(No Model.) 9 Sheets—Sheet 1.

W. H. DOANE.

TENONING MACHINE.

No. 387,949. Patented Aug. 14, 1888.

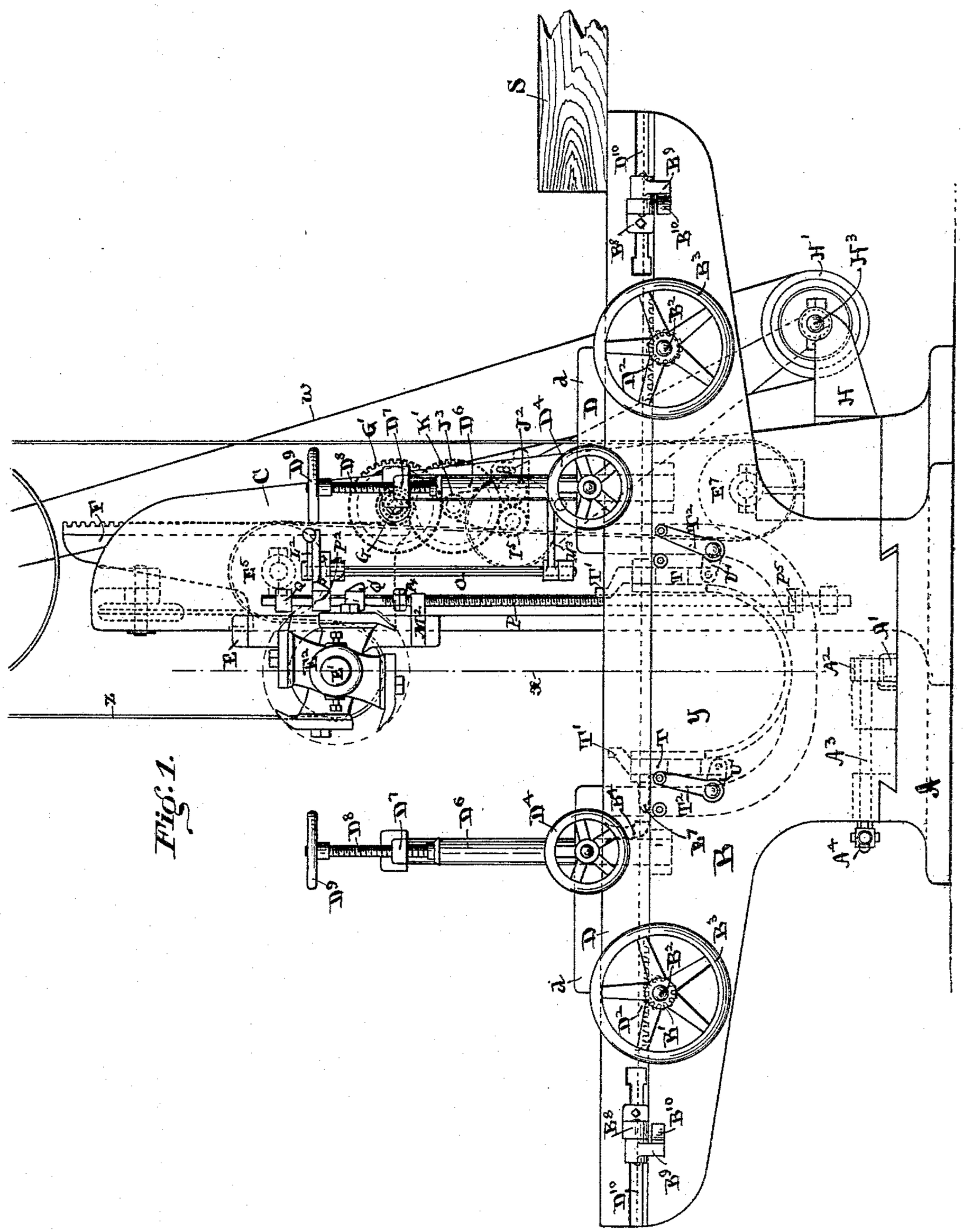

Fig. 1.

Attest.
C. W. Bogardt.
L. E. Rosen.

Inventor.
William H. Doane.
By L. E. Rosen. Atty.

(No Model.) 9 Sheets—Sheet 2.

W. H. DOANE.

TENONING MACHINE.

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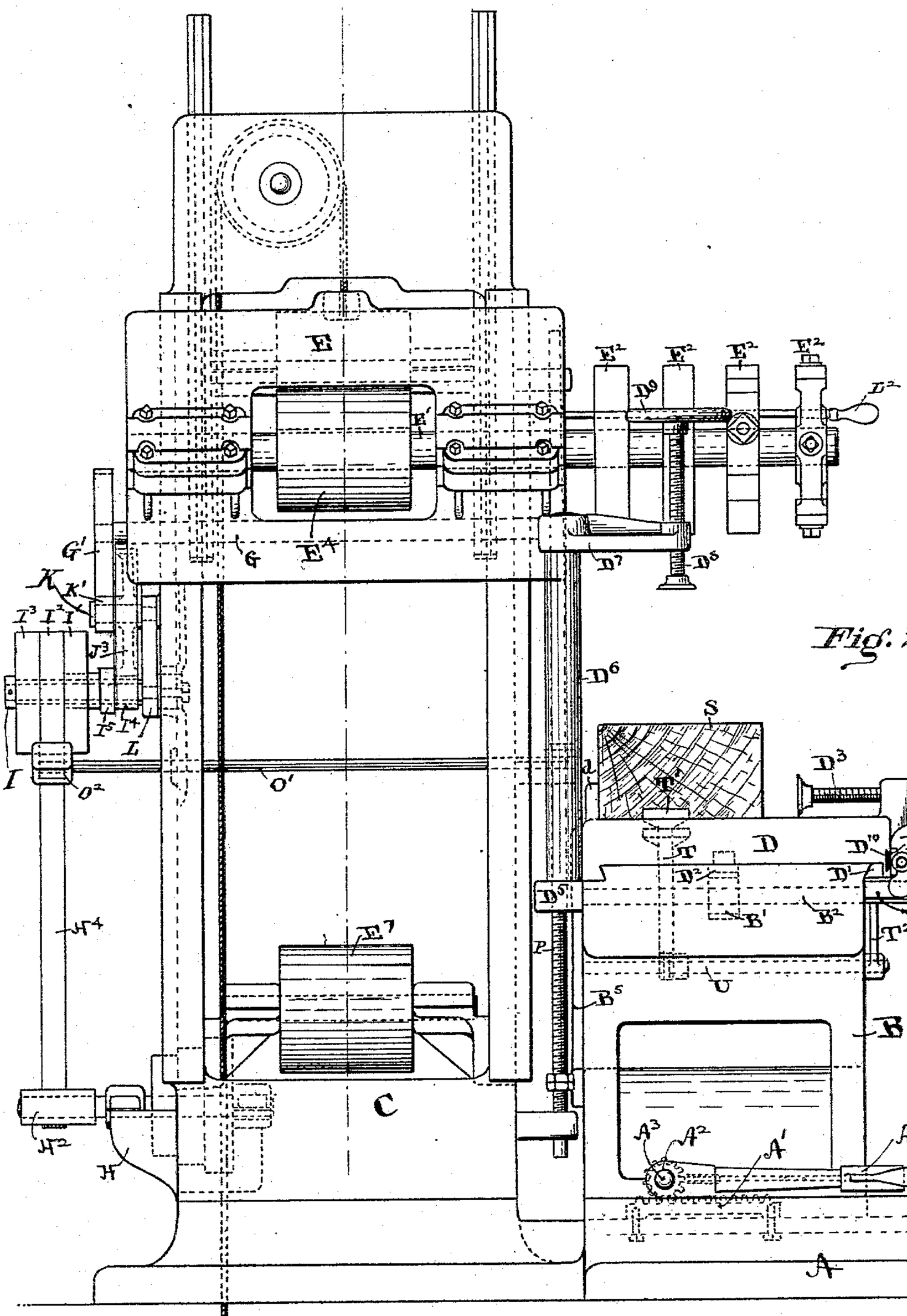

Fig. 2.

Attest.
C. W. Bogart.
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by Lemuel Wilcox, Atty.

(No Model.)

9 Sheets—Sheet 3.

W. H. DOANE.

TENONING MACHINE.

No. 387,949. Patented Aug. 14, 1888.

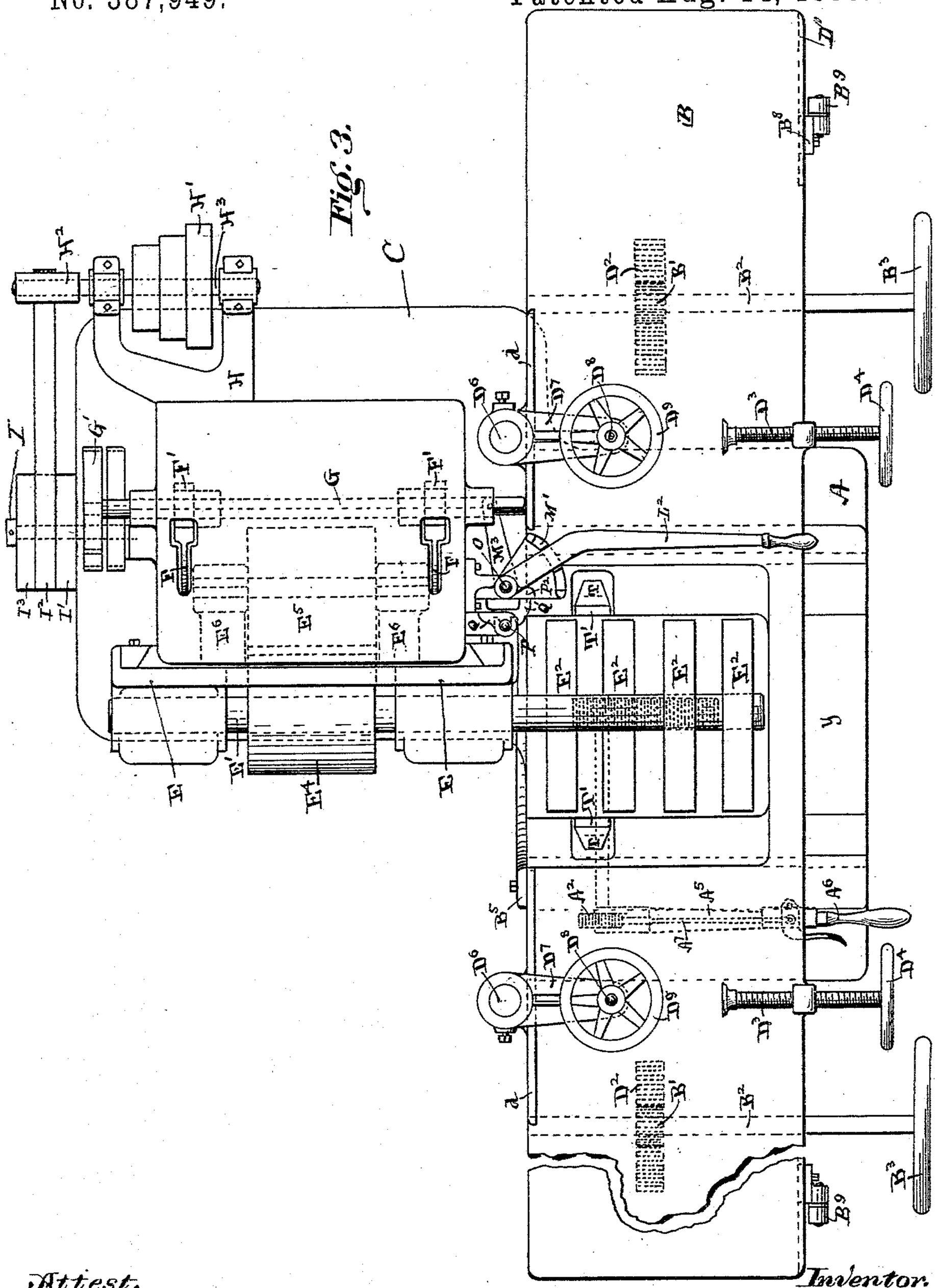

Fig. 3.

Attest.
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L. C. Hosea.

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William H. Doane.
By L. C. Hosea, Atty.

N. PETERS. Photo-Lithographer, Washington, D. C.

(No Model.) 9 Sheets—Sheet 4.

W. H. DOANE.

TENONING MACHINE.

No. 387,949. Patented Aug. 14, 1888.

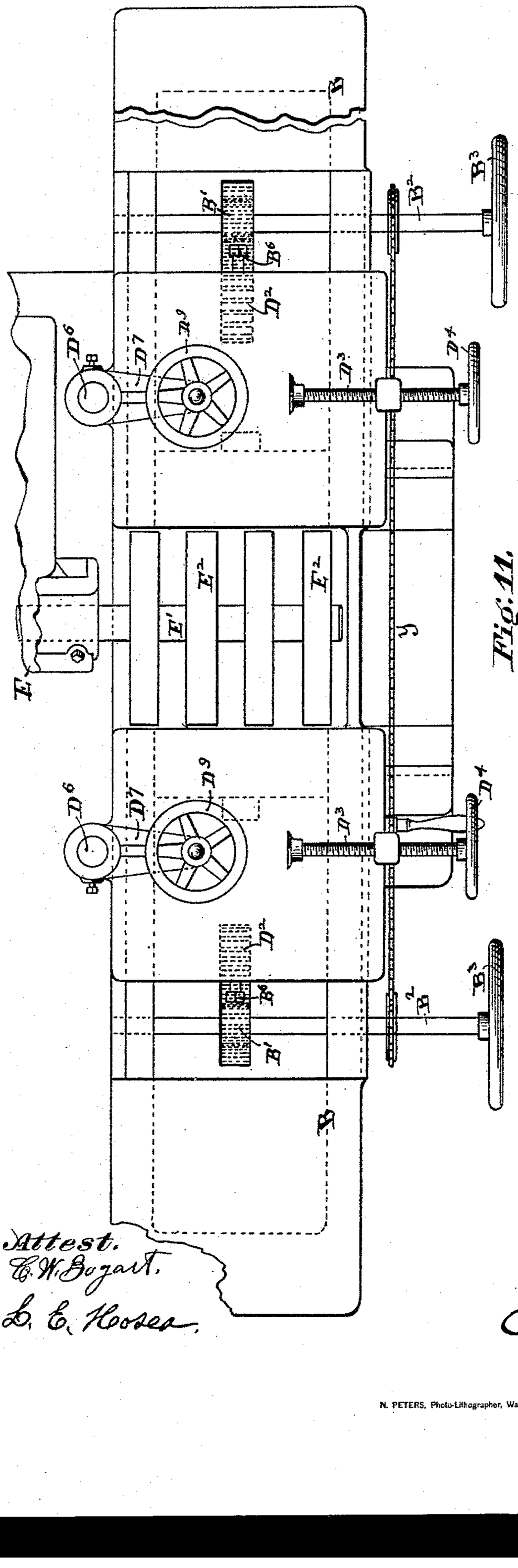


Fig. 11.

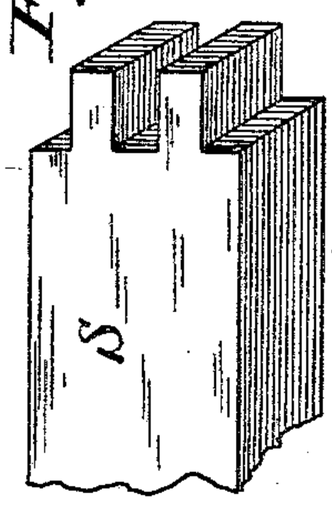


Fig. 3.

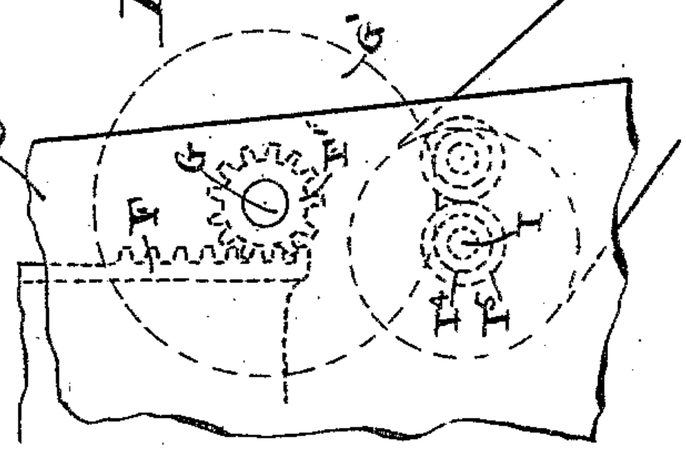
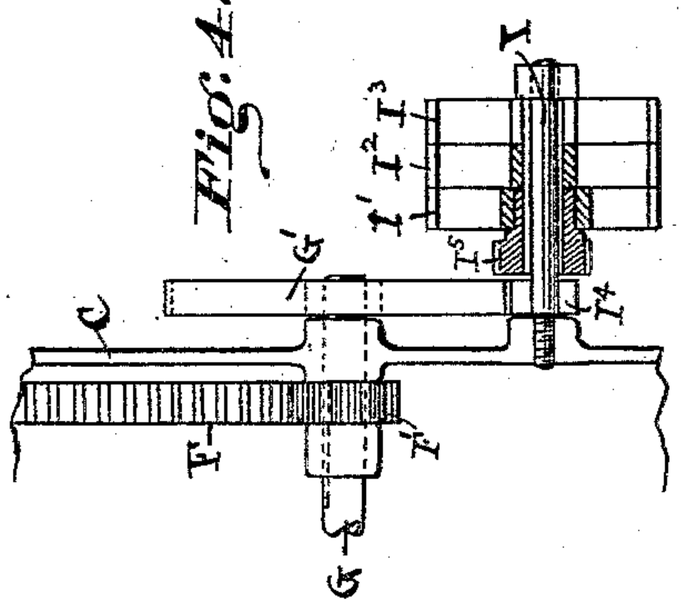


Fig. 4.



Attest.
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William H. Doane,
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(No Model.) 9 Sheets—Sheet 5.

W. H. DOANE.

TENONING MACHINE.

No. 387,949. Patented Aug. 14, 1888.

Fig. 6.

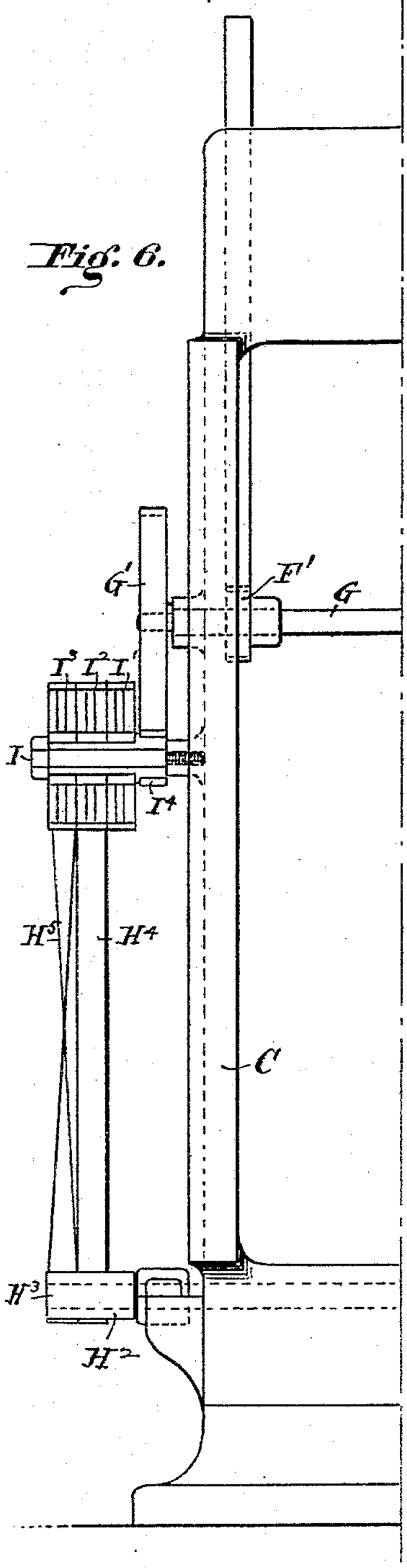
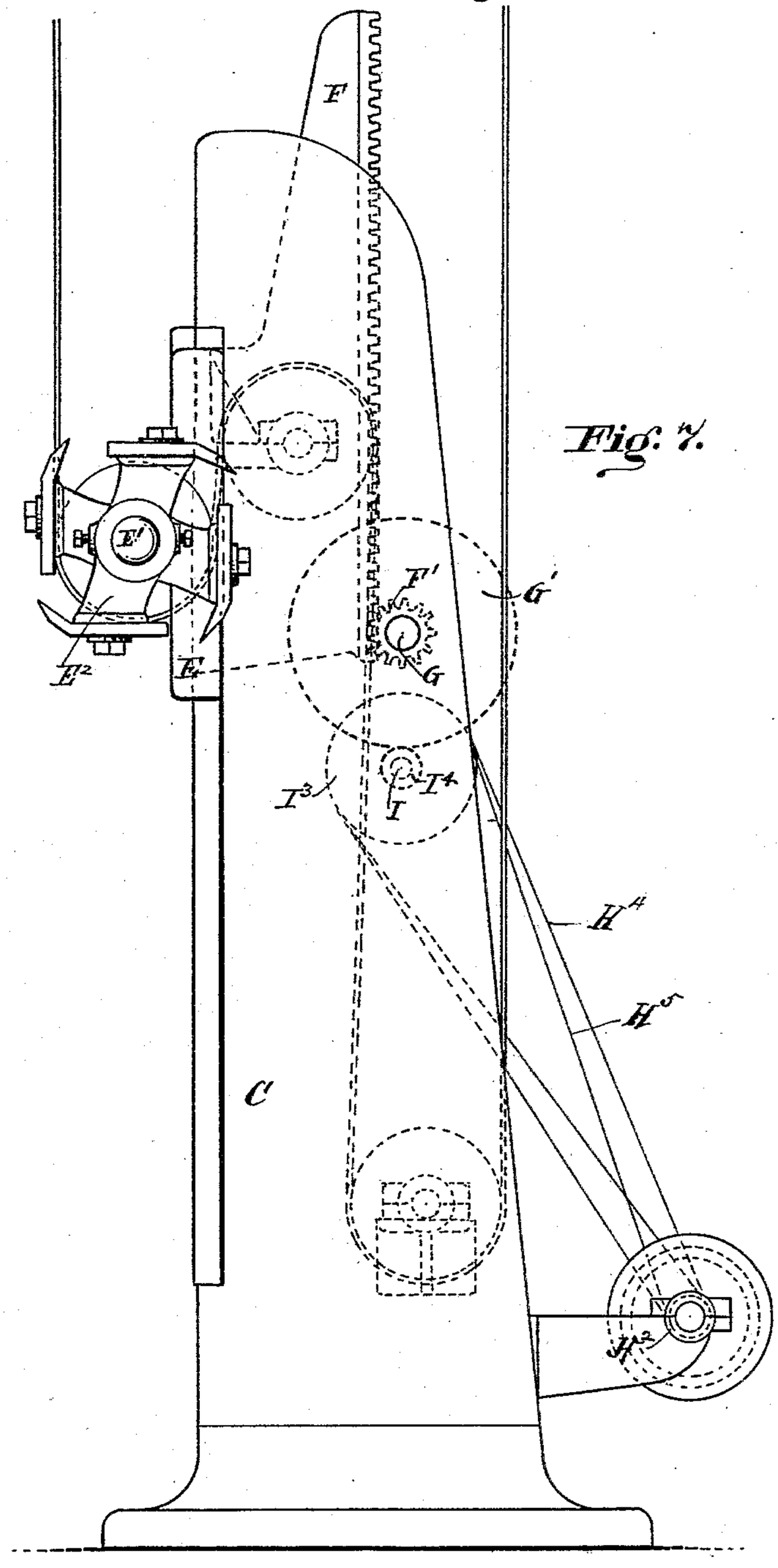


Fig. 7.



Attest.
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Inventor.
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(No Model.)

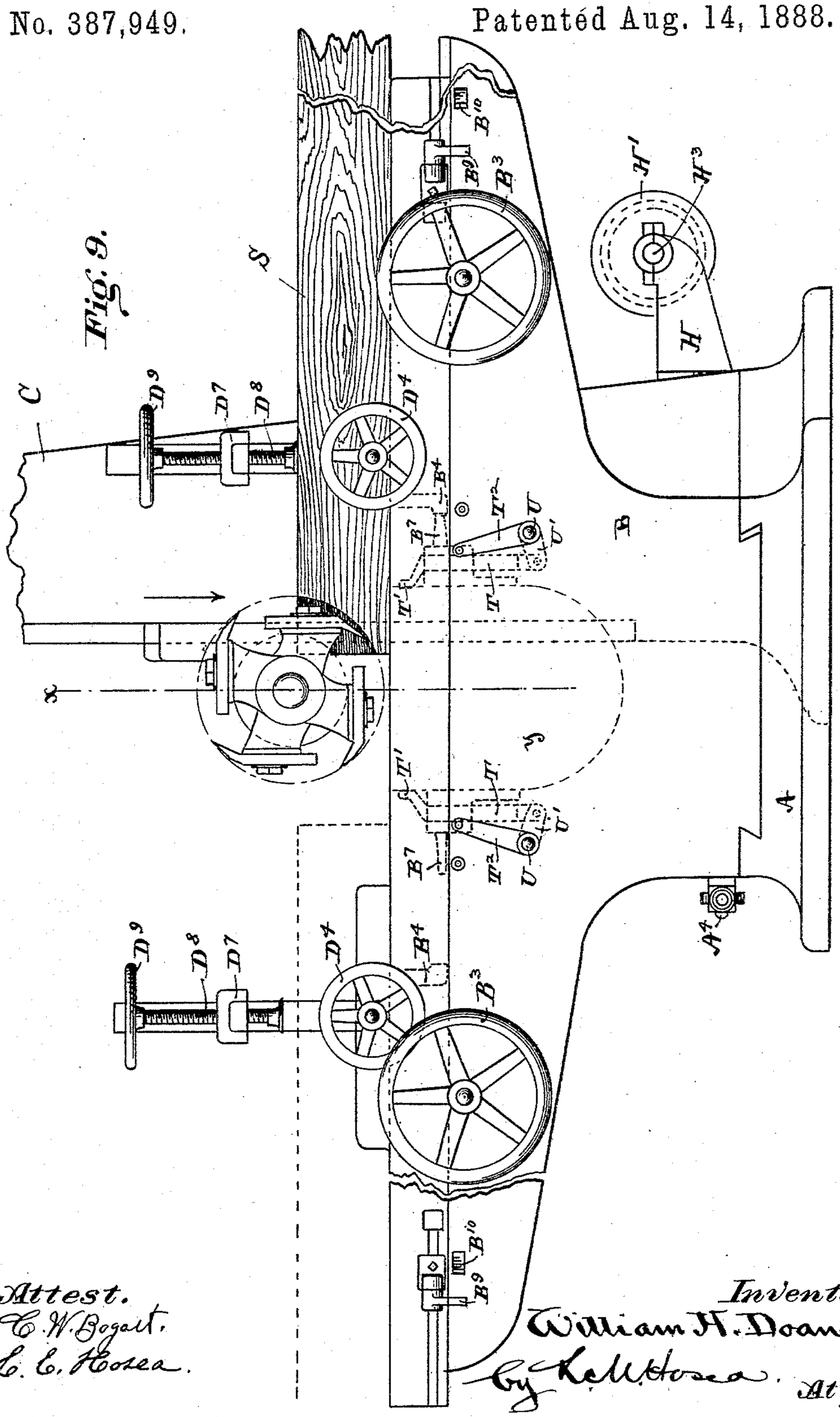
9 Sheets—Sheet 6.

W. H. DOANE.

TENONING MACHINE.

No. 387,949. Patented Aug. 14, 1888.

Fig. 9.



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(No Model.)

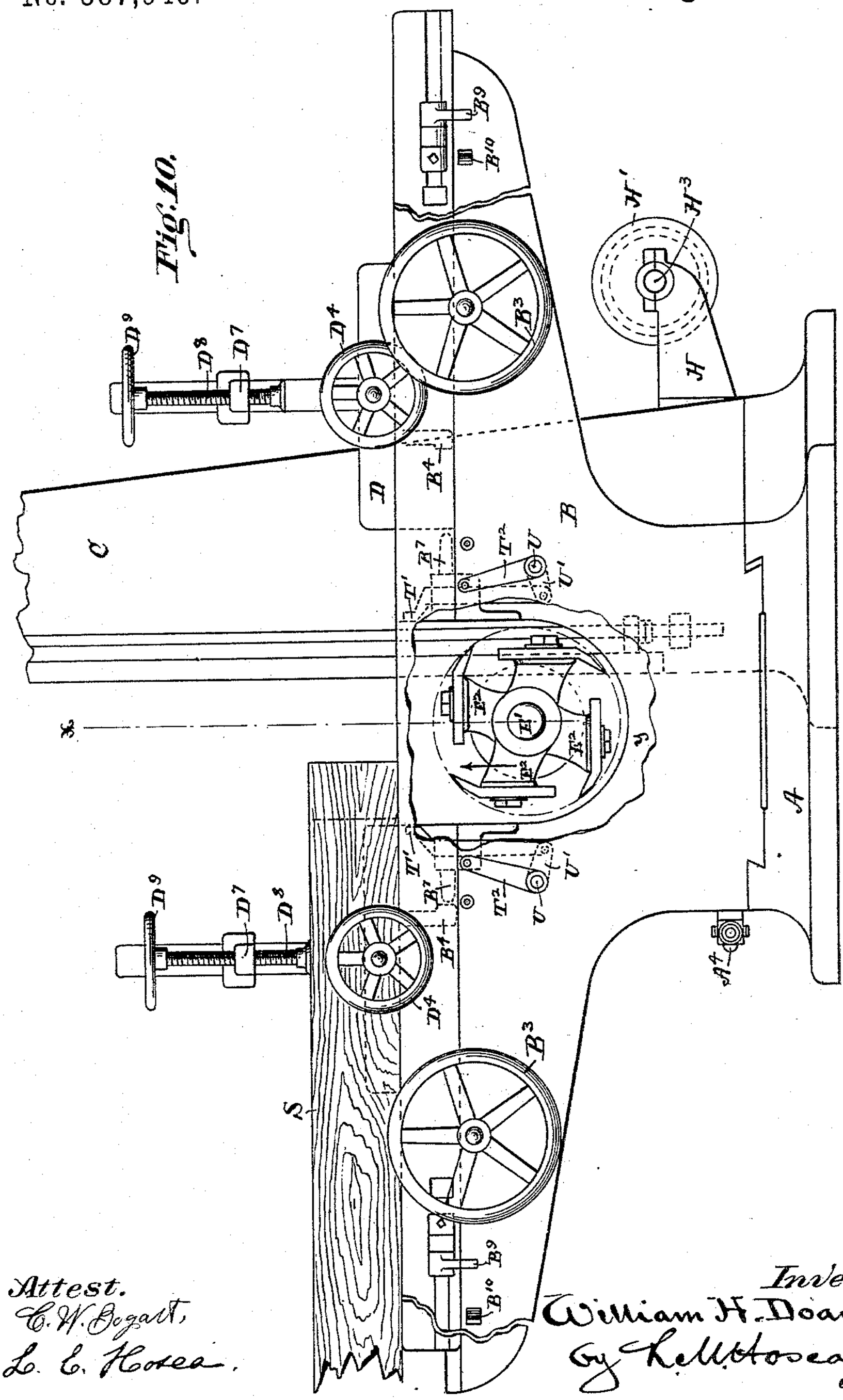
9 Sheets—Sheet 7.

W. H. DOANE.

TENONING MACHINE.

No. 387,949. Patented Aug. 14, 1888.

Fig: 10.



Attest.
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L. C. Korea.

Inventor.
William H. Doane,
by L. C. Mitchell
Atty.

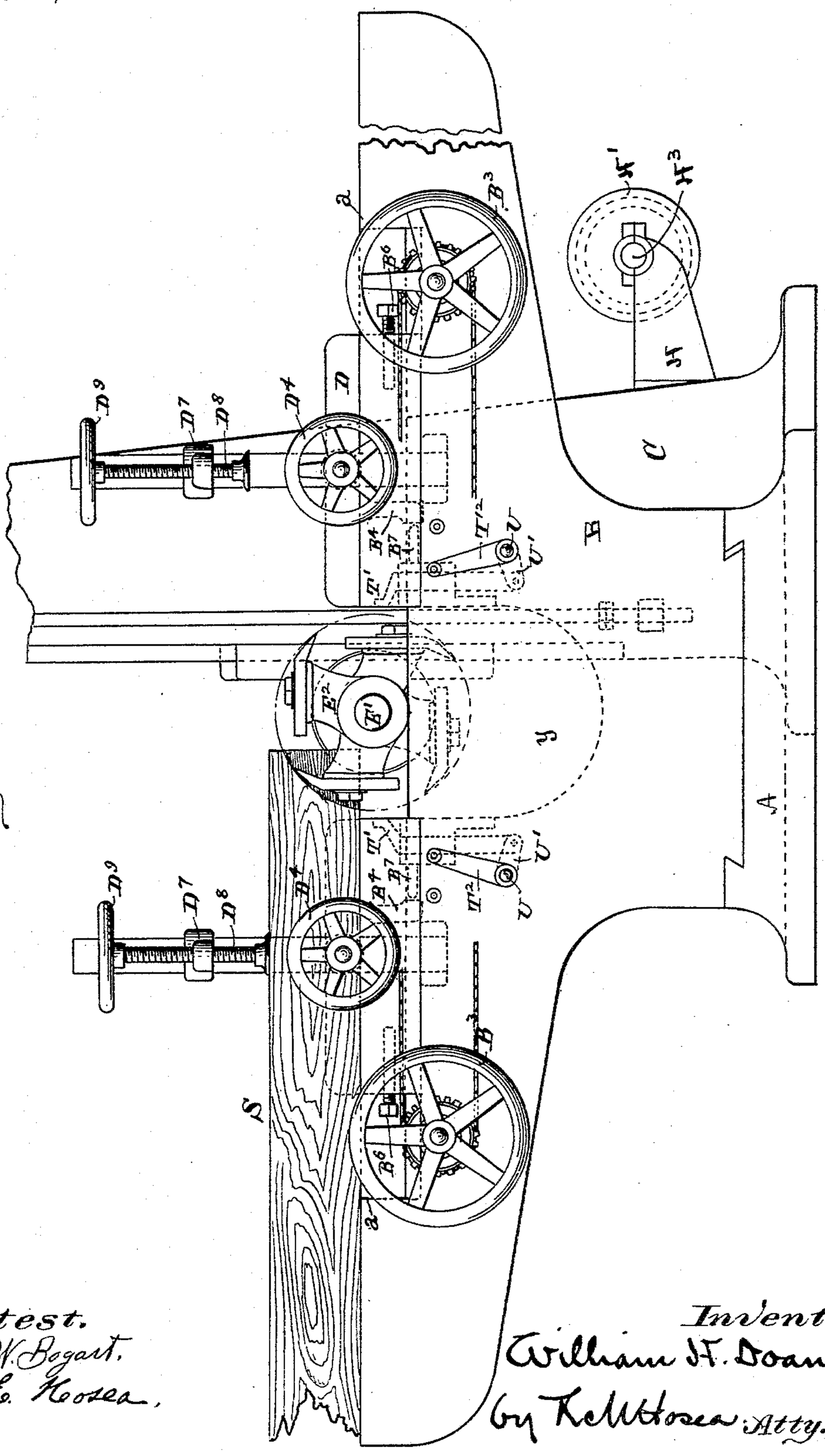
(No Model.)

9 Sheets—Sheet 8.

W. H. DOANE.

TENONING MACHINE.

No. 387,949. Patented Aug. 14, 1888.



Attest.
C. W. Bogart.
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Inventor.
William H. Doane.
by Kellogg & Hosea Atty.

(No Model.) 9 Sheets—Sheet 9.

W. H. DOANE.

TENONING MACHINE.

No. 387,949. Patented Aug. 14, 1888.

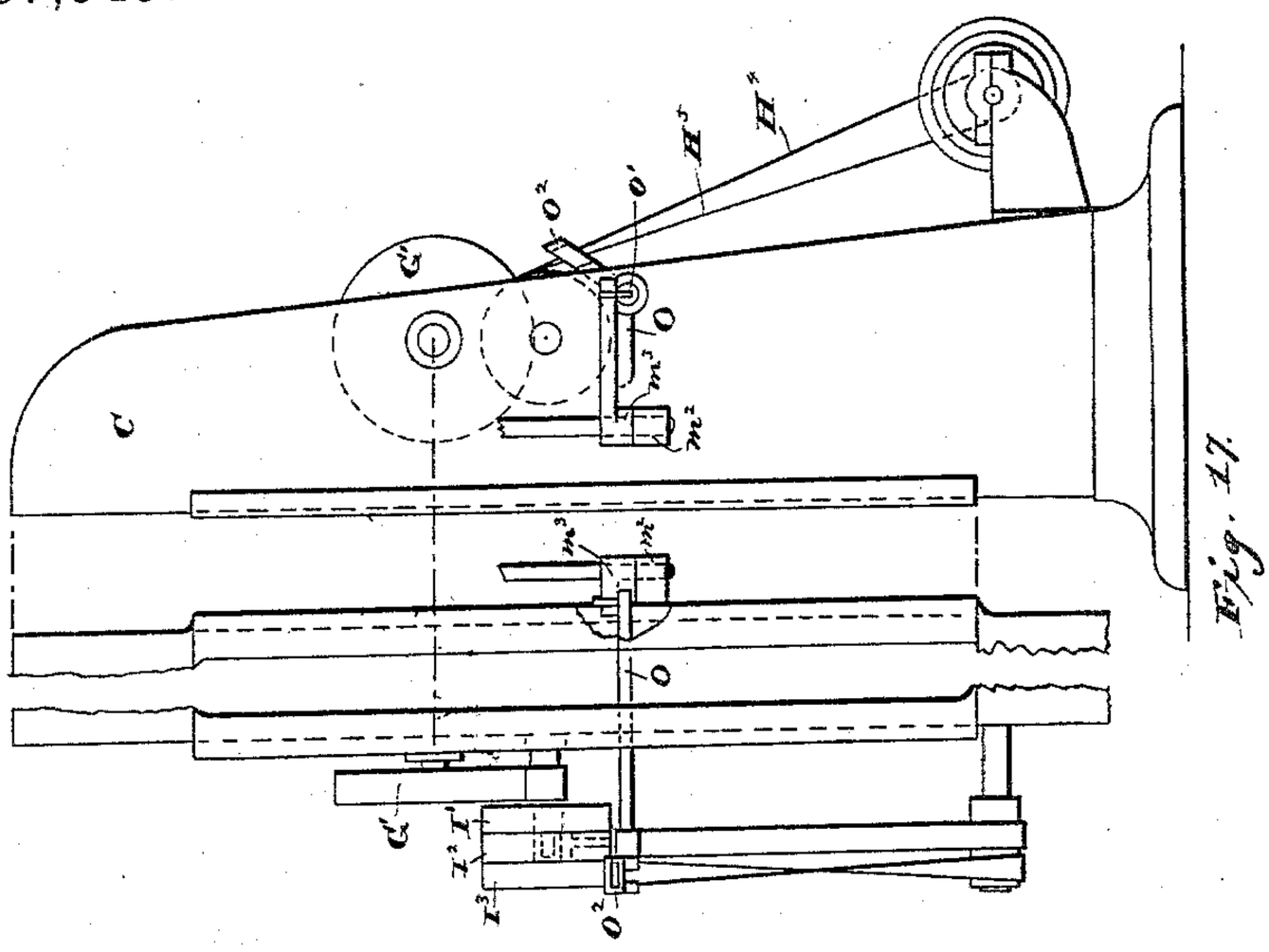

Fig. 17.

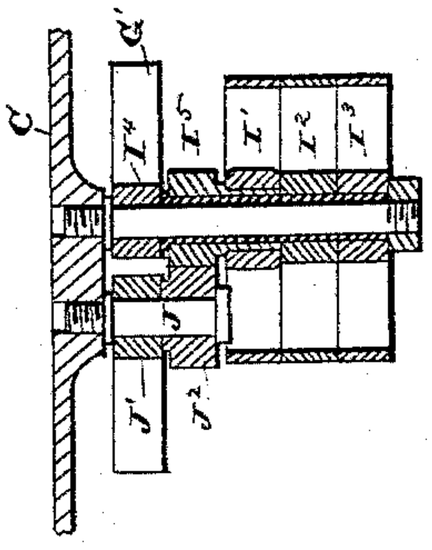

Fig. 15.

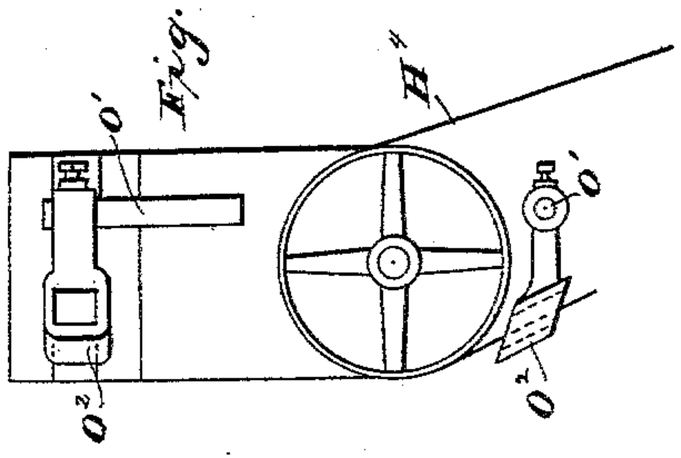

Fig. 16.

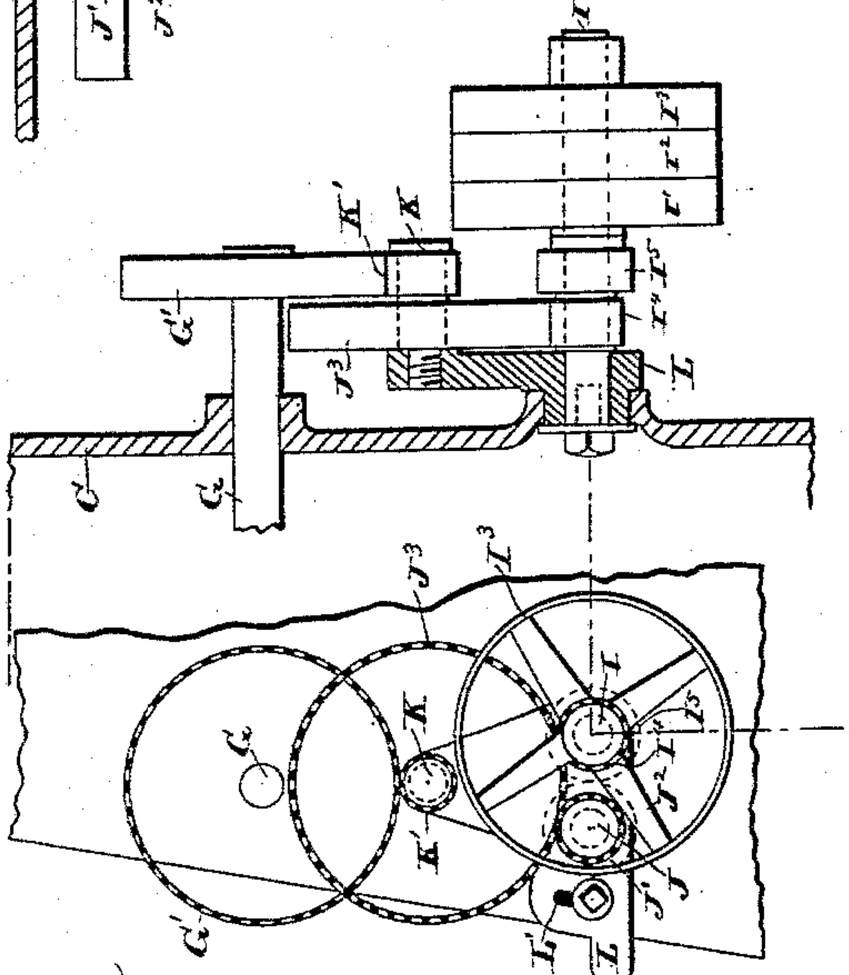

Fig. 13.

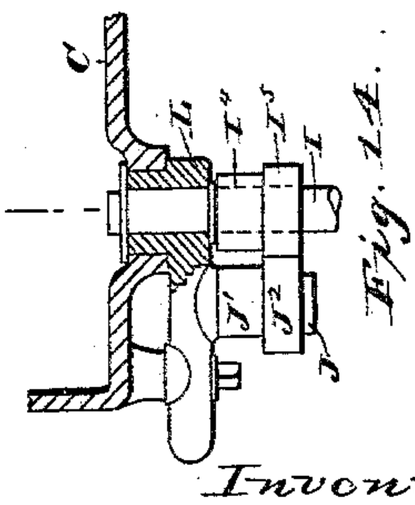

Fig. 14.

Witnesses.
Chas. R. Burr.
Thomas Durant.

Inventor.
William H. Doane.
by Mcleish Church.
his Attorneys.

UNITED STATES PATENT OFFICE.

WILLIAM H. DOANE, OF CINCINNATI, OHIO.

TENONING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 387,949, dated August 14, 1888.

Application filed February 17, 1888. Serial No. 264,415. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM H. DOANE, a citizen of the United States, residing at Cincinnati, Ohio, have invented new and useful Improvements in Tenoning-Machines, of which the following is a specification.

My invention relates to "tenoning-machines," particularly of the class of power-machines employed for tenoning the ends of joists, car-sills, &c., and for similar work, its object being to improve the same in respect to their action in several particulars, which may be generally stated as follows: first, to render the feed of the cutter-heads automatic in respect to the vertical limitations of the feed action; second, to facilitate the adjustment of the work to the cutters by providing movable work-carrying platens with propelling and adjusting devices, so that after the work is clamped thereto its position may be accurately adjusted in relation to the cutters to regulate or vary the relative position, depth, &c., of the tenons; third, to regulate the adjustment of the platens by the provision and arrangement of certain stops employed in combination therewith, whereby not only is the initial adjustment of the work in relation to the cutters facilitated, but also the shifting and readjustment of the work for the action of the cutters upon the opposite end of the timber; and, finally, to construct and arrange the various parts to produce a compact and efficient machine for the purposes in view, all as more particularly specified and illustrated hereinafter.

Mechanism embodying my invention in its preferred forms is illustrated in the accompanying drawings, in which—

Figure 1, Sheet 1, is a general side or front elevation of the machine so far complete as to indicate all of its main features. Fig. 2, Sheet 2, is a general end elevation of same. Fig. 3, Sheet 3, is a general plan view of same. Figs. 4 and 5, Sheet 7, are detail views at different sides of minor modifications in the power-transmitting mechanism for giving vertical motion to the gateway carrying the cutter-shaft and cutters. Figs. 6 and 7, Sheet 8, are detail elevations at different sides of other minor modifications in the same. Fig. 8, Sheet 7, is a detail showing the end of a sill tenoned by the action of the machine. Fig. 9, Sheet 4, is a detail front elevation showing the cutter-head in descent from its upper position, and the sill in place being tenoned by the downward or direct action of the cutter-head, and the opposite platen in position ready to receive the sill when shifted across the gap. Fig. 10, Sheet 6, is a similar detail showing the cutter-head in its lower position, ready to begin its upward cut, and the sill shifted to its second position, ready to be tenoned at its uncut end by the upward or reverse cut of the cutter-head, and the first platen restored to its initial position. Fig. 11, Sheet 7, and Fig. 12, Sheet 5, are details showing a plan and end elevation embodying modifications in the constructive arrangement of the platens, in which each platen is separate and independent from the other. Fig. 13, Sheet 9, is a side elevation and correspondingly vertical transverse section of a portion of the column, showing the construction and arrangement of the pivoted stud-plate hereinafter referred to, with the system of gearing carried thereon. Fig. 14, Sheet 9, is a corresponding horizontal section of the same parts. Fig. 15, Sheet 9, is a plan section further illustrating the modification shown in Figs. 4 and 5. Fig. 16, Sheet 9, is a detail plan and corresponding elevation of the belt-shifter and shifting-rod; and Fig. 17, Sheet 9, a corresponding front and side elevation of the column and double belt-shifter.

Referring now to the drawings, in which the parts hereinafter described are indicated by letters of reference in aid of the description, A designates the base or sole plate of the machine, upon which is mounted the main table or supporting-frame B and main column C. The table B (I apply the term "table" thus to the fixed supporting-frame in contradistinction to the term "platen" as applied to the adjustable tables thereon, referred to later) is extended longitudinally in both directions beyond the vertical path x of the cutter-head, presently to be described, the two end portions being separated by a gap or depression, y, to allow the cutter-head, while continuously performing its cutting action, to pass downward and upward through the gap, across the horizontally-extended plane occupied by the sill or joist timber S under treatment, and cut tenons at opposite ends of the same in succes-

sive reciprocating movements. This peculiarity of action or "duplex" movement distinguishes the class of machines herein termed "double-acting" or "duplex" tenoning-machines. The gap thus formed is connected directly across in front by the front wall of the frame, which extends longitudinally outward at each side as a bracket under each extension of the table proper, and is connected at the rear by a depressed or U-shaped bridge-bar, B^5, Figs. 2 and 3. The sides of the frame constitute below a supporting-pedestal resting upon the sole-plate A. The entire table B, with its extensions and intervening gap, thus rests upon a central pedestal, and this is "gibbed" upon the base or sole plate A in guideways from front to rear, to permit the table B to be shifted as a means of adjusting the work laterally in relation to the cutter-heads, so as to regulate the positions of the tenons to be cut. The lateral adjustment thus described is effected by a fixed rack, A′, (shown by dotted lines in Figs. 1 and 2,) secured across the upper surface of the sole-plate A, in which is meshed a spur-pinion, A^2, carried at one end of a pivotal shaft, A^3, journaled in a frame, B. A ratchet, A^4, carried at the opposite end of the shaft A^3, projected beyond the pedestal, is provided with a ratchet hand-lever, A^5, provided with a spring-handle, A^6, and pawl A^7. The shaft A^3 being rotated by the ratchet-lever A^5 in fixed relations to the table B, the engagement of the spur-pinion A^2 with the rack A′ shifts the position of the table B laterally in its guides upon the sole-plate A, for the purpose stated.

Each horizontal extension of the table B is provided with surface guideways parallel with the general line of extension, upon which is mounted by a gib or gibs, D′, a slide-frame, D, having two platens, which may be secured together as one structure, or constructed and arranged otherwise to move together or independently. The present description will be confined to the first-mentioned construction, as shown in Figs. 1, 2, and 3, in which the slide-frame D has two platens, separated by an interval corresponding with, but somewhat wider than, the gap of the main table B, and connected across in front by an extension of the front walls of the slide-frame flush with the front wall of the main table B.

The slide-frame D is moved longitudinally upon its guides by means of duplicate racks and pinions, as follows: Racks D^2 (shown by dotted lines, Figs. 2 and 3) are secured longitudinally to the under side of each of the platens, engaged by spur-pinions B′, carried upon a shaft, B^2, journaled across and in the front and rear walls of the main frame B. The front projecting end of each shaft is provided with a hand-wheel, B^3. Thus the platens can be adjusted longitudinally in relation to the vertical path of the cutter-heads by the operator standing at either side of the central gap, *y*, of the frame. In order to prevent the platens from passing beyond the limits of the gap *y* in the main table B toward the cutters, stops B^4 are provided depending from the under sides of the platens and engaging against suitable lugs provided upon the lower frame, B; or any other suitable provision may be made.

The rear or outer limit of the slide-frame D at each end of the table B is controlled by a slide-plate, B^8, Figs. 1 and 2, having on its under side or inside a rib or spline planed to fit a longitudinal groove, D^{10}, formed in the outer or front wall of the platen, by which means the slide-plate may be adjusted longitudinally to any desired position, and is retained by a set-screw. From each of the slide-plates B^8 a stud projects outwardly endwise, carrying a pivoted dog, B^9, which, as the slide-frame D is moved relatively away from the cutters, swings outward over the beveled face of a fixed lug, B^{10}, projected into its path from the side of the table B, and falls behind said lug, and, by engagement against the abutment formed by the perpendicular rear side of said lug, prevents the table from moving again toward the cutters until this engagement is relieved by hand. The relative point of engagement is determined and adjusted by the position of the slide-plate B^8, so that when the platen is in position (with the dog B^9 against the lug B^{10} and the sill moved forward against a stop, T′, presently to be described) the relative depth of the tenon is determined by said engaging position of the plate B^8.

Each platen of the slide-frame D is provided with suitable clamps for holding the work—such, for example, as side screws, D^3, actuated by hand-wheels D^4 and the top screws, D^8, provided with hand-wheels D^9, and carried in gallows frames or standards D^6 D^7, held in lugs D^5 at the back of the main table B. These, in connection with suitable stops, *d*, at the rear side of the platen projecting above its surface, furnish the means of holding work of any size securely in position. In connection with the platens, independent stops T′ are provided, arranged to be operated vertically in the central gap of the table B, one at each side, and rising into the projected path of the timber. Each stop T′ is the engaging end of a bar, T, moved in vertical guides below the platens with sufficient movement to carry the stop T′ above the plane of the platen-surfaces to engage the timber, and below the plane of the platen-bottoms to clear the same for the passage of the platens over the stops, as may be required.

The bars T are each provided with one arm, U′, of a bell-crank lever, whose pivot U is in fixed bearings in the frame B, and whose remaining arm, T^2, is a hand-crank carried outside of the frame B in convenient reach of the operator. The two movable stops T′ T′ are duplicates, as described, and are arranged one at each side of the central gap of the table B, just beyond the range of the cutter action. Their function is to furnish guide-stops to facilitate adjusting the sill or timber properly upon the platen to regulate the length of the

tenons in connection with stops B^8, as explained, which function being accomplished, they are lowered out of the way, as stated.

It may conduce to brevity and clearness here to describe, generally, so much of the operation of the machine as relates to the parts already enumerated, which are particularly concerned in the adjustment of the work to the cutters according to the desired length and relative position of the tenons. First, then, suppose it is desired to tenon the sill or timber S at both ends and the operation to be begun at the right-hand end of the machine. The slide-frame D, embodying the platens, is moved to the right-hand limit, according to gage-stop B^{10}, and the right-hand stop, T', elevated, and the sill S placed on the platen against the back-stops *d* and shoved to the left until stopped by the said stop T'. The timber is then clamped by the side clamps, D^3, the stop T' lowered by its hand-lever T^2, and the platen moved to the left by its hand-wheel B^3 to the limit of its movement, where its stop B^4 strikes against the inside projection, B^7, of the frame. This, it will be observed, shifts the opposite platen backward, its dog B^9 passing over the lug B^{10}, since the platens are connected. The lateral position of the sill in relation to the cutters is now adjusted, if required, by moving the frame B by the ratchet-lever A^5. The upper clamp, D^8, is now brought down upon the sill S, which is thereby held firmly to the platen and the platen held rigidly upon its guides. The cutters, being in due rotation, are now started downward from their initial highest position, cutting through the sill S, (as shown, for example, in Fig. 9,) and by the mechanism hereinafter described, after the cutters have passed through and below the work to the position shown, for example, in Fig. 10, (which is the lowest limit of their travel,) they remain rotating at such lower limit until the operator starts the elevating mechanism in operation. Before doing this, however, the operator loosens the clamps holding the timber to the platen (consequently releasing the platen) and shifts the sill longitudinally across the gap *y* of the table B above the cutters to a relatively similar opposite adjustment of and upon the opposite platen, and as indicated, for example, in Fig. 10, where, by the upward movement of the cutters, the remaining end of the sill is tenoned. It should be noted, however, that the manipulations described will produce corresponding tenons at both ends of the timber; but any desired variations in relative length or position of tenons producible with the same cutters may be accomplished by the adjusting means described.

The mechanism directly concerned in the actuation of the cutters is as follows: Upon the sole-plate A, at the rear of the table B, at one side of the central gap, *y*, of the table, is arranged a column, C, consisting, practically, of two side plates in planes parallel with the general length of the table B, joined at the top and bottom in front, but otherwise open between. The front edges of these plates are faced as or provided with guide-bars for a counterbalanced cross-head, or, as usually termed, a "gateway," E, carrying at its back one or more vertical parallel rack-plates, F, (two being shown,) meshing with spur-pinions F', whose operating-shaft G is journaled at the rear of the racks between and in the walls of of the column C. By the action of the pinions upon the racks the gateway E is moved vertically upon its guides.

Across the front of the gateway E, and projecting at the side of the column C in the central vertical line of the gap *y* in the table B, is journaled the shaft or mandrel E', on which the cutters E^2 are carried. Between the journal-brackets of the mandrel E' the mandrel is provided with a belt-pulley, E^4, by which power is transmitted by a belt, Z, from a counter-shaft above the machine, the belt passing downward from the counter-shaft around the front of the pulley E^4, upward at its rear over an idler-pulley, E^5, carried in bearings E^6 of the gateway E between the racks F, and thence around an idler, E', journaled between the walls of the column C below, as indicated by dotted lines in Figs. 1 and 3, and thence vertically back to the counter-shaft driving-pulley above. The pulleys E^4 and E^5 are thus movable with the gateway E, and are carried in bights of a double loop of the belt, which permits the vertical movement of the gateway without disturbing the rotative relation of the belt to the cutter-mandrel.

The power applied to raise and lower the gateway E and its mandrel E' is arranged to cease automatically at predetermined upper and lower limits, and acts independently of the rotation of the cutter-mandrel. The arrangement is as follows: From the relatively-fixed upper counter-shaft (not shown) power is transmitted by a cone-pulley and a belting, *w*, Fig. 1, to a corresponding cone-pulley, H', in bearings H upon the sole plate A or column C, (preferably the latter,) and carries a wide driving-pulley, H^2, at its end, giving rotation by belt H^4 to fast and loose pulleys I' I^2 I^3, all carried upon the extended hub of a gear, I^4, running loose upon a stud, I, secured to the rear wall of the column C, Figs. 1, 2, and 3. The outer pulley, I^3, being fast to the hub, drives the gear I^4. The inner pulley, I', is fast to a gear, I^5, intervening between it and the gear I^4, and drives said gear I^5, but is loose in relation to the hub of gear I^4, while the pulley I^2 runs loose upon the hub of gear I^4; and when the belt is shifted upon it from either direction the feed-motion ceases. Power is thus given alternately to the gears I^5 and I^4, shifting the belt H^4 from the central loose pulley, I^2, to the adjacent pulleys I' I^3 alternately. These latter gears connect as follows: A stud plate, L, (dotted lines, Fig. 1,) illustrated in Figs. 13 and 14, is pivoted to the column C concentric with the stud I, carrying a stud, J, in proximate relations to the stud I, and a stud, K, in proximate rela-

tions to the shaft G. Upon these studs are carried sets of idler-pinions and gears, as hereinafter described, for the purpose of transmitting a direct or reverse rotation from the pulleys I′ I³ to the gear G′ on shaft G, and thence to the racks F, by the continuous action of the belt H⁴. The pulley I′ being fast to pinion I⁵, the latter drives a pinion, J², and adjacent gear, J′, both on stud J, and the gear J′ drives a gear and pinion, J³ K′, on stud K, the pinion K′ driving directly into the gear G′ and giving the direct motion of the feed. The pulley I³ being fast to pinion I⁴, the latter drives into the gear and pinion J³ K′ on stud K (without the intervention of the idlers J² J′) and gives motion to the gear G′. The plate L, being pivoted, as stated, may be partially rotated and the pinion K′ dropped out of mesh with gear G′. A slot, L′, in the plate, engaging upon a stud or bolt seated in the column C, limits this movement, the object of which is to entirely disconnect the power mechanism and permit the shaft G′ to be operated by a hand-lever applied as desired to its squared projecting end.

In the modification exhibited in Figs. 4, 5, and 15 the gearing is somewhat simplified. In this the plate L, stud K, and gears J³ and K′ are omitted, and the stud J is secured directly to the column. The gears I⁴ and J′ are in constant mesh with the gear G′, and are driven alternately by shifting the belt on pulleys I′ I³, as before described.

The belt-shifting mechanism, Figs. 1, 3, and 16, is arranged as follows: A shifting-rod, O′, terminated by a yoke, O², engaging the belt H⁴, extends to a crank, M³, upon a vertical pivot-shaft, O, arranged at the rear of the table B in bearings upon the column C. From this shaft a hand-lever, L², projects forward over the table to convenient reach of the operator. This lever moves over a segment-bar, M′, Fig. 3, by which the limits of its movement are determined, and by a slight depression at the center of the arc, into which the lever falls automatically, it is retained at will to hold the belt on the central idler-pulley, I², until the lever is shifted to the extremity of the segment-bar by hand. As one convenient means of automatically actuating the belt-shifter by the movement of the gateway E, I have shown adjacent to the pivot-shaft O a "stop-rod," P, carrying oppositely-beveled stops Q Q′, projecting at opposite sides of the rod P and curved to opposite sides of the rod O, respectively above and below a dog, P², on the shaft O. The dog P² also projects at opposite sides of the rod O, and its terminal engaging faces are brought thus into the vertical line of the beveled faces of the stops Q′ Q², so as to engage said faces in the vertical movement of the rod P. The stop-rod P is moved vertically in bearings upon the column C with sufficient friction to retain the position to which it may be moved, and carries two lugs, P⁴ P⁵, spaced apart sufficiently to permit the vertical play of an embracing-yoke, M², attached to and projecting from the gateway E. The lugs P⁴ P⁵ are preferably screw-nuts threaded upon the rod P, and thus adjustable as desired. By this means the vertical movement of the gateway in either direction engages one of the lugs P⁴ or P⁵, elevates or depresses the rod P, and thus brings one or the other of its stops Q Q′ into engagement with the dog P², giving the rod O a partial rotation and shifting the belt H⁴ from either side to the central idler-pulley, I².

The operation of this portion of the mechanism may be most conveniently described at this point. Suppose, then, the cutters to be in rotation in the upper position, and the belt H⁴ on its idler-pulley, in which case the hand-lever L² will be central. The work being adjusted upon the platens, as already described, and properly secured, the hand-lever L² is moved over in the proper direction to carry the belt H⁴ upon the down-feed pulley. The gateway E is now carried down by the rotation of the shaft G and the engagement of the pinions F′ with the racks F, the cutters E² acting upon the timber. When the gateway has descended to the proper limit, the yoke M² engages the lower stop, P, carries said rod thence downward, and causes the beveled face of the stop Q to engage the upper beveled face of the dog P² of the pivot-rod O, and thereby rotates the same to its original or starting position, drawing the belt H⁴ back to its idler I² by means of the crank-arm M³ and shifting-rod O′. The hand-lever L² is thus also restored to its original position upon its segment-bar and drops into its retaining-depression. The timber is now shifted for the tenoning of its opposite end and readjusted, as described. The hand-lever L² is now moved over to the opposite limit, thus carrying the belt H⁴ to its upward-feed pulley, whereupon the gateway E is moved upward, the cutters acting upon the timber S from below until the yoke M² engages the upper lug, P⁴, of the rod P, and carries the rod P upward until the stop Q′ engages the dog P² at the opposite side of the rod O and partially rotates said rod, and by the described connections shifts the feed-belt H⁴ back again to its central idler, I², and restores the lever L² to its original or starting position. As already explained, the motion of the gateway in either direction ceases when the belt H⁴ is shifted to the idler-pulley I². Figs. 1, 9, 10, and 12 exhibit the various positions of the gateway and cutters and the relation and position of the timber in various stages of treatment. Thus the action of the machine is automatic in shifting the feed-belt back to its inert position at both limits of the gateway motion, and, as already explained, the power feeding mechanism is so arranged that the gateway may be fed by hand at will by applying a crank-lever to the shaft G.

It remains to describe certain minor modifications in the arrangement of the mechanism.

Figs. 6 and 7 exhibit a modification of the

feed system. The pinion I^4 alone is used on the stud I to drive gear G′ on shaft G. To the drive-belt H^4 is added another—a crossed—belt, H^5, also connecting the pulley H^2 with the three pulleys I' I^2 I^3, all mounted upon the extended hub of the pinion I^4, I' I^3 being fastened thereto and I^2 running loose between them. The belt-yoke O^2 is doubled to embrace both belts H^4 and H^5, which are thus shifted together, as illustrated in Fig. 17. In the position shown in Fig. 6 the crossed belt H^5 rotates the pinion I^4 by the fast pulley I^3, while the belt H^4 rotates the idler I^2. Shifting both belts to the right causes the belt H^4 to rotate the pinion I^4 by means of the fast pulley I', while the crossed belt H^5 will then rotate the idler I^2.

Fig. 8 shows the tenoned end of a sill as an example of the action of the cutters; but it will be obvious that tenons may be made either single, double, triple, or varied within wide limits of form, size, and position by rearrangement of the cutters upon their mandrel and by the platen adjustments described.

In Figs. 11 and 12 are shown a plan and side elevation, respectively, of the machine with the connection between the platens removed, leaving them independent of each other. The construction and attachments are otherwise the same as already described, and shown in the preceding figures. To these attachments is added an adjustable stop, B^6, to limit the backward or receding movement of the platens from vertical line of the cutters. The form of the stop shown is practically an adjustable bolt-head threaded into each platen longitudinally at the end, and a shoulder, *a*, projected upward from each end of the table as an abutment. I have also shown in these figures a rotating connection between the shafts B^2, whereby the movement of the platens may be made simultaneous. The connection shown is a chain, 2, engaging upon sprocket-wheels 3; but any suitable connecting mechanism may be employed for the purpose and arranged to be placed in or out of operative connection, as desired.

I claim as new and desire to secure by Letters Patent of the United States—

1. In a tenoning-machine having power-driven cutters cutting vertically in relation to the timber and feed mechanism for moving the cutters vertically by the driving-power to cut tenons during such movement, in combination with mechanism, substantially as described, for automatically controlling and confining the feed motion within upper and lower limits of action, substantially as set forth.

2. In a vertical tenoning-machine, in combination with the cutter-gateway and its feed mechanism for moving the same vertically by the driving-power to cut tenons during such movement, a controlling device for governing said feed, and connecting mechanism between the gateway and controlling device, whereby the movement of the gateway automatically controls the feed at and within the proper limits of its own action, substantially as set forth.

3. In a vertical tenoning-machine embodying, in combination, a cutter-head and gateway, power feed mechanism and connections between the same, whereby the feed is controlled and automatically stopped at proper limits of its action, and a hand-lever connected with said feed mechanism, whereby the feed may be controlled by hand, as desired, independently of the power-connection, substantially as set forth.

4. In a vertical tenoning-machine embodying a cutter-head and gateway, power-feed mechanism, and an adjustable driving-belt connection with said feed, whereby the shifting of the belt upon and between fast or loose pulleys operates to control and limit the action of the feed, the combination of a bell-crank having one arm attached to and actuating the belt-shifter and the other extended as a hand-lever for the operator, and mechanism connecting said bell-crank with the cutter-gateway, whereby the movement of the latter near its extreme limits rotates said bell-crank from either limit back to a central or normal position where the belt is held upon its idler, substantially as set forth.

5. In a vertical tenoning-machine embodying a cutter-gateway, power feed mechanism, and a feed-belt adjustable upon fast and loose pulleys to control and limit the action of the feed, the combination of a belt-shifter, a vertical pivot-shaft with which said shifter has an actuating connection, an actuating dog or dogs upon said shaft, and mechanism actuated by the gateway in its vertical movement to rotate said shaft and actuate said belt-shifter in both directions to control and limit the feed movement, substantially as set forth.

6. In a vertical double-acting tenoning-machine, in combination with the vertically-moving cutters and horizontally-moving platen, a table or supporting-frame having a central gap or depression, into which the cutters descend, adjustable upon the base-plate or supporting-pedestal horizontally in the axial line of the cutter-mandrel, substantially as set forth.

7. The combination, in a vertical double-acting tenoning-machine, with the sole-plate, the column, and the gateway vertically guided upon said column, of a table or supporting-frame having a central gap or depression, into which the cutters descend, guided upon the sole-plate, and a rack-and-pinion device connecting said sole-plate and table, whereby the table may be moved and adjusted laterally in the line of the cutter-mandrel, substantially as set forth.

8. In a vertical double-acting tenoning-machine, in combination with the vertically-moving cutters and a table or supporting-frame having a central gap or depression, into which the cutters descend, a platen or platens for carrying the work, adjustable longitudinally upon said table in a horizontal plane of the

cutter-mandrel toward and from the gap, substantially as set forth.

9. In a vertical double-acting tenoning-machine, in combination with the vertically-moving cutters and a table or supporting-frame having a central gap or depression, into which the cutters descend, two platens or work-holding surfaces adjustable longitudinally upon said table at opposite sides of said depression, and connected across the same outside the limits of the cutters, substantially as set forth.

10. In a vertical double-acting tenoning-machine, a table or supporting-frame having a central gap or depression, into which the cutters descend, adjustable in the line of the cutter-mandrel, in combination with a work-carrying platen or platens adjustable longitudinally upon said table perpendicularly to the cutter-mandrel, substantially as set forth.

11. In a vertical double-acting tenoning-machine, a table or supporting-frame having a central gap or depression, into which the cutters descend, provided with longitudinal surface guides, a work-carrying platen adjustable on said guides toward or away from the cutters, and a rack-and-pinion device interposed between said table and platen for moving the latter, substantially as set forth.

12. The combination, in a vertical double-acting tenoning-machine, of a relatively-fixed table having surface guides, a work-supporting platen movable on said guides, a stop between the table and platen limiting the movement of the platen toward the cutters, and a stop projecting upward at or near the central depression of the table in the path of the platen, above the line of the platen-surface, and downward below the limit of interference with the platen, as a gage to determine the position and adjustment of the work upon the platen, substantially as set forth.

13. In a vertical double-acting tenoning-machine embodying vertically-fed cutters and a relatively-fixed table having a central depression, into which the cutters pass, through and below the work, a double platen with an interval between its platen-surfaces corresponding with said depression, said platen being adjustable longitudinally at right angles with the cutter-mandrel, stops limiting the movement of the platens in either direction toward the cutters, and two gage-stops, arranged one at each side of the table-depression and adjustable from a lower limit of non-interference upward into or above the plane of the platen-surfaces, respectively, to determine the adjustment of a sill or joist timber from either end upon either platen-surface, substantially as set forth.

14. In a vertical double-acting tenoning-machine, the combination, with the vertically-fed cutters, of a relatively-fixed table and a platen movable thereon toward and from the cutters, and a catch between said platen and table, adjustable longitudinally on said platen and acting to allow the platen to pass without engagement backward, but to engage in the forward movement and limit the same, substantially as set forth.

15. In a vertical double-acting tenoning-machine, in combination with a relatively-fixed supporting-table, a work-carrying platen provided with a fixed stop limiting its movement toward the cutters, and an adjustable stop limiting its movement in the opposite direction, substantially as set forth.

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

WILLIAM H. DOANE.

Witnesses:
L. M. HOSEA,
L. E. HOSEA.