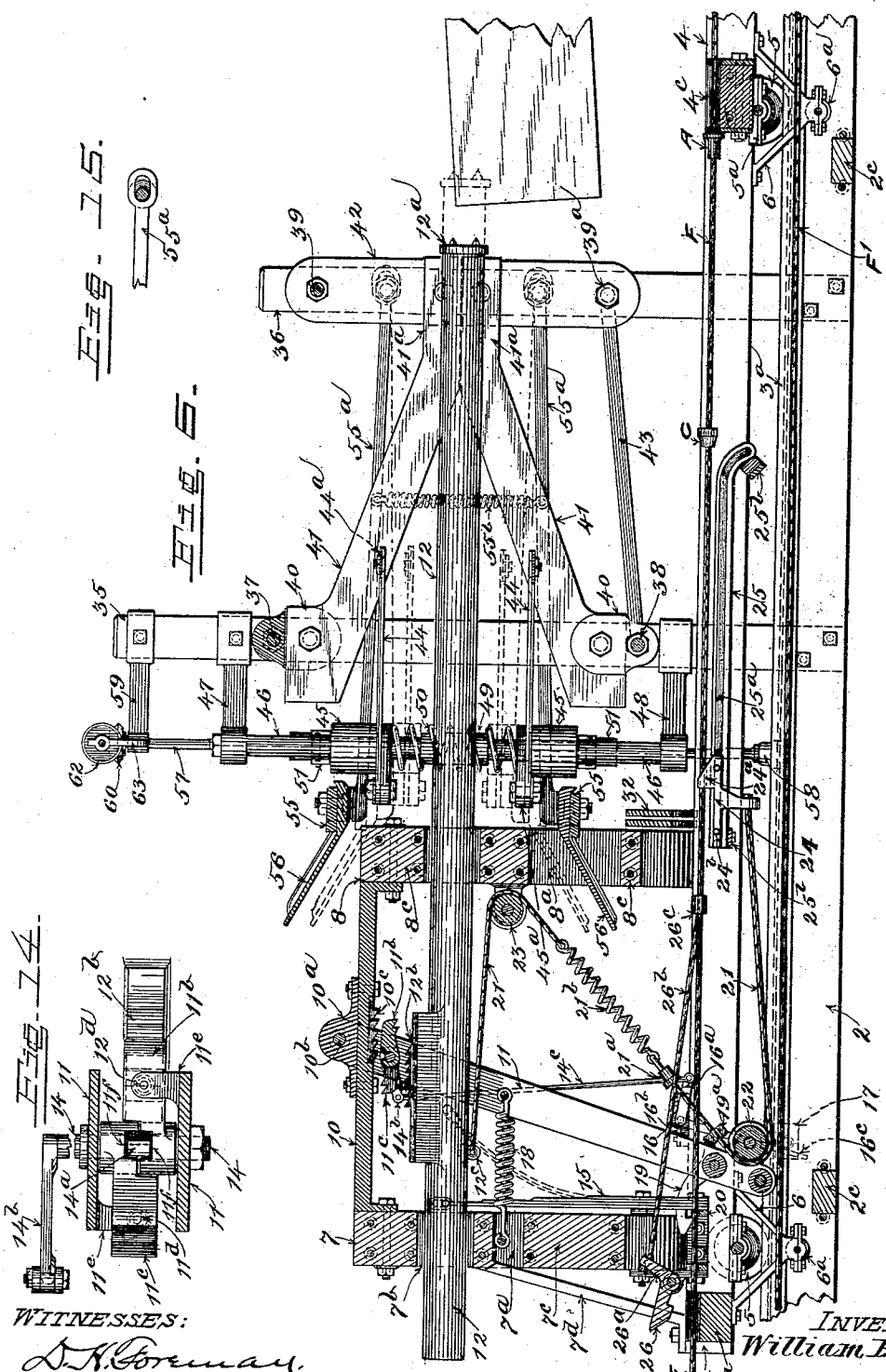


FIG. 7a.

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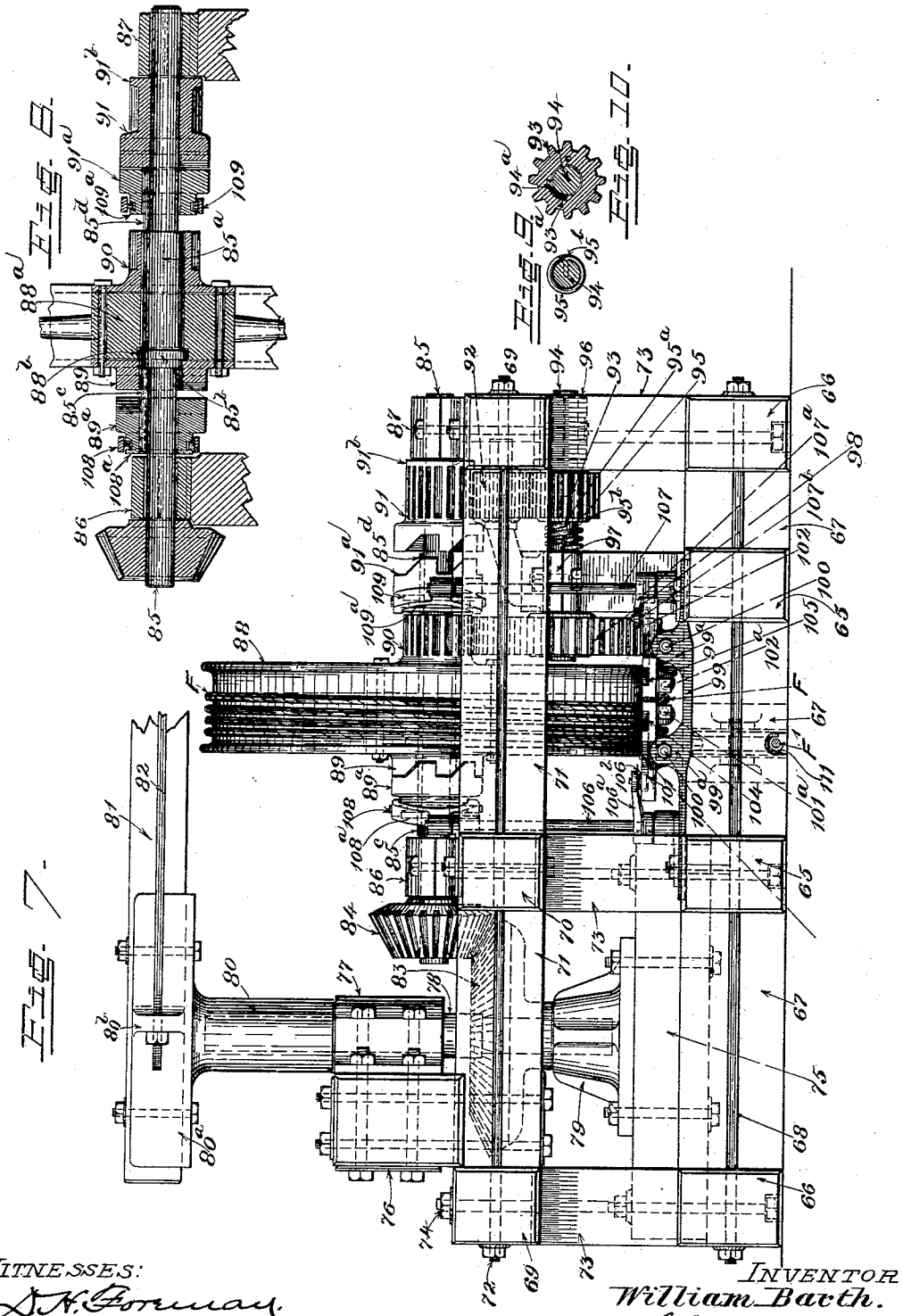


Fig. 8.

Fig. 10.

Fig. 7.

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UNITED STATES PATENT OFFICE.

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MACHINE FOR SHEARING RAILROAD-TIES.

SPECIFICATION forming part of Letters Patent No. 620,533, dated February 28, 1899.

Application filed February 28, 1898. Serial No. 671,958. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM BARTH, a citizen of the United States of America, residing at Gillett, in the county of El Paso and State of Colorado, have invented certain new and useful Improvements in Machines for Shearing Railway-Ties; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

My invention relates to a machine designed for shearing wooden railway-ties, it being well known that ties having sheared or hewn surfaces are more desirable than those formed by a saw, and consequently a more valuable commercial product.

The construction comprises, mainly, oblique or angular parallel side and adjustable top and bottom cutting-knives secured upon the main base of the machine, also a traveling timber carriage or carrier, whereby the rough logs are hewn and dressed upon four sides by one operation or excursion of the said movable timber-carriage upon a suitable track or guideway formed upon the main base.

The machine is designed to be operated by horse-power by the use of a suitable power or whin of novel construction especially designed for this purpose and forming a part of this invention.

Novel and original features of construction are embodied in the automatic clamping-lever by which the timber is securely clamped and held in position during shearing operation, the spring-retained knife-guides providing for irregularities in size and shape of timbers and facilitating the proper feed of the cutting-knives; also, a reverse mechanism on the horse-power, whereby the rapid return of the moving timber-carriage is effected automatically.

My invention also possesses the portable feature in construction, affording greater practical utility, being so arranged that it can be readily transported upon a suitable carriage by horses to remote timber districts and quickly set up for operation.

In the description reference is to be had to the accompanying drawings, which form a part hereof, and in which—

Figure 1 is a side elevation of a portion of the base with the cutting-knives, also a portion of the traveling timber-carriage. In this figure a log is shown in half-hewn position. Fig. 2 is a plan view of the same. Fig. 3 is an extension of Fig. 1, showing in side elevation the remaining portion of the base of the main machine, also of the timber-carriage. A side elevation of the horse-power or whin is also shown in this figure. Fig. 4 is a plan view of the portion of the machine shown in side elevation in Fig. 3. It will be observed that Figs. 1 and 3, though separated, form in reality a single view. This is also true of Figs. 2 and 4. Fig. 5 is an end elevation of the machine, cutting the base in section on line x x, Fig. 1, and drawn to an enlarged scale. Fig. 6 is a longitudinal sectional elevation of a portion of the timber-carriage and the base, with the cutting-knives, drawn also to an enlarged scale, the section being taken principally upon a vertical plane passed through the center of the machine and showing the parts in the position wherein the completely-hewn tie is being automatically discharged from the clamping-bars. Fig. 7 is a front elevation of the horse-power, taken on the line y y, Fig. 3, drawn to an enlarged scale and showing the sweep-arm swung around over the machine. Fig. 8 is a detail view, in longitudinal section, taken upon the main power-shaft, showing the adjacent gears, boxes, clutches, and cable-drum hub. Fig. 9 illustrates a reverse-action compensating spring interposed in the gear-train of power. Fig. 10 is a section of a portion of the gear-train. Figs. 11, 12, and 13 illustrate in outline the different relative positions of the power-reversing trips or cams. Fig. 14 is a detail view of the latch-pawls of the clamping-lever. Fig. 15 illustrates a detail of construction.

Similar reference characters indicating corresponding parts in the views, let the numeral 2 designate the side pieces of the main base of the machine, being a rectangular timber structure, with said side pieces securely connected at the ends by a rear cross-timber 2^a

and a front cross-timber 2^b with adjoining tie-rods and intermediate cross-braces 2^c. Spiked to the top inner corners of the base-timbers 2 are square timber runners 3 and 3^a, which form the guides or flanges of a track-way for the wheels of the moving timber carrier or carriage. This carrier is also a rectangular frame structure, but of smaller dimensions than the main base. It is constructed of side pieces 4 4, framed upon the ends, with rear cross-heads 4^a and front cross-heads 4^b and an intermediate cross brace or timber 4^c. This carrier structure is mounted upon a number of wheels 5, suitably secured in boxes 5^a, bolted to the under side of the side frames 4 4. The gage of these wheel-carriers is made to conform to the track formed by the flange-pieces 3 3 upon the main base. Iron straps 3^b 3^b are spiked upon the top of the main base timbers, adjoining the flange-guides 3, which form the tread of the carrier-wheels 5. Adjoining the main carrier-wheels and journaled into suspended brackets 6, which are bolted to the under side of the carrier-timbers 4, are a number of interlocking wheels or rollers 6^a, which take bearing upon and run against the under side of the flange-piece 3^a, being disposed of and traveling in the space between the side timbers of the main frame 2 2, as shown in Fig. 5. The function of these locking-rollers is to prevent the moving timber-carriage being raised or displaced when traveling upon the track in the operation of shearing a tie.

Bolted upon the carrier-frame at suitable places are a number of upright posts or standards 7, 8, and 9. These standards are constructed in detail of two flat bars of iron 7^a, 8^a, and 9^a, each of which is flared out at the base in opposite directions, as shown in Figs. 2 and 5, and the lower ends thereof bolted securely to the top of the carrier-frames 4 4. Near the tops of these respective standards the iron side plates are curved outward, forming between them circular openings 7^b, 8^b, and 9^b, in which openings are mounted the tubular tie-clamping bars 12 and 13, as will be described farther on. Wooden fillets 7^c, 8^c, and 9^c are interposed between these standard-plates, as shown in Figs. 5 and 6. Supporting iron braces 9^d and 7^d are bolted to the respective standards 9 and 7 and the frame-timbers 4, as shown. Between the standards 7 and 8 and bolted to the top of each extends a longitudinal truss-iron 10. Midway between the standards a box 10^a is secured to this truss-iron. This box forms the bearing for a suspended swinging tie-clamping lever, constructed of two bars of iron 11 11, (see Figs. 2 and 5,) suspended from either side box 10^a and fulcrumed upon the bolt 10^b. Fitted into the circular openings 7^b and 8^b of the standards 7 and 8 is a tubular timber-clamping bar 12, designed to have free longitudinal sliding movement in the same, but rigidly supported as against any traverse or vertical side movement. To the opposite or forward end of the timber-carriage is fitted into the standard 9 a similar opposing tubular timber-clamping bar 13. This bar is designed to be securely fastened within the standard 9 against any movement whatever by adjacent clamping-bolts 9^c, it being clamped into the same in a position depending upon the length of the tie being sheared. Within the tubular timber-clamping bar 13 is fitted a smaller tubular discharge-bar 13^a (see Figs. 3 and 4) of somewhat greater length than the outer clamping-bar and adapted to slide freely in the same, the function of this device being to discharge the sheared tie by the protruding end of the bar coming in contact with the main-frame buffer-bar 2^d.

The engaging ends of the clamping-bars 12 and 13 are fitted, respectively, with toothed caps or heads 12^a and 13^a for securely engaging the ends of the timber when clamped between them. The timber is clamped by the forward sliding movement of the rear bar 12. This is effected automatically by horse-power by the clamping-lever 11. Bolted to the front base of the rear standard 7 is a pair of disengaging-springs 15 15, (see Figs. 1, 2, and 5,) the free upper ends of which engage upon either side by a traverse bolt the rear end of the sliding clamp-bar 12. The function of these springs is to slide or retain this clamping-bar into the disengaged position shown in Fig. 6. Upon the rear end of the clamping-bar 12 is secured a toothed rack 12^b. Upon the under side of the truss-iron 10, midway from the ends, is secured a toothed rack 10^c. Between the side bars 11 11 of the clamping-lever and directly beneath the toothed rack 10^c is a locking-pawl 11^c, designed to engage the same and lock the clamping-lever 11 into the position shown in Fig. 1. Adjoining the pawl 11^c is a locking-pawl 11^b, oppositely disposed, designed to engage the toothed rack 12^b, and thereby securely lock and retain the clamping-bar 12 in the position shown in Fig. 1. These pawls interlock with their respective racks independently of each other, being actuated by individual springs 11^d and 12^d, (see Figs. 1 and 14,) which springs are supported upon brackets 11^e, suitably formed upon the side of the clamping-lever 11. The pawls are designed, however, to be disengaged simultaneously by tripping devices which actuate the shaft 14, (see Fig. 14,) upon which they are supported. Into each of the adjoining faces of the hubs of these pawls is formed an elongated circular slot or stud seat 11^f 11^f. Within this slot a disengaging-stud 14^a protrudes from the shaft 14 and banks against one side of the elongated slots 11^f 11^f in such a way that a partial rotation of the shaft 14 by the suitable tripping devices throws both pawls out of engagement with their respective racks.

Upon the end of the shaft 14 is formed a crank-arm 14^b, to the end of which is bolted a connecting-rod 14^c, which rod is bolted upon the opposite end to the crank-arm 16^a of a rock-

shaft 16. This rock-shaft is journaled in a box 16^b, secured upon the side frame 4 of the carriage. This rock-shaft extends transversely beyond the plane of the moving carriage and main-frame structures. (See Figs. 2 and 5.) Its outer end is bent downward at right angles, forming a depending crank-arm 16^c, designed to hang within the plane of an interfering stud or trip 17, suitably located upon the side of the main-frame base-timber 2. This construction constitutes the tripping device, by means of which the clamping-lever pawls 11^c and 11^b are disengaged from their respective toothed racks.

A retaining-spring 18, fastened upon one end to the post 7 and upon the opposite end midway between the side arms 11 11 of the clamping-lever, is designed to throw this lever into the position shown in Fig. 6 when released from the forward locked position shown in Fig. 1. Constructive requirements necessitate the bending of the downward-extending ends of this clamping-lever 11, which is centrally supported to one side of the central line of construction, as is clearly shown in Figs. 2 and 5. Onto the outer side of the downward-extending end of the lever 11 is fitted a hooked latch 19, designed to engage a cross-bar 20 of the main carriage-frame, and thereby securely retain the lever in the position shown in Fig. 6. The opposite end of this hooked latch terminates in a trip-arm 19^a, disposed in the plane of travel of a disengaging-cone 21^a, adjustably clamped upon the cable 21.

Fitted between the ends of the lever 11, adjoining the trip-arm 19^a, is a grooved pulley 22, around which the cable 21 passes. The upper end of this cable 21 is fastened to an eyebolt 12^c upon the rear under side of the timber-clamping bar 12. From this fastening the cable is passed forward (see Fig. 6) over and around a grooved pulley 23, bracketed to the rear side of the standard 8 immediately beneath the clamp-column opening 8^b. Embodied within this cable 21 is a compensating spring 21^b. Passing around and under the grooved pulley 22 the opposite end of this cable 21 is at a suitable distance fastened to a traveling automatic drop-off trip 24.

An upwardly-extending forked lug 24^a (see Fig. 5) upon the trip-head 24 is designed to engage the cone C, (see Fig. 6,) clamped upon the main traveling cable F. Upon the sides of this trip-head are roller-studs 24^b, which travel in grooves 25^a, formed upon the adjoining edges of the two guide-bars 25. (See Figs. 2 and 6.) These guide-bars are centrally located and securely bolted to suitable cross-bars 25^b between the main-frame timber 44 of the moving carrier-frame. The extreme forward ends of the guides are curved downwardly below the normal plane of engagement between the trip-head lug 24^a and cone C. With the trip-head carried into this position its disengagement from the cone is automatically effected, as shown in broken lines in Fig. 1.

Bolted to a suitable cross-head upon the rear side and to the base of the standard 7 are boxes carrying a rocking hook or latch 26, the function of which device is to securely fasten the moving carriage to the main base-frame when occupying the extreme rear position upon the trackway by the interlocking of the said latch with a fixed hook 27, securely bolted to the rear cross-head 2^a of the main frame. (See Fig. 1.) The latch 26 is formed with an angular arm 26^a, (see Fig. 6,) into which is fastened a disengaging-cable 26^b, the other end of which is clamped to the main traveling cable F by a clamp-block 26^c.

Bolted to the side timber 4 of the moving carriage is a standard 28. (See Figs. 1, 2, and 5.)

Having described the carriage or moving structure, the coöperating mechanism mounted upon the stationary base will not be set forth in detail.

Two posts 29 29 (see also Figs. 1, 2, and 5) are bolted to a main-frame timber 2 at a proper fixed distance therefrom by intermediate blockings 29^a 29^a. Into the top of these posts is fitted a squared rod 30, which has partial rotary movement therein, and is disposed in a line parallel to the carriage-track. Adjoining the forward post and upon the forward end of the squared rod 30 is fixed a lever-socket 31. Two timber cradle-irons 32, formed with V-shaped ends and fitted with square holes to conform to the rod 30, (see Fig. 5,) and thereby be rotated therewith, but designed to slide freely thereupon, are carried over the side frame 4 of the moving carriage far enough to bring the V-shaped timber-holding ends into a vertical plane upon the center of the tie-clamping bars. To one of the cradle-irons is bolted a spring-latch carrier 32^a, placed directly in the plane of the standard 28. (See Fig. 2.) This latch is designed to engage or disengage automatically the sloping top of the standard 28 when the same is being carried by the moving carriage in either direction. The cradle-irons are disposed upon the rod 30 by the rearward travel of the standard 28 by disengaging-chains 32^b, the forward end of which is fastened to the fixed lever-socket and at suitable distances connected with the respective cradle-irons. A detachable latch-lever 33 fits the socket 31, adjoining which and secured to the post 29 is a notched sector 34, designed to be engaged by the spring-latch 33^a. This construction is designed to facilitate the proper centering of timbers of varying dimensions between the clamping-bars 12 and 13.

Bolted to the outside of the main-frame timbers are the four posts 35 35 36 36. These constitute the supports of the combined construction forming the cutter-head, which will now be described in detail.

Extending entirely across the construction

from post to post are three main supporting-rods 37, 38, and 39. These rods are threaded throughout their entire length and secured to the posts with both inside and outside nuts, as shown. Onto each of the rods 37 and 38 are fitted two iron knife-supporting blocks 40, designed to be firmly secured by locking-nuts on each side thereof, as shown. The free ends of these blocks are drilled and slotted, as shown, into which slots are firmly bolted the diverging ends of the inclined side shearing-knives 41 41. The opposite or converging ends of each pair of these knives terminate in an extended shank 41^a, (see Fig. 6,) which is drilled and firmly secured by flush-bolts to the upright yoke-irons 42 42. The object in securing the side knives to the slotted blocks and yoke-irons, as shown, instead of bolting them directly onto the supporting-rods is to facilitate their temporary removal from the machine for resharpening. The upper end of the yoke-irons 42 are secured upon the threaded supporting-rod 39 with lock-nuts. (See Fig. 2.) The lower supporting-rods 39, attached to the post 36, do not extend entirely across the construction, but terminate immediately inside of the yoke-piece 42, as shown at 39^a, (see Fig. 6,) the object being to allow the clamping-bar standard 9 to pass up between the yokes and side knives when the carriage is carried to the extreme rear timber-loading position upon the main base-track. Greater stability is afforded the lower arms of the yoke 42 and the short rods 39^a by the tie-bars 43, carried forward to the supporting-rod 38.

By shifting the respective locking-nuts on the several supporting-bars it will be seen that the side knives can be set to any desired distance apart, depending upon the sectional dimensions of the tie being sheared. These side shearing-knives of the machine are designed in shearing the timber to form the top and bottom faces of a tie, which to meet the requirements of practice are of a given or standard distance apart. Hence it will be understood that these knives need only be shifted when necessary to conform to some standard or specific dimensions of a particular tie contract. With the top and bottom shearing-knives of the machine, however, the proposition is different. These knives are designed to shear and form the sides of a tie, which in practice is not of specific dimensions, but is dependent upon the natural dimensions of the timber being sheared. The construction is designed, therefore, by guides and yielding spring devices to automatically conform to the varying dimensions and irregularities of the timbers. By reference to Figs. 1, 2, and 6 it will be seen that these top and bottom shearing-knives 44 44 are inclined at opposite angles from a central line, the rearward or diverging ends being bolted to an extending arm 45^a of a supporting collar or box 45, the opposite ends being bolted together by a yoke 44^a. (See Fig. 2.) The boxes 45 are fitted to slide freely upon the upright guides or posts 46, (see Fig. 5,) which are secured to and supported by the main-frame posts by the upper bracket-iron 47 and the lower bracket-irons 48 48. Upon the center of each guide-post is formed integral therewith a shoulder or collar 49. An expanding-spring 50 is mounted upon each upright guide adjoining the shoulder 49 and takes end bearing directly upon the adjacent ends of the upper and lower boxes 45, tending at all times to force the upper and lower knives apart. This movement, however, is limited by the outer sides of the boxes 45 coming into contact with the projecting arms 51, (see Figs. 1 and 5,) which are formed with semicircular ends, conforming to the shape of the upright guides 46, against which they also slide freely. The opposite or outer ends of these arms 51 are fitted to one of the ends of an elongated right and left hand threaded screw-collar 52. To the opposite end of this elongated screw-collar and upon the reverse thread thereof is fitted a nut 53, which is swiveled in the arms 54 of the guide-shoe-supporting bar 55. These upper and lower supporting-bars 55 are formed somewhat like the letter **U**, (see Fig. 2,) the central portions thereof passing from side to side across the entire construction above and below the forward ends of the respective upper and lower knives. (See Figs. 1 and 6.) To the center of each of these upper and lower cross-bars 55 is bolted an angular guide-shoe 56, while the ends of the branching sides 55^a are bolted to the posts 36, upon which they are designed to take pivotal bearing. Midway between the bearings and cross-bar the upper and lower side bars 55^a are connected by a contracting-spring 55^b of a greater initial elastic power than the knife-expanding springs 50, hereinabove described. With the guide-shoes unobstructed by a timber these contracting-springs 55^b force the upper and lower knives together in direct opposition to the expanding-springs 50, and are limited in their range by the inner ends of the knife-supporting collars 45 banking against the ends of the enlarged central portion 49 of the supporting-guide parts 46, the several parts thus occupying a normal position, (shown by the dotted lines in Fig. 6,) which position is the minimum distance between the knives to which they can shear the sides of a tie. The maximum distance being limited to the length of the upright guide-posts 46, the distance to which the upper and lower constructions can be expanded is governed by the dimensions of the timber and point of contact with the guide-shoes 56. Thus it will be seen that when the guide-shoes 56, together with the projecting arms 51, are forced apart by the entering timber removing the resistance of the arms 51 from the knife-boxes 45 the springs 50 will force the upper and lower knives apart to a distance limited by the boxes again coming in contact with the arms 51 and guide the knives into the timber at a

depth equal to the distance between the heel of the guide-shoe 56 and the cutting edge 44. The object in giving elastic support and outward adjustment to the knives 44 44 by the spring 50, as hereinabove described, and in not connecting them directly to the cross-bars 55 of the guide-shoes 56 is this: Immediately after the knives have entered the timber or at any time during the shearing operation either or both of the guide-shoes may ride over a knot or other irregularity in the timber, throwing them greatly out of line. This displacement will not affect the shearing-knives, now implanted between the tie and slab, and will only result in the arms 51 sliding idly upon the upright guide-post 46.

With the varying dimensions of the timber it is desirable to vary in proportion the depth at which the top and bottom knives 44 shall cut—in other words, the thickness of the slab and area of the sheared side face of the tie. This is effected by varying the distance between the heel of the guide-shoe 56 and the cutting edge of the knives 44 by turning the elongated reverse-threaded screw-collar 52, (see Figs. 1, 2, and 5,) which will carry the nuts 53, supporting the guide-shoe bar 55, and the projecting arms 51, governing the knife-boxes 45, to or from the center of the elongated screw, depending upon the direction of rotation. Square holes 52ª are formed in the elongated screw-collar 52, adapting them to be fitted upon upright square iron shafts 57 57, upon which they slide freely up and down. It is evident these screw collars and shafts rotate together in either direction. The lower ends of the shafts 57 are fitted into base-blocks 58, secured upon the main-frame base-timbers, their upper extremities being journaled in supporting bracket-irons 59 upon the posts 35. To the upper end of each shaft is keyed a miter gear-wheel 60, (see Fig. 5,) and the ends of the shafts 51 are connected by a counter-shaft 61, crossing overhead, upon the ends of which are fitted miter-gears 62, that mesh with the respective gears 60. This counter-shaft is supported in bracket-boxes 63 63, projecting inwardly from the bracket-irons 59. A hand-wheel 64 is keyed upon one of the shafts 57 at any convenient place, by the rotation of which through the train of shafting the several parts of the construction can be operated for adjustment, as hereinabove described.

To the extreme right of the shearing-machine base-frame and on a line therewith is located the horse-power or whin, (see Figs. 3, 4, and 7,) specially designed with an automatic reverse and quick-return action to facilitate the operations of the shearing-machine. The machine is built upon a wood framing comprising the main-base central timbers 65 65 with end base-timbers 66 66, framed together by yoke-pieces 67 67 and tie-rods 68. Above the base-frame is built a staging comprising the end timbers 69 69 and a central timber 70, these timbers likewise being framed with yoke-pieces 71 and tie-rods 72. This staging is supported upon a number of timber standards 73 73, and the base end stage-framings are securely tied together by the upright tie-rods 74 74. A base-timber 75 is let in upon and securely bolted to the center of the timbers 65 and 66. Also a cross-timber 76 is let in upon and bolted to the stage-yokes 71 71. To the center of this cross-timber is bolted a box 77, within which is fitted an upright gear-shaft 78, the lower end of which fits into a cast-iron step 79, which is bolted to the base-timber 75. To the top of the shaft 78, adjoining the box 77, is keyed the sweep-head 80, into the jaws 80ª of which is fitted the horse sweep or lever 81. A truss-rod 82, bolted to the outer end of the sweep, is anchored to the lug 80ᵇ of the sweep-head. Upon the lower end of the upright shaft 78, adjoining the step 79, is keyed the bevel-gear main wheel 83. This wheel meshes with a bevel-pinion 84, keyed to the end of the drum-shaft 85. This shaft is constructed with an enlarged central portion 85ª, (see Fig. 8,) and a fixed collar 85ᵇ is shrunk thereon and made integral therewith. The ends of the shaft 85 take bearing in the boxes 86 and 87, bolted, respectively, to the upper side of the stage-timbers 70 and 69. The hub of the cable-drum 88ª, which is of the usual construction, is designed to fit freely upon the enlarged portion 85ª of the shaft 85. A seat 88ᵇ is turned out of the side of the hub adjoining the collar 85ᵇ, designed to fit over and turn freely upon the same. To the side of the drum-hub adjoining the collar 85ᵇ is bolted the fixed jaw of a clutch 89, the central opening of which is made to conform to the enlarged portion 85ª of the shaft. By the same bolts and to the opposite side of the drum-hub is bolted a gear-pinion 90, which is likewise bored to fit freely the enlarged portion of the shaft. The clutch member and pinion being securely bolted to the drum-hub form therewith an integral part and lock the construction upon the collar 85ᵇ against any sliding movement thereof upon the shaft, but permitting free rotary movement thereon. Upon the reduced portion of the shaft 85, between the box 86 and the adjoining end of the enlarged portion 85ª, is formed a feather 85ᶜ, onto which is fitted the sliding jaw of a clutch 89ª, designed to rotate with the main shaft and to be thrown into and out of engagement with the jaw 89. Adjoining the opposite end of the enlarged portion of the main shaft, formed upon the reduced portion thereof, is a feather 85ᵈ, upon which is fitted the sliding jaw of a clutch 91ª, designed to rotate with the main shaft and to be thrown into and out of engagement with the clutch-pinion 91. This clutch-pinion is designed to turn freely upon the shaft 85 except when engaged by the feathered clutch-jaw 91ª. Longitudinal sliding movement of the clutch-pinion 91 upon the shaft is prevented by the toothed shroud 91ᵇ banking against the meshing teeth of an idler-

pinion 92. This idler-pinion meshes with a train-pinion 93, which is fitted onto a counter-shaft 94 in the manner shown in detail in Figs. 9 and 10, in which 93^a is an enlarged key or feather seat, designed to permit a one-fourth turn of the pinion 93 upon the feathered counter-shaft 94, on which 94^a represents the feather. Adjoining the pinion 93 (see Fig. 7) is a helical compensating spring 95, encircling the shaft 94, one end 95^a of which is secured to the pinion 93 and the other end 95^b to the shaft 94. The shaft 94 is supported in the boxes 96 and 97, mounted respectively upon the timbers 69 and 65, as shown. A gear-wheel 98 is keyed onto the end of the counter-shaft 94, adjoining the cable-drum, and meshes with the gear-pinion 90, which is bolted to the drum-hub, as hereinbefore described.

Bolted to the extending ends of the central base-timbers 65 are a pair of cross-bars 99, (see Figs. 3, 4, and 7,) upon which are formed upwardly-extending lugs 99^a. Into these lugs are screwed the ends of guide-rods 100, upon which guides are fitted and slide freely back and forth the clutch-cams 101 and 102. Into the adjoining ends of the clutch-cams are screwed adjustable engagement-studs 101^a and 102^a, respectively, and into the opposite end of the cam 102 is screwed an adjustable engagement-stud 102^b. Upon the upper side of each of the cams are formed parallel flanges 104 and 105, disposed diagonally thereupon, (see Fig. 4,) between which are formed corresponding grooves.

Mounted in suitable boxes upon the base and upper frames are two upright rock-shafts 106 and 107, to the lower ends of which are secured, respectively, the horizontal cam-arms 106^a and 107^a, into the under side of the outer ends of which are fitted the roller-studs 106^b and 107^b. These roller-studs are disposed within the diagonal grooves formed upon the upper sides of the sliding cams 101 and 102 between the parallel flanges 104 and 105. To the upper ends of the rock-shafts 106 and 107 are secured, respectively, the clutch-arms 108 and 109, each terminating in a forked end designed to engage the clutch-shifting collars 108^a and 109^a, respectively.

Wound several times around the cable-drum 88 and firmly secured thereto by the clamping-staples 88^b (see Figs. 3 and 4) is an endless main cable F, paid out directly from the under side of the drum to the moving carriage structure, passing through suitable cribbing 110 under the horse-walk, over the carriage cross-head 4^b, the cross-brace 4^c, Fig. 6, drop-off trip 24, cross-head 4^a, Figs. 1 and 2, and carried to the extreme rear end of the main base-frame, where it is passed over and around the grooved sheave 2^e, which is mounted in suitable boxing and firmly bolted to the rear cross-timber 2^a. Thence the lower span F′ of the main cable is returned directly to the horse-power, passing under and around the grooved sheave 111, firmly mounted in suitable boxing upon the base-framing of the power and thence passed over and around the drum 88 to the locking-staples 88^b.

Clamped upon the main cable F in a suitable position is an engaging cone D, designed in the proper travel thereof to engage the adjustable studs 101^a and 102^a (see Figs. 11 and 12) and slidingly operate the clutch-throwing cams 101 and 102 in the direction of the arrow. Also clamped upon the main cable F, at a suitable distance from the drum-staples 88^b, is an engaging cone E, (see Fig. 3,) designed in the proper travel thereof to engage the adjustable stud 102^b (see Fig. 13) and slidingly operate the cam 102 in the direction of the arrow.

Attached to one end of the cam 101 is a cam-shifting cable G, (see Figs. 1, 2, 3, 4, and 13,) which is carried forward to the shearing construction over suitable guide-sheaves G′, G^2, and G^3, along the side of the main base-timber, to a suitably-constructed hand-operating lever G^4, by which the cam 101 is designed to be operated in the direction of the arrow, Fig. 13. The lever G^4 is boxed to the base of the post 35, as shown, conveniently adjacent the other hand-operating devices of the construction.

Firmly clamped upon the main cable F are two engaging cones A and B, (see Figs. 1 and 6,) suitably placed adjacent to the carriage-frame cross-brace 4^c, one upon either side of the same, but far enough apart to afford considerable "slack" or lost travel in the cable F before taking up the traveling carriage by engagement of one or the other cone against the adjoining side of the cross-brace 4^c, for the purpose hereinafter shown. Near by the cone A is clamped to the cable F the drop-off trip-actuating cone *c*, designed to engage the lug 24^a of the trip-head 24 in the proper stage of operation, as shall be hereinafter explained.

The operation of the machine is as follows: The horses attached to the sweep-arm of the power are supposed to move without interruption in the direction of the arrow (see Fig. 4) through the operations of clamping, shearing, discharging the tie, returning the carriage for reloading, and the constant reoccurrence of these operations. With the sliding clutch 89^a of the power in engagement with the jaw 89, fixed to the cable-drum, and with the clutch-jaws 91 and 91^a disengaged, as clearly shown in Figs. 4, 7, and 11, the cable-drum will rotate in the direction indicated by the adjacent arrow in Fig. 3, causing the travel of the main cable F in the direction also indicated by the arrow in this figure, and with the cone A engaging the side of the cross-brace 4^c, as shown in Figs. 1 and 6, the timber-carriage will be carried forward in the shearing operation. This stage of operation is clearly illustrated by Figs. 1, 2, 3, and 4, wherein the timber is shown in an advancing half-sheared position. Let it be assumed that from the position herein shown the timber-

carriage has completed its excursion upon the trackway, bringing it into the position with relation to the fixed cutter-head clearly shown in part in Fig. 6, wherein it will be seen that the depending arm 16^c of the pawl-trip has been carried into engagement with the tripping-stud 17, thus disengaging the pawls 11^c and 11^b from their respective racks, as shown in this figure, releasing both the clamping-bar 12 and lever 11, which are instantly thrown back by the springs 15 and 18 into the position herein shown and the lever 11 interlocked with the cross-bar 20 by the hook 19, the toothed head 12^a of the clamping-bar being withdrawn from engagement with the new-hewn tie, as shown. Simultaneously with the trip of the stud 17 the protruding discharge-bar 13^a within the clamping-bar 13 has been brought into forcible contact with the main-frame buffer-iron 2^a, (see dotted lines, Fig. 3,) thus driving the tie from engagement with the toothed head 13^a. Simultaneously with the tie-discharge action of the timber-carriage the cone D upon the main cable F has been carried into engagement with the stud 102^a of the clutch-shifting cam 102, throwing the clutches 91 and 91^a into partial engagement, since it will be seen by reference to Fig. 4 that the stud 102^a occupies a position somewhat in advance of the adjoining stud 101^a and will be engaged by the cone D first, thus effecting this partial engagement under the operative action of the engaged clutches 89 and 89^a, instantly bringing the cone D into contact with both studs, (see Fig. 11;) but continuing under the operative action of the engaged clutches both cams are carried upon the guide-rods by the cone D to the position shown in Fig. 12 and through the cam-shifting cable G throwing the hand-lever G^4 (see Fig. 1) into the position shown in broken lines. During the movement of the cams the now engaged clutches 91 and 91^a have yielded to the opposing motion of the rotating shaft through the compensating action of the spring 95 and the shaft-feather 94^a moving across the enlarged feather-seat 93^a of the gear-train pinion 93. (See Figs. 9 and 10.) The disengagement of the clutches 89 and 89^a now being completely effected, the rotative motion of the cable-drum is reversed through the operative action of the now engaged clutches 91 and 91^a, the shroud 91^b, the idler 92, the pinion 93, the shaft 94, the gear 98, and the pinion 90, and through the speed-increasing gear-train the cable F now carries the timber-carriage with accelerated speed to the extreme rear reloading position. In the meantime, however, the cable F has traveled over the distance of lost motion between the engaging cones A and B before taking up the carriage, during which period the branch cable 26^b, Fig. 6, has slacked sufficiently to permit the hook 26 to drop into operative position and the moving cone C has been carried with relation to the standing carriage from the relative position shown in Figs. 1 and 6 to the opposite end of the drop-off trip-guides 25, where, sliding up the inclined face of the forked lug 24^a of the trip-head 24, it drops into engagement behind the said lug, simultaneous with which action the cone B is brought into contact with the carriage-frame cross-brace 4^c, and the moving timber-carriage is started upon its return excursion to the extreme rear position. The timber-cradles 32 32 having become engaged with the standard 28 through the spring-latch carrier 32^a during the shearing excursion of the carriage, and then carried forward out of the way of the advancing post or standard 8 of the carriage-frame and disposed under the lower guide-shoe 56, as shown in Fig. 6, are now carried by the moving standard 28 sliding along the square operative rod 30 and disposed thereupon by the disengaging chains 32^b in position to receive a timber, as shown in Figs. 1 and 2. The timber-carriage having reached the extreme rear position upon the trackway, the hook 26 interlocks with the fixed hook 27, securely fastening it for the time being. Simultaneous with this action the cone E upon the cable F adjacent to the cable-drum has traveled out with the upper span of the cable F far enough to come into engagement with the engaging stud 102^b of the clutch-shifting cam 102 (see Fig. 13) and slidingly moves the cam upon the guide-rod in the direction of the arrow under the operative action of the engaged clutches 91 and 91^a, throwing them out of engagement, as shown in Fig. 13. Both clutches now being out of engagement, the horses in their uninterrupted travel rotate only the main bevel gear-wheels and the freed drum-shaft. It will be observed that both the shift-cams 101 and 102 have the ends of the diagonally-disposed roller-stud grooves 104 and 105 for a short distance projected in a straight line at right angles to the traverse swinging movement of the roller-studs, the object being to securely lock the clutch-arms and moving clutch members in either completely-thrown position of the cams. The construction is now in position for reloading the timber-carriage, which operation will be briefly described. A timber having been rolled from a receiving-platform (not shown in the drawings) into the V-shaped ends of the adjusting cradle-irons 32 32 (see Fig. 5) is by the operator adjusted to properly center between the open clamping-bars 12 and 13 through manipulating the sector-latched hand-lever 33. Judging of the proper depth of cut of the upper and lower knives he turns the hand-wheel 64 accordingly, effecting the adjustment, as hereinbefore described. Moving the cam-shifting lever G^4 from the position shown in broken lines into the position shown in Fig. 1, and thereby shifting the cam 101, Fig. 13, in the direction of the arrow and throwing the clutches 89 and 89^a into engagement, as shown in Fig. 4, the cable-drum and cable F are moved in the direction of the arrows, Fig. 3. The timber-carriage, however, stands immovable during

the travel of the cone A over the space between it and the cross-brace 4^c, the carriage remaining locked to the main frame by the engaged hooks 26 and 27. In the meantime the moving cone C, already in engagement with the trip-head 24 through connection by the cable 21, forcibly draws the clamping-bar 12 forward, impinging it against the end of the timber, simultaneous with which action the cone 21^a on the cable 21 engages the trip end 19^a, disengaging the latch 19, releasing the lever 11, which is swung forward by the continued engagement of the cone C with the trip-head 24, and under the powerful leverage thus afforded securely clamps the timber between the clamping-bars 12 and 13, (see Fig. 4,) in which forward position the clamping-bars and lever are securely locked by the pawls 11^c and 11^b, as hereinbefore described. The trip-head 24, having been carried to the curved end of the guides 25, disengages the cone C, thus preventing the subsequently released bar and lever 12 and 13 to be thrown into the rear position, carrying the trip-head 24 back with them, as hereinbefore described. Since the timbers in practice are liable to be cut to slightly-varying lengths, the spring 21^b is embodied in the cable 21 to meet this contingency and effecting at all times the automatic power-clamping action hereinabove described. The advancing main cable F now having drawn the branch cable 26^b taut, the hook 26 is disengaged from the hook 27, liberating the moving carriage, simultaneous with which action the cone A engages the side of the cross-brace 4^c and the carriage is carried upon the shearing excursion in which follows a repetition of the operation and actions previously described.

Having thus described my invention, what I claim is—

1. In a machine for shearing railway-ties, the combination with the stationary frame, a carriage mounted thereon, of timber holding and clamping devices mounted on one of the said instrumentalities, a pair of separated knives mounted on the other instrumentality, each knife being composed of two rearwardly-diverging blades adapted to shear the timber on two sides to form a tie as the carriage is operated and means for adjusting the two knives to regulate the distance between them as circumstances may require.

2. In a machine for forming railway-ties, the combination of the stationary frame, a movable frame mounted thereon, suitable timber holding and clamping devices mounted on one of the frames, four knives mounted on the other frame, each knife being composed of two blades rearwardly diverging at a suitable angle, one pair of said knives being vertical side knives, and the other pair of knives upper and lower horizontal knives, the two knives of each pair being suitably separated, and the two pairs being arranged to shear the timber on four sides to form a tie as the movable frame is actuated and suitable means for adjusting the two knives of each pair to regulate the distance between them as circumstances may require.

3. In a machine for forming railway-ties, the combination of a stationary frame, two pairs of knives mounted thereon, the one pair occupying a vertical position, and the other pair a horizontal position, each pair of knives being adjustable whereby the timber may be cut down to form a tie of the desired dimensions, each knife being composed of two rearwardly-diverging blades whose forward extremities are suitably connected, a carriage mounted on the stationary frame, two clamping-bars, one being stationary and the other movable, the stationary bar being tubular and provided with a forwardly-protruding, telescoping bar adapted to engage the stationary frame and disengage the tie as the movable bar is withdrawn, and suitable means for shifting the movable bar in the one direction or the other according as it is necessary to clamp or release the timber.

4. In a tie-forming machine, the combination of a stationary frame having two vertical posts, a pair of separated collars adjustably mounted on each post, a pair of horizontal upper and lower knives, each composed of two rearwardly-diverging blades whose forward extremities are connected together, the rear extremities of the blades being made fast to the said collars, expanding-springs located between the two collars on each post, adjustable stops for limiting the movement of the collars in response to the springs, a movable carriage mounted on the stationary frame, timber holding and clamping mechanism mounted thereon, and means for actuating the carriage whereby the timber is forced between the knives and sheared on two opposite sides.

5. The combination of a stationary frame, a carriage mounted thereon, suitable timber holding and clamping mechanism mounted on the carriage, two vertical posts mounted on the stationary frame, two pairs of separated collars slidingly mounted on the posts, expanding-springs for separating the two pairs of collars, each post having an enlarged portion between the collars, vertical guide-rods mounted on the stationary frame in suitable proximity to the posts, reverse-threaded screw-sleeves slidingly mounted on said rods and adapted to turn therewith, brackets threaded to fit said sleeves and projecting into the path of the collars on the posts, nuts mounted on the oppositely-threaded portions of the sleeves, upper and lower bars extending crosswise of the machine and in whose extremities the said nuts are swiveled, contracting-springs connecting these bars, guide-shoes mounted on the said bars, and means for turning the rods, whereby the said brackets and guide-shoe-supporting bars are adjusted, and a pair of knives, each knife being composed of two rearwardly-diverging blades whose forward extremities are con-

nected, the rear extremities of the said blades being attached to the said collars.

6. In a timber-shearing mechanism, the combination of a stationary frame, a carriage movably mounted thereon, shearing-knives mounted on the stationary frame, timber-clamping bars mounted on the carriage, a lever fulcrumed on the carriage, two oppositely-disposed spring-actuated pawls mounted on the lever, a toothed rack attached to the carriage above the pawls, another rack attached to one of the clamping-bars below the pawls, the pawls being arranged to engage said racks for the purpose of actuating the clamping-bar and locking the lever against the return movement, and means for actuating the said lever, comprising a winding-drum, an endless cable surrounding the drum, and a suitable connection between the cable and the lever whereby the movement of the cable actuates the lever.

7. In a timber-shearing mechanism, the combination of a stationary frame movably mounted thereon, shearing-knives mounted on the stationary frame, timber-clamping bars mounted on the carriage, a lever fulcrumed on the carriage, two oppositely-disposed spring-actuated pawls mounted on the lever, a toothed rack attached to the carriage above the pawls, another rack attached to one of the clamping-bars below the pawls, the pawls being arranged to engage the said racks for the purpose of actuating the clamping-bars and locking the lever against the return movement, means for actuating the said lever comprising a cable having one extremity attached to the clamping-bar, a trip-head attached to the opposite extremity of the cable, a curved guide engaged by the trip-head, intermediate guide-pulleys respectively mounted on the carriage and lever, said pulleys being engaged by the said cable, a winding-drum, an endless cable mounted thereon and engaging suitable guide-pulleys mounted on the stationary frame, a stop fast on the endless cable and adapted to engage the trip-head whereby the lever is drawn forward for the purpose of clamping the bar, the trip-head being disengaged from the stop on the endless cable by virtue of the curved guide in which it travels when the clamping-bar is suitably actuated.

8. The combination of the stationary frame, the carriage adapted to travel thereon, a latch adapted to lock the carriage on the frame when the carriage is at its rearward limit of movement, timber-clamping bars mounted on the carriage, shearing-knives mounted on the stationary frame, a drum for actuating the carriage, an endless cable surrounding the drum and adapted to travel longitudinally on the frame, a branch cable leading from the endless cable to the locking-latch, means actuated by the endless cable for automatically forcing one of the clamping-bars against the timber to be sheared, the branch cable being slackened during said operation, means for disengaging the endless cable from the clamping mechanism, the slackened branch cable being drawn taut during the clamping operation whereby the carriage-locking latch is disengaged from the stationary frame, and a stop on the cable adapted to engage and drive the carriage in the forward direction for the purpose of bringing the timber into shearing engagement with the knives of the stationary frame.

9. The combination with the stationary frame, the carriage adapted to travel thereon, a latch adapted to lock the carriage on the frame when the carriage is at its rearward limit of movement, timber-clamping bars mounted on the carriage, shearing-knives mounted on the stationary frame, a drum for actuating the carriage, an endless cable surrounding the drum and adapted to travel longitudinally on the frame, a branch cable leading from the endless drum to the locking-latch, means actuated from the endless cable for automatically forcing one of the clamping-bars against the timber to be sheared, the branch cable being slackened during said operation, means for disengaging the endless cable from the clamping mechanism, the slackened branch cable being drawn taut during the clamping operation whereby the carriage-locking latch is disengaged from the stationary frame, and a stop on the cable adapted to engage and drive the carriage in the forward direction for the purpose of bringing the timber into shearing engagement with the knives of the stationary frame, and means initially operated by the endless cable for reversing the rotation of the winding-drum whereby the carriage is returned to its rearward position on the frame.

10. The combination with the stationary frame, shearing-knives mounted thereon, the carriage and timber clamping bars mounted thereon, of means for forcing one of the clamping-bars against the end of the timber to be sheared, comprising a lever fulcrumed on the carriage and carrying two pawls, a rack on the carriage adapted to be engaged by one pawl, a rack on the clamping-bar adapted to be engaged by the other pawl, a latch carried by the lever adapted to lock it on the carriage in the position when its pawls are disengaged from the racks, a cable attached to the clamping-bar at one extremity and passing around guides on the carriage and lever, said cable passing through an aperture formed in a shank on the lever-locking latch, and a stop fast on the cable, whereby as the latter is actuated the stop engages the said shank, actuates the latch and unlocks the lever, whereby the latter is allowed sufficient movement for clamping the bar.

11. The combination with the stationary frame, shearing-knives mounted thereon, a carriage, and timber-clamping bars mounted thereon, of means for forcing one of the clamping-bars against the end of the timber to be sheared, comprising a lever fulcrumed on the

carriage and carrying two pawls, a rack on the carriage adapted to be engaged by one pawl, a rack on the clamping-bar adapted to be engaged by the other pawl, a latch carried by the lever and adapted to lock it on the carriage in the position when its pawls are disengaged from the racks, a cable attached to the clamping-bar and passing around guides on the carriage and lever, said cable passing through an aperture formed in a shank on the lever-locking latch, a stop formed on the cable whereby as the latter is actuated, the stop engages the said shank, actuates the latch and unlocks the lever, whereby the latter is allowed sufficient movement for clamping the bar, and means actuated from the stationary frame for disengaging the lever-pawls from the respective racks on the carriage and clamping-bar.

12. The combination with the stationary frame, shearing-knives mounted thereon, the carriage, timber-clamping bars mounted thereon, of a lever fulcrumed on the carriage, a rock-shaft journaled in the lever, two oppositely-disposed pawls mounted on said shaft and having recesses formed in the collars into which projects a lug fast on the said shaft, a crank-arm attached to said shaft, a rock-shaft journaled in the carriage below and provided with a crank, a rod connecting the two rock-shaft cranks, and another crank fast on the lower rock-shaft and so located as to be actuated by a stop on the stationary frame when the carriage has reached its forward limit of movement, whereby the lever-pawls are disengaged from their respective racks and the lever released.

13. The combination with the stationary frame, shearing-knives mounted thereon, the carriage, timber-clamping bars mounted thereon, a lever fulcrumed on the carriage, a rock-shaft journaled in the lever, two oppositely-disposed pawls mounted on the said shaft and having recesses formed in the collars into which projects a lug fast on the said shaft, a crank-arm attached to said shaft, another rock-shaft journaled in the carriage below and provided with a crank, a rod connecting the two rock-shaft cranks, another crank fast on the lower rock-shaft and so located as to be actuated by a stop on the frame when the carriage has reached its forward limit of movement, whereby the lever-pawls are disengaged from their respective racks and the lever released, and suitable means for automatically returning the lever and clamping-bar to their normal positions after the unlocking of the lever.

14. The combination with the stationary frame, shearing-knives mounted thereon, the carriage, timber-clamping bars mounted thereon, a lever fulcrumed on the carriage, a rock-shaft journaled in the lever, two oppositely-disposed pawls mounted on said shaft and having recesses formed on the collars into which projects a lug fast on the said shaft, a crank-arm attached to said shaft, another rock-shaft journaled in the carriage and provided with a crank, a rod connecting the two rock-shaft cranks, another crank fast on the lower rock-shaft and so located as to be actuated by a stop on the stationary frame when the carriage has reached its forward limit of movement, whereby the lever-pawls are disengaged from their respective racks and the lever actuated, and suitable means for automatically returning the lever and clamping-bar to their normal positions after unlocking the lever, comprising two springs fast on the carriage and engaging the lever and bar respectively, the arrangement being such that said springs are placed under tension when the lever and bar are moved forward for clamping purposes.

15. The combination of the stationary frame, the cutting-knives mounted thereon, the carriage, the timber-clamping mechanism mounted thereon, means for moving the carriage both forward and backward on the stationary frame while the power is applied in one direction only, said means comprising a power-shaft suitably journaled, a drum-shaft geared to the power-shaft, a drum loosely mounted thereon, a clutch member fast on the drum, a gear also fast on the drum, a clutch member splined on the drum-shaft and adapted to coöperate with the member on the drum, a second clutch member splined on the shaft, a third clutch member fast on the shaft and adapted to coöperate with the second clutch member, the fast clutch member having a cogged portion or shroud, and a train of gears operated from the said shroud and connecting the same with the gear on the winding-drum, an idler-gear being interposed to reverse the rotation of the drum, means operated by the cable for shifting the movable clutch members on the drum-shaft whereby when the carriage has reached its forward limit of movement, the clutch member engaging that on the drum is disengaged therefrom, and the other clutch member moved to engagement with the member connected with the train of reversing-gears, and a compensating spring interposed in the gear-train for use during the automatic shifting of the clutches.

16. The combination with the stationary frame, the cutting-knives mounted thereon, the carriage, the timber-clamping mechanism mounted thereon, of means for moving the carriage both forward and backward on the stationary frame while the power is applied in one direction only, said means comprising a power-shaft suitably journaled, a drum-shaft geared to the power-shaft, a drum loosely mounted thereon, a clutch member fast on the drum, a gear also fast on the drum, a clutch member splined on the drum-shaft and adapted to coöperate with the member on the drum, a second clutch member splined on the shaft, a third clutch member fast on the shaft and adapted to coöperate with the second clutch member, the

fast clutch member having a cogged portion or shroud, a train of gears operated from the said shroud and connecting the same with the gear on the drum, an idler-gear being interposed to reverse the rotation of the drum, means operated by the cable for shifting the movable clutch members on the drum-shaft whereby when the carriage has reached its limit of movement, the clutch member engaging that on the drum is disengaged therefrom, and the other movable clutch member moved to engagement with the member connected with the train of reversing-gears, the compensating spring interposed in the gear-train for use during the automatic shifting of the clutches, said clutch-shifting means comprising two cams slidingly mounted on the stationary frame and provided with inclined grooves, rock-shafts journaled in the frame, clutch-shifting arms fast on the rock-shafts and engaging the movable clutch members, other arms also fast on the said shafts and having extremities engaging the grooves of the cams, and a stop fast on the cable and adapted to actuate the cams sufficiently to shift the clutch members through the instrumentality of the said parts.

17. The combination with the stationary frame, the cutting-knives mounted thereon, the carriage, the timber-clamping mechanism mounted thereon, of means for moving the carriage both forward and backward on the stationary frame, while the power is applied in one direction only, said means comprising a power-shaft suitably journaled, a drum-shaft geared to the power-shaft, a drum loosely mounted thereon, a clutch member fast on the drum, a gear also fast on the drum, a clutch member splined on the drum-shaft and adapted to coöperate with the member on the drum, a second clutch member splined on the shaft, a third clutch member fast on the shaft and adapted to coöperate with the second clutch member, the fast clutch member having a cogged portion or shroud, a train of gears operated from the said shroud and connecting the same with the gear on the drum, an idler-gear portion interposed to reverse the rotation of the drum, means operated by the cable for shifting the movable clutch members on the drum-shaft, whereby when the carriage has reached its forward limit of movement, the clutch member engaging that on the drum is disengaged therefrom, and the other movable clutch member moved to engagement with the member connected with the train of reversing-gears, a compensating spring interposed in the gear-train for use during the automatic shifting of the clutches, said clutch-shifting means comprising cams slidingly mounted on the stationary frame and provided with inclined grooves, rock-shafts journaled in the frame, clutch-shifting arms fast on the rock-shafts and engaging the movable clutch members, other arms also fast on the said shafts and having their extremities engaging the grooves of the cams, a stop fast on the cable and adapted to actuate the cams sufficiently to shift the clutch members through the instrumentality of the said parts, another stop on the cable adapted to engage one of the cams when the carriage has reached its rearward limit of movement, whereby the said cam is operated to throw the clutch member out of engagement with the member connected with the reversing train of gears, whereby both clutch members are disengaged allowing the shaft to turn without turning the drum.

18. The combination with the stationary frame, the cutting-knives mounted thereon, the carriage, the timber-clamping mechanism mounted thereon, of means for moving the carriage both forward and backward on the stationary frame, while the power is applied in one direction only, said means comprising a power-shaft suitably journaled, a drum-shaft geared to the power-shaft, a drum loosely mounted thereon, an endless cable surrounding the drum, a clutch member fast on the drum, a gear also fast on the drum, a clutch member splined on the drum-shaft and adapted to coöperate with the member on the drum, a second clutch member splined on the shaft, a third clutch member fast on the shaft and adapted to coöperate with the second clutch member, the fast clutch member having a cogged portion or shroud, a train of gears operated from the said shroud and connecting the same with the gear on the drum, an idler-gear being interposed to reverse the rotation of the drum, means operated by the cable for shifting the movable clutch members on the drum-shaft, whereby when the carriage has reached its forward limit of movement, the clutch member engaging that on the drum is disengaged therefrom, and the other movable clutch member moved to engagement with the member connected with the train of reversing-gears, a compensating spring interposed in the gear-train for use during the automatic shifting of the clutches, said clutch-shifting means comprising cams slidingly mounted on the stationary frame and provided with inclined grooves, rock-shafts journaled in the frame, clutch-shifting arms fast on the rock-shafts and engaging the movable clutch members, other arms also fast on the said shafts and having their extremities engaging the grooves of the cams, a stop fast on the cable and adapted to actuate the cams sufficiently to shift the clutch members through the instrumentality of the said parts, another stop on the cable adapted to engage one of the cams when the carriage has reached its rearward limit of movement, whereby the said cam is operated to throw the clutch member out of engagement with the member connected with the reversing train of gears, whereby both clutch members are disengaged allowing the shaft to turn without turning the drum, and a hand-lever suitably connected with the

other cam for operating the same to produce forward rotation of the drum by throwing the proper clutch members into engagement.

19. The combination of the stationary frame, shearing-cutters mounted thereon, a carriage movably mounted on the frame, the timber-clamping mechanism mounted on the carriage, and means for giving the carriage both forward and backward movements while the power is applied in one direction only, said means comprising a driving-shaft, a drum-shaft geared to the driving-shaft, a drum loosely mounted on said shaft and provided with a clutch member and a pinion, a clutch member splined on the drum-shaft and adapted to engage the drum clutch member during the forward movement of the carriage, another clutch member fast on the drum-shaft and provided with a cogged portion or shroud, a second clutch member splined on the shaft and adapted to engage the clutch member fast on the shaft during the backward movement of the carriage, an endless cable surrounding the drum and provided with stops adapted to engage the carriage and impart both the forward and backward movements, means operated from the cable for shifting the splined clutch members on the drum-shaft when the carriage has reached its forward limit of movement, whereby one splined clutch member is disengaged from the clutch member on the drum and the other splined clutch member thrown into engagement with the clutch member fast on the drum-shaft, said means comprising the grooved cams, movable arms connecting the grooved cams and the splined clutch members, a stop on the cable adapted to engage the said cams and shift them sufficiently to throw one clutch member out of engagement with its coöperating member on the drum, and the other clutch member into engagement with its coöperating member on the shroud, and suitable gears connected with the said shroud and engaging the pinion on the drum for reversing the rotation of the latter for the purpose of returning the carriage to its backward limit of movement on the stationary frame.

20. The combination of the stationary frame, the carriage mounted thereon, a pivoted device for locking the carriage on the frame when the carriage has reached its rearward limit of movement, a winding-drum, a cable wound therearound and traveling longitudinally on the frame, a branch cable attached to the main cable at one extremity and to the said locking device at the opposite extremity, two separated stops A and B fast on the cable, a projection on the carriage which the said stops are adapted to engage, means for operating the drum, whereby the cable is actuated causing the stop A to engage the projection on the carriage and carry the latter forward a suitable distance, means initially operated from the cable for reversing the movement of the drum and actuating the cable sufficiently to cause the stop B to engage the projection on the carriage, whereby the latter is moved backward on the frame, the space between the stops A and B being sufficient to slacken the branch cable attached to the pivoted locking device whereby the said device is allowed to lock the carriage on the frame as soon as the carriage has reached its backward limit of movement, the branch cable being utilized to unlock the said device during the forward movement of the carriage, the said branch cable being drawn taut and the carriage unlocked from the frame before the stop A reaches the projection on the carriage.

21. The combination with a stationary frame, cutting-knives mounted thereon, a carriage, and timber-clamping mechanism mounted on the carriage, of means for moving the carriage both forward and backward on the stationary frame, while the power is applied in one direction only, said means comprising a drum-shaft and means for rotating the same, a drum loosely mounted thereon, a cable surrounding the drum, a clutch member fast on the drum, a gear also fast on the drum, a clutch member splined on the drum-shaft and adapted to coöperate with the member on the drum, a second clutch member splined on the shaft, a third clutch member fast on the shaft and adapted to coöperate with the second clutch member, the first clutch member having a cogged portion or shroud, a train of gears operated from the said shroud and connecting the same with the gear on the drum, an idler-gear being interposed to reverse the rotation of the drum, and suitable means operated by the cable for shifting the movable clutch members on the drum-shaft, whereby when the carriage has reached its forward limit of movement, the clutch member engaging that on the frame is disengaged therefrom, and the other movable clutch member moved to engagement with the member connected with the train of reversing-gears.

22. The combination of a stationary frame, cutting-knives fast thereon, a carriage mounted on the stationary frame, timber-clamping bars mounted on the carriage, a lever connected with one of said bars, whereby as the lever is actuated the said bar is made to clamp the timber to be sheared, a cable connected with said lever and provided at one extremity with a trip-head, a grooved guide in which said trip-head is adapted to move, a main operating-cable having a stop adapted to slip over said trip-head when moving in one direction and to engage and operate the trip-head for the purpose of operating the lever and actuating the clamping-bar when the cable is moving in the opposite direction, the construction of the trip-head guide being such as to cause the trip-head to move out of the path of the stop on the cable when the latter has performed the clamping function.

23. In a machine for forming railway-ties,

the combination of a stationary frame, two pairs of knives mounted thereon, the one pair occupying a vertical position and the other pair a horizontal position, the vertical knives being adjustable to regulate the distance between them and the horizontal knives being automatically adjustable for the same purpose, whereby the dimensions of the tie may be regulated as circumstances may require, each knife being composed of two rearwardly-diverging blades whose forward extremities are suitably connected, a carriage mounted on the stationary frame, and timber holding and clamping devices mounted on the carriage.

24. The combination of a stationary frame, knives mounted thereon, a carriage, timber-holding mechanism mounted on the carriage, means for moving the carriage both forward and backward on the stationary frame while the power is applied in one direction only, said means comprising a power-shaft, a drum-shaft geared to the power-shaft, a drum loosely mounted thereon, an endless cable surrounding the drum, a clutch member fast on the drum, a gear also fast on the drum, a clutch member splined on the drum-shaft and adapted to engage the member on the drum, a second clutch member splined on the shaft, a third clutch member fast on the shaft and adapted to coöperate with the second clutch member, the fast clutch member having a cogged portion or shroud, a train of gears operated from the said shroud and connecting the same with the gear on the winding-drum, means operated by the cable for shifting the clutch members on the drum-shaft, whereby when the carriage has reached the desired point in its forward movement, the clutch member engaging that on the drum is disengaged therefrom, and the other clutch member moved to engagement with the member connected with the train of gears, the arrangement and construction of the said train of gears being such as to impart to the drum and cable a reverse movement at an accelerated speed, whereby a quick return or relatively fast reverse movement is imparted to the carriage.

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

WILLIAM BARTH.

Witnesses:
PETER BARTH,
WILLIAM A. GORSLINE.