(No Model.)

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T. T. RAINFORD.

GANG BAND SAW MILL.

No. 548,091. Patented Oct. 15, 1895.

Fig. 1.

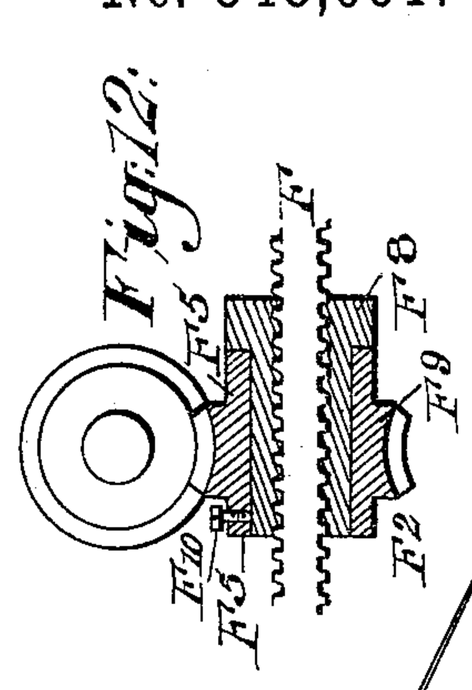

Fig. 12.

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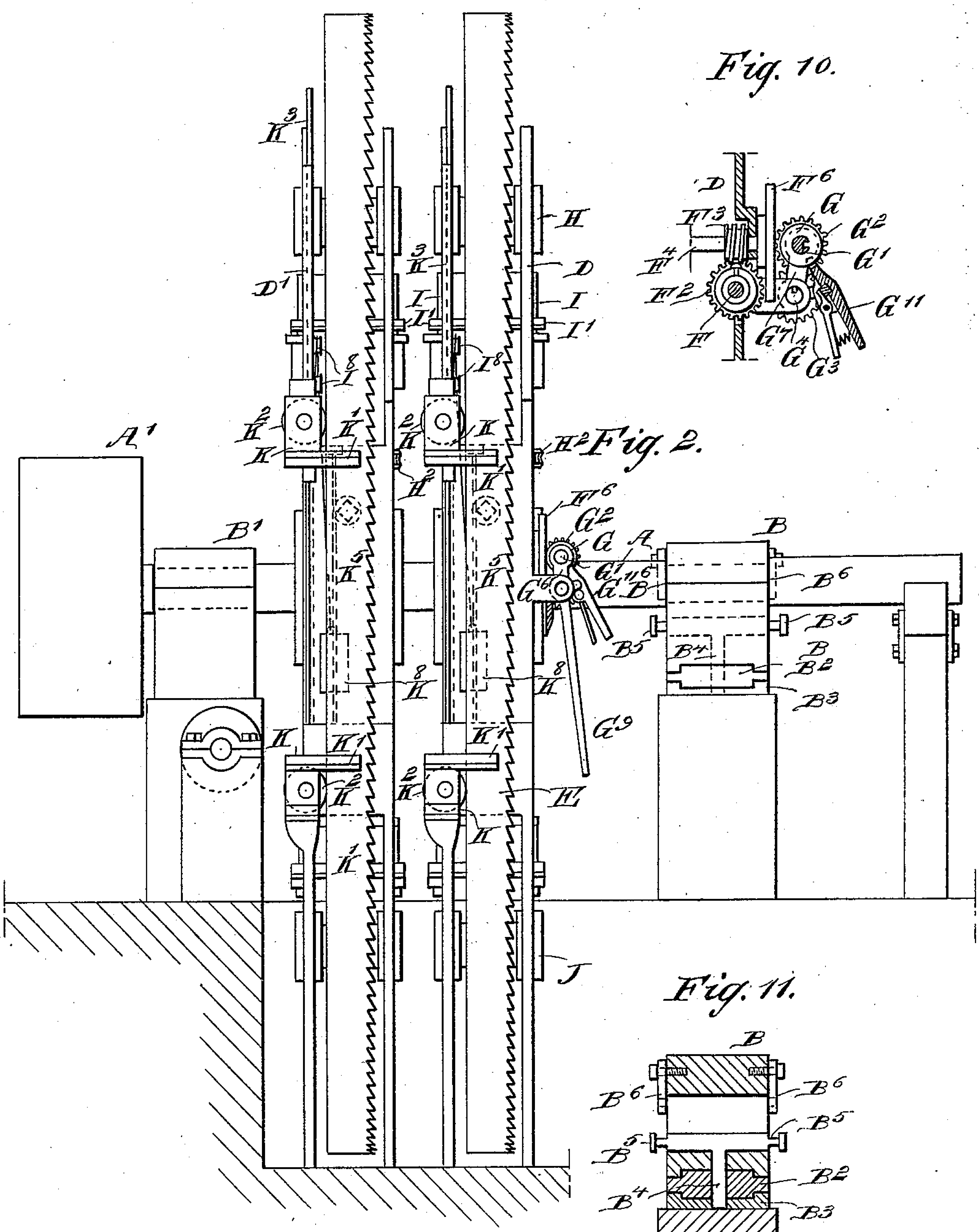

Fig. 10.

Fig. 2.

Fig. 11.

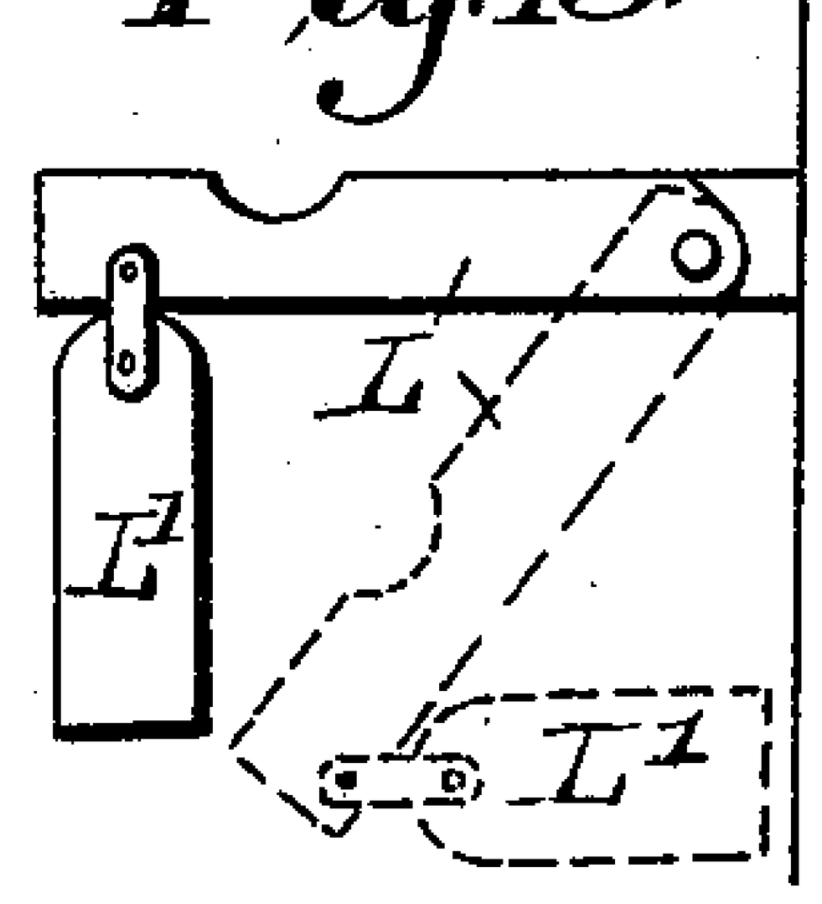

Fig. 13.

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No. 548,091. Patented Oct. 15, 1895.

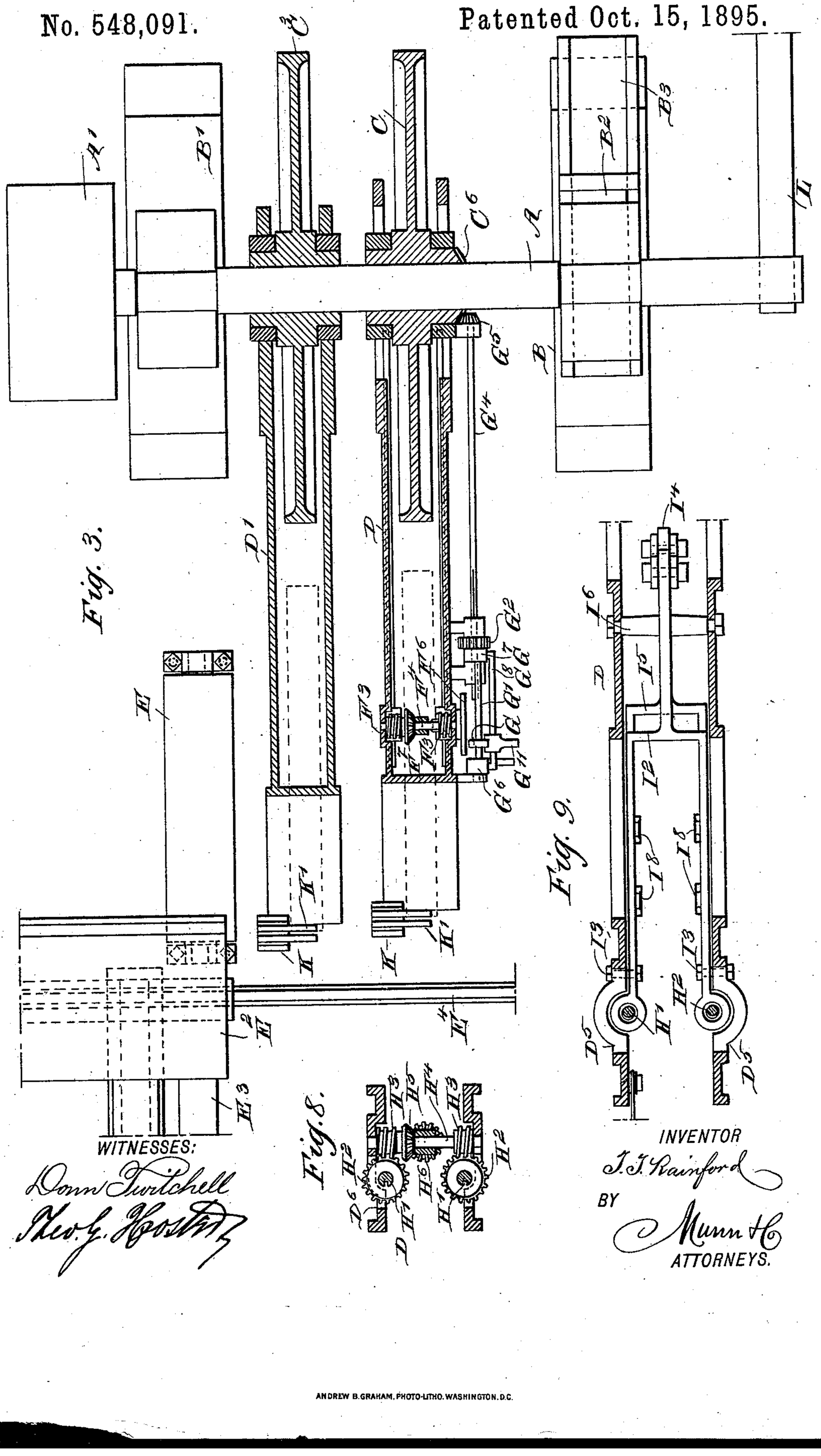

Fig. 3.

Fig. 9.

Fig. 8.

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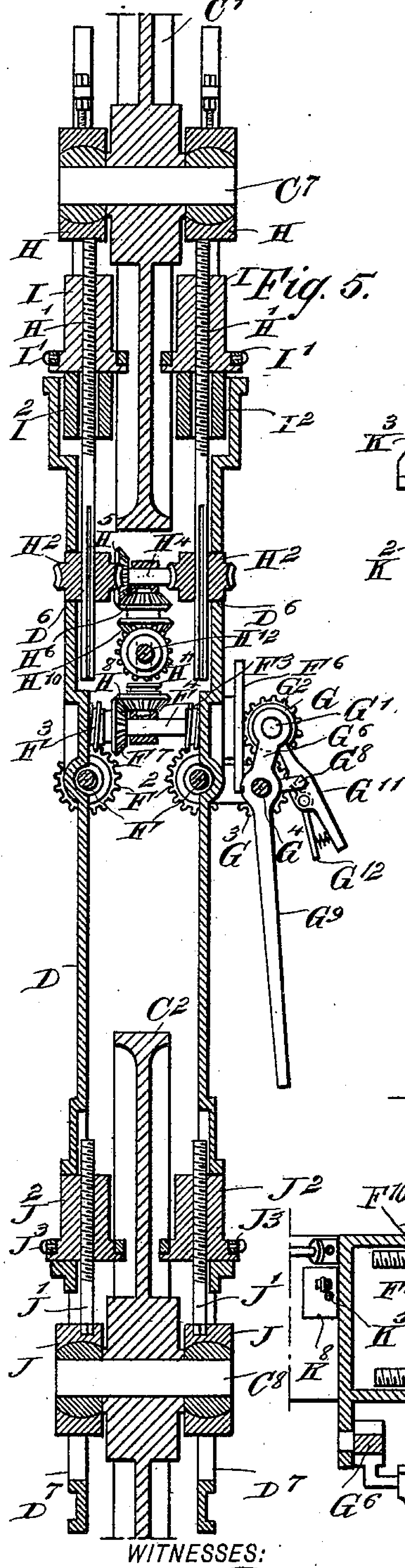

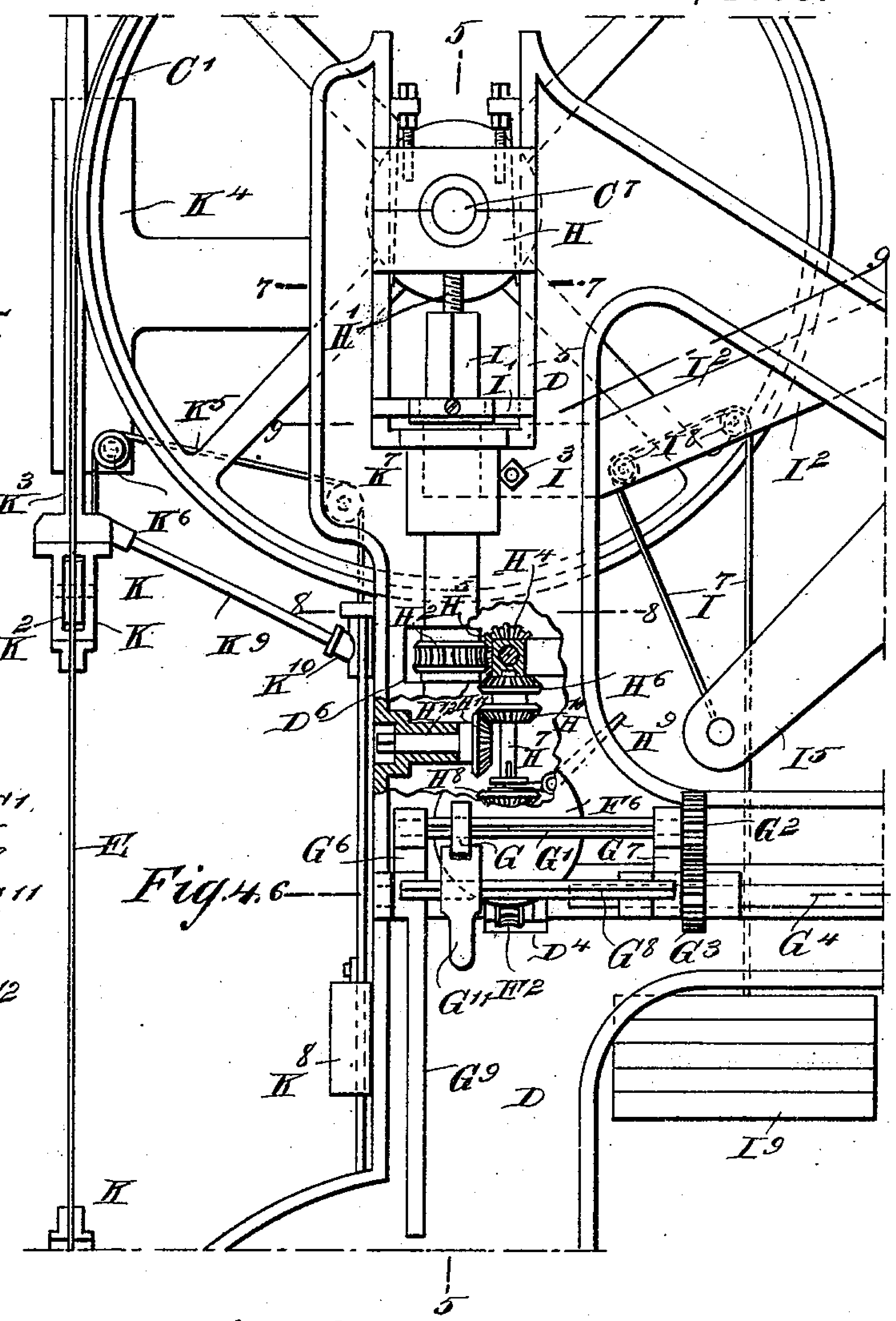

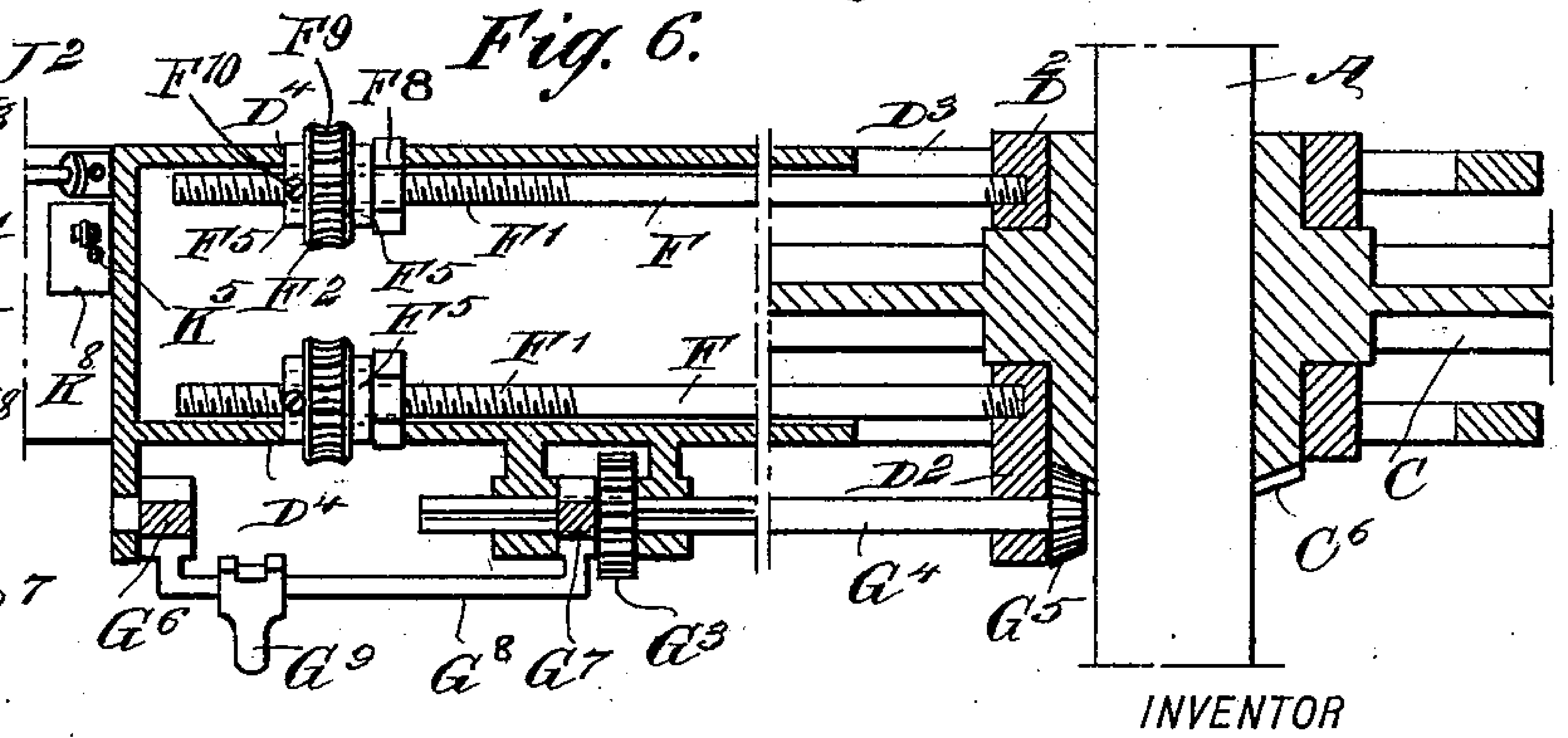

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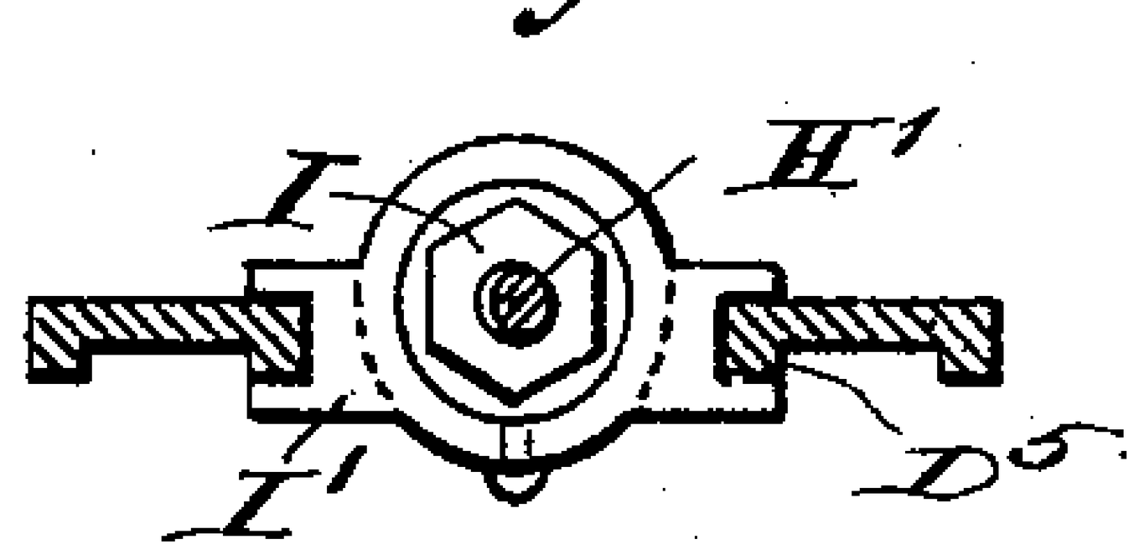

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UNITED STATES PATENT OFFICE.

THOMAS T. RAINFORD, OF TACOMA, WASHINGTON.

GANG BAND-SAW MILL.

SPECIFICATION forming part of Letters Patent No. 548,091, dated October 15, 1895.

Application filed August 4, 1894. Serial No. 519,467. (No model.)

To all whom it may concern:

Be it known that I, THOMAS T. RAINFORD, of Tacoma, in the county of Pierce and State of Washington, have invented a new and Improved Gang Band-Saw Mill, of which the following is a full, clear, and exact description.

The object of the invention is to provide a new and improved gang band-saw mill which is comparatively simple and durable in construction, very effective in operation, and more especially designed for cutting a log or piece of timber at one forward movement into any desired number of boards of equal or different thicknesses.

The invention consists principally of a main driving-shaft carrying a series of main saw-band driving-wheels and a frame for each driving-wheel supporting saw-band wheels in vertical alignment with each other and in alignment with the main driving-wheels.

The invention also consists in certain parts and details and combinations of the same, as will be fully described hereinafter and then pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate corresponding parts in all the views.

Figure 1 is a side view of the improvement. Fig. 2 is a front-end elevation of the same. Fig. 3 is a sectional plan view of the same on the line 3 3 of Fig. 1. Fig. 4 is an enlarged side elevation of the adjustable frame with parts in section. Fig. 5 is a transverse section of the same on the lines 5 5 of Figs. 4 and 1. Fig. 6 is a sectional plan view of the same on the lines 6 6 of Figs. 4 and 1. Fig. 7 is a sectional plan view of the bearing-block support for the upper band-saw wheel, the section being taken on the line 7 7 of Fig. 4. Fig. 8 is a sectional plan view of the bearing-block raising and lowering device, the section being taken on the line 8 8 of Fig. 4. Fig. 9 is a sectional plan view of the weighted-lever mechanism for automatically holding the band-saw taut. Fig. 10 is a transverse section of the frame-shifting mechanism. Fig. 11 is a transverse section of one of the pillow-blocks of the main driving-shaft, the section being taken on the line 11 11 of Fig. 1. Fig. 12 is a detail longitudinal section of the worm-wheel nut, and Fig. 13 is a detail view of the support for the end of the main driving-shaft when the saw-bands are being placed on the wheels or removed therefrom.

The improved sawmill is provided with a main driving-shaft A, extending transversely and journaled in suitable pillow-blocks B B′, set on proper foundations, as plainly illustrated in the drawings. On one end of the main driving-shaft A is secured a pulley A′, connected by a belt with other machinery for imparting a rotary motion to the said shaft A. On the latter is secured a main saw-band driving-wheel C, on the hub of which is held a box D^2, on which is fitted to slide longitudinally a frame D, extending forwardly and carrying in its upper end a band-saw wheel C′ and a similar wheel C^2 in its lower portions, the said wheels C′ and C^2 being in vertical alignment with each other, and in alignment with the main saw-band driving-wheel C. Over the wheels C, C′, and C^2, passes an endless saw-band E, the vertical portion of which, between the wheels C′ and C^2 serves to cut into a log moved forward in the usual manner by a suitable feeding device.

In the rear of the main saw-band driving-wheel C is secured on the shaft A a second main saw-band driving-wheel C^3, on the hub of which is held a stationary frame D′, carrying in its front end saw-band wheels C^4 and C^5, arranged in vertical alignment with each other and set somewhat in front of the wheels C′ and C^2, as will be readily understood by reference to Figs. 1 and 3. Over the wheels C^3 C^4 C^5 passes a second saw-band E′, the vertical portion of which, between the wheels C^4 and C^5, is adapted to cut into a log as the latter is fed transversely, it being understood that the saw-band E′ is somewhat in the rear of the band E, but farther out, as illustrated in Fig. 1, whereby two cuts are made simultaneously by the said vertical portions of the saw-bands E and E′. As the frame D can be longitudinally adjusted, the saw-bands E and E′ can be moved a greater or less distance apart, according to the thickness of the boards to be cut.

As shown in Fig. 1, the log or timber E^2 under treatment is supported on a carriage E^3, adapted to travel transversely on a suitable track E^4, the outer ends of the log being supported on a suitable roller E^5, journaled lon-

gitudinally in the rear of the frame D'. (See Figs. 1 and 3.) Now by shifting the log E^2 longitudinally the first saw-band E may be brought any desired distance from the outer edge of the log, so that the first cut made by the saw-band E will cut a board of a thickness which may vary from the thickness of the board cut by the saw-band E' following the first saw-band E.

In order to shift the frame D longitudinally the following device is provided: The hub of the wheel C is journaled in bearings D^2, on which is fitted to slide the rear end of the frame D, the latter being provided for this purpose with a transverse opening D^3, as shown in Figs. 1 and 3. In the bearings D^2 are secured the longitudinally-extending rods F, (see Fig. 6,) provided at their forward ends with screw-threads F', engaging the threaded bore of a worm-wheel nut F^2, in mesh with the worm-wheels F^3, secured on a transversely-extending shaft F^4, journaled in suitable bearings in the frame D. The worm-wheel nuts F^2, as shown in Fig. 13, are each composed of two parts—a threaded nut F^8, provided with a head and fitting, the screw-rod, and a worm-wheel F^9, provided with a hub F^5 at each side and mounted on the nut. The worm-wheel nuts fit into openings D^4, formed in the sides of the frame D, so that when the said worm-wheel nuts F^2 are rotated, then they screw and push or haul on the fixed rods F, and consequently shift the frame D longitudinally on the bearings D^2, owing to the worm-wheel nuts fitting in the openings D^4.

When it is desired to readjust the frame laterally, so as to cause the saw to lead into or out of the log, as may be desired, then the operator loosens the set-screw F^{10} in the hub of the worm-wheel F^2 (see Fig. 6) and gives a slight turn to the hexagon head of the nut F^8 in either direction, until the accurate lead of the saw is obtained. Then the set-screw is again screwed up to fasten the hub and nuts in place, and the adjustment is maintained. The adjustment is the setting of the frame in alignment with the main wheel C.

On the front end of the shaft F^4, previously mentioned, is secured a friction-disk F^6, adapted to be engaged at its front face by a friction-roller G, fitted to slide on and to turn with a longitudinally-extending shaft G', carrying at one end a gear-wheel G^2, (see Figs. 1 and 4,) in mesh with a gear-wheel G^3, fitted to slide on and to turn with a shaft G^4, journaled at one end in suitable bearings in the frame D and at its inner end in the bearings D^2, as will be readily understood by reference to Fig. 6. On this inner end of the shaft G^4 is secured a bevel gear-wheel G^5, in mesh with a bevel gear-wheel C^6, formed on the hub of the wheel C, so that when the latter is rotated the said gear-wheel C^6 meshing in the gear-wheel G^5 causes the rotation of the shaft G^4, and the motion of the latter is transmitted by the gear-wheels G^3 and G^2 to the shaft G'. Now when the friction-roller G, turning with the said shaft G', is in its frictional contact with the front face of the friction-disk F^6, then the latter and its shaft F^4 and worms F^3 are rotated to cause a rotary motion of the worm-wheel nuts F^2, to shift the frame D longitudinally by the said worm-wheel nuts F^2 screwing on the fixed rods F, as previously described. The shaft G' is journaled in a frame having the side arms G^6 and G^7 connected with each other by a longitudinally-extending bar G^8, the side arm G^6 being pivoted in the frame D and the other side arm G^7 being fulcrumed loosely on the shaft G^4, it being understood that the said shaft G^4 is in alignment with the pivot for the side arm G^6. On the latter is secured a handle G^9, adapted to be taken hold of by the operator, so as to swing the frame carrying the shaft G' inward or outward to move the friction-roller G into or out of frictional contact with the disk F^6. As long as the wheel C is rotating, the said shaft G', with its friction-roller G, is in motion, and whenever the operator desires to shift the frame D he simply swings the arm G^9 outward to move the friction-roller G in frictional contact with the disk F^6, so that the rotary motion of the friction-roller is transmitted to the disk F^6, as above described. Normally, however, the friction-roller G is out of engagement with the disk F^6 during the time of sawing logs.

Now in order to impart a sliding motion to the frame D, either to the right or to the left, I provide a shifting-fork G^{11}, engaging opposite sides of the friction-roller G, the said shifting-fork being fitted to slide longitudinally on the bar G^8, so as to move the friction-roller G either to the left or to the right of the center of the friction-disk F^6 to impart a forward or return motion to the said friction-disk, and consequently a motion to the right or to the left to the frame D. The shifting-fork G^{11} is preferably provided with a suitable hand-locking lever G^{12} for holding the said shifting-fork in position after the friction-roller G is moved to the proper position.

When the frame D is moved by the above-described device to the right, the saw-band E naturally slackens, and when the said frame is moved outward or to the left then the saw-band E would break if no provision were made for changing the position of the wheels C' and C^2 relatively one to the other. Now in order to compensate for the longitudinal movement of the frame D inward or outward, as described, to hold the saw-band E at all times in the proper position on its wheels C' C^2, I make the wheels C' and C^2 vertically adjustable and move the wheel C' up and down in its bearings by a mechanism actuated from the mechanism for shifting the frame D longitudinally, as above described. For this purpose the shaft C^7 of the wheel C' is journaled in self-adjusting spherical boxes, mounted in bearings H, fitted to slide vertically in guideways D^5, formed in the frame D. Each of the bearings H rests at its lower

end on a screw-rod H′, extending vertically on the inside of the frame D, the lower end of each screw-rod being engaged by a worm-wheel mounted to slide on and to turn with the screw-rod H′, the latter screwing in a nut-block I, supported from a lever mechanism, as hereinafter more fully described. Each worm-wheel H^2 engages at its top and bottom a recess D^6, formed in the side of the frame D, so that the worm-wheel is free to rotate to drive the screw-rod H′ to raise and lower the latter by the screw-rod screwing in the nut-block I. The worm-wheels H^2 are in mesh with worms H^3, (see Fig. 8,) secured on a transversely-extending shaft H^4, journaled in suitable bearings in the frame D, the said shaft H^4 carrying a bevel gear-wheel H^5, in mesh with a bevel gear-wheel H^6, secured on a vertically-disposed shaft H^7, journaled in suitable bearings held on the shafts H^4 and F^4. (See Figs. 4, 5, and 8.) On the lower end of the shaft H^7 is mounted to slide and to turn a bevel gear-wheel H^8, adapted to be thrown into or out of mesh with a gear-wheel F^7, secured on the shaft F^4. The bevel gear-wheel H^8 is provided with a shifting-lever H^9, under the control of the operator, to move the said bevel gear-wheel H^8 into or out of mesh with the bevel gear-wheel F^7.

On the hub of the gear-wheel H^6, previously mentioned, is secured a second bevel gear-wheel H^{10}, in mesh with a bevel gear-wheel H^{11}, held on a shaft H^{12}, extending longitudinally and journaled in suitable bearings arranged on the frame D, as plainly indicated in Fig. 4. The gear-wheels H^{10} H^{11} and shaft H^{12} serve for raising or lowering the upper band-wheel C′ independently and separately and are worked by a hand-crank applied to the end of the shaft H^{12}, which protrudes through the face of the frame D with a square end to receive the said hand-crank for the purpose of turning the shaft to adjust the height of the wheel C′ to suit different lengths of saws without changing the relative position that the saw E has to the saw E′ in their vertical position.

It is understood that the miter gear-wheel H^8 is raised up out of mesh with its fellow gear-wheel F^7 by the lever H^9, so that the wheel F^7 remains dormant, together with the worms F^3 and the worm-wheels F^2, so that the screw-rod H′ can be worked separately by hand. Now when the gear-wheel H^8 is in mesh with the gear-wheel F^7, and the shaft F^4 is rotated by the friction-roller G being in frictional contact with the disk F^6, as previously described, then a rotary motion is given to the said wheel H^8, its shaft H^7, and the gear-wheel H^6, so that the latter transmits its rotary motion to the gear-wheel H^5 and the worm-shaft H^4, whereby the worms H^3 on the said shaft H^4 rotate the worm-wheels H^2, and thereby turn the screw-rods H′, so that the latter screw up or down in the nut-blocks I to raise or lower the bearings H, and consequently the shaft C^7 and wheel C′. Thus when the frame D is shifted to the right by the mechanism previously described, then the screw-rods H′ are turned in such a direction as to screw upward in the nut-blocks I to raise the wheels C′, and thereby draw the saw-band E taut as the frame D moves outward to the right. When the frame D moves inward or to the left, then the friction-roller G is on the other side of the center of the disk F^6, so that a reverse motion is transmitted by the mechanism described to the screw-rods H′, whereby the latter are screwed downward in the nut-blocks I to lower the wheel C′, so as to compensate for the movement of the frame D in the direction to the left to hold the saw-band sufficiently taut over the wheels C, C′, and C^2.

The nut-blocks I are each provided with guide-arms I′, fitted to slide vertically in the guideways D^5 for the bearings H, and each nut-block I is engaged at its under side by an eye formed in the fork of a lever I^2, fulcrumed at I^3 on the frame D, as plainly illustrated in Figs. 1 and 9. This lever I^2 is pivotally connected at its outer end by a link I^4 with a second lever I^5, fulcrumed at I^6 on the frame D, and being connected at its free end with one end of a rope I^7, extending first upwardly over pulleys I^8 held on the lever I^2 in the rear of its fulcrum I^3. The rope I^7 then extends downward and carries or supports at its lower end a weight I^9, which has a tendency to impart an upward swinging motion to the eye ends of the lever I^2, to consequently press against the under side of the blocks I, so as to hold the screw-rods H′ with an upward pressure against the under side of the bearings H to hold the saw-band E at all times sufficiently taut for the work and after adjustment as above described.

The lower band-wheel C^2 has its shaft C^8 journaled in bearings J, fitted to slide in guideways D^7, arranged in the frame D, and the upper ends of the said bearings are engaged by screw-rods J′, extending upwardly and screwing in nut-blocks J^2, adapted to be turned by the operator when necessary, to adjust the wheel C^2 into vertical alignment, but normally held in position by set-screws in guide-arms J^3, engaging the guideways D^8, as plainly illustrated in the drawings. When the set-screw in the arms J^3 is loosened, then the nut-block J^2 can be turned by the operator applying a suitable tool, so as to screw the screw-rods J′ up or down, according to the desired adjustment of the band-wheel C^2. This adjustment for the bearings of the wheel C^2 is duplicated and is used on the bearings for the wheels C^4 C^5 in the frame D′. By this arrangement one side of the wheel C′ can be raised or lowered until it is in proper alignment, after which the set-screw is screwed up to again fasten the nut-block J^2 and arm J^3 together.

In order to properly guide the vertical portions of the saw-bands E and E′, I provide for each saw-band two guides K, engaging the band above and below the log to be cut, as

indicated in the drawings. Each saw-guide K is provided with two parallel arms K′, between which passes the saw-band, the back of which travels on a friction-roller K^2, journaled in the guide. Each guide is provided with guide-arms K^3, fitted to slide in suitable brackets K^4, projecting from the corresponding frame D or D′ at the front end thereof. Each upper saw-guide K is supported on a rope K^5, extending upwardly and passing over a pulley K^6, journaled on the bracket K^4, and then the rope extends over a second pulley K^7, journaled near the frame D or D′, the rope then extending downward to support at its lower end a counterbalancing-weight K^8. A rod K^9 connects each saw-guide K with the sleeve K^{10}, fitted to slide in suitable bearings on the front edge of the frame D or D′, so as to properly guide the saw-guide K in its up-and-down movement.

The lower saw-guides K are rigidly supported from the frame D or D′, but are of the same construction as the upper guides—that is, each has two parallel arms and a friction-roller, as will be readily seen by reference to Fig. 2.

In order to permit of conveniently placing the saw-bands upon the sets of wheels, or to remove old ones therefrom, the following device is provided: The pillow-block B, supported at one end of the shaft A, is set on a wedge B^2, fitted to slide in a foundation-plate B^3, held on the top of the foundation for the said pillow-block, as plainly shown in Figs. 1 and 3. A bolt B^4 is fitted to slide vertically in the pillow-block B and is adapted to pass through the wedge B^2 and the foundation-plate B^3, so as to lock the three parts together, as will be understood by reference to Figs. 1 and 11. The upper end of the bolt B^4 is provided with a cross-arm B^5, adapted to move in a vertical slot arranged in the pillow-block, and the outer end of this cross-piece B^5 is adapted to be engaged by a hook B^6, pivoted on the cap for the pillow-block B.

Now when it is desired to place new saw-bands on the wheels or remove the old ones therefrom, then the operator first places a suitable support under the outer end of the shaft A, after passing the saws around the shaft A between the said support and pillow-block B. The operator then moves the cross-piece B^5 upward to withdraw the bolt B^4 from the foundation-plate B^3 and the wedge B^2, and then locks the cross-piece in place by engaging the hooks B^6 with the outer end of the cross-piece. The operator now withdraws the wedge B^2 from under the pillow-block B, so as to form a passage for one run of the saw to move the old saws out from between the wheel C and pillow-block B and pass the new ones in place between the pillow-block B and wheel C, to finally place the saws in position over the sets of wheel C C′ C^2 and C^2 C^4 C^5. After this is done the wedge B^2 is again put in position and the cross-piece B^5 unhooked to again engage the bolt B^4 with the wedge B^2 and the foundation-plate B^3. The support is then removed from the outer end of the saw-driving shaft A to permit of taking the old saws from the end of the shaft.

Any suitable means may be employed for supporting the outer end of the shaft A while putting the saw-bands in place or removing them. The device illustrated in the drawings, and shown in detail in Fig. 13, consists of an arm or lever L, fulcrumed at one end upon a suitable support and provided near the other end with a recess or groove to receive the end of the shaft A when the lever is swung up beneath the shaft. A leg or standard L′ is secured to the free end of the arm or lever L and supports it when in position under the shaft A.

It is understood that any desired number of adjustable frames D, carrying saw-band wheels, may be provided for a single mill, so that any desired number of saw-bands may be run and set in such a manner as to cut a large number of boards at one forward movement of the log. At the same time the adjustable frames D can be moved in such positions that the several saw-bands are differently spaced one from the other to cut boards of various thicknesses, or the frames may be adjusted to space the saw-bands alike to cut boards all of the same thickness.

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

1. A gang band saw mill, comprising a series of main saw band driving wheels secured on the driving shaft, a frame for each driving wheel, and saw band wheels journaled in each frame, one being located above the other but in alignment with the main saw band driving wheel of its frame, substantially as shown and described.

2. A gang band saw mill, comprising a series of main saw band driving wheels secured on a main driving shaft, a series of frames for the said wheels, of which one is stationary and the others are longitudinally adjustable, and saw band wheels journaled in each frame, one above the other and in alignment with the corresponding main saw band driving wheel in this frame, substantially as shown and described.

3. In a gang band saw mill, the combination, with a main saw band driving wheel secured on a driving shaft, of a frame fitted to slide longitudinally on bearings held on the hub of the said wheel, and saw band wheels located one above the other and in alignment with the main saw band driving wheel, each of the said saw band wheels being held vertically adjustable in the frame, substantially as shown and described.

4. In a gang band saw mill, the combination, with the main saw band driving wheel secured on the main driving shaft, of a frame fitted to slide longitudinally on bearings held on the hub of the said wheel, saw band wheels held on the said frame and located one above the other and in alignment with the main saw

band driving wheel, and means, substantially as described, for moving the said frame longitudinally, as set forth.

5. In a gang band saw mill, the combination, with the main saw band driving wheel secured on the main driving shaft, of a frame fitted to slide longitudinally, saw band wheels held on the said frame and located one above the other and in alignment with the main saw band driving wheel, and a mechanism for adjusting the said frame longitudinally, the mechanism being adapted to be actuated from the said main saw band driving wheel, substantially as shown and described.

6. In a gang band saw mill, the combination, with the main saw band driving wheel secured on the main driving shaft, of a frame fitted to slide longitudinally, saw band wheels held on the said frame and located one above the other and in alignment with the main saw band driving wheel, a mechanism for adjusting the said frame longitudinally, the mechanism being adapted to be actuated from the said main saw band driving wheel, and means, substantially as described, and driven from the said frame adjusting mechanism, to vertically adjust one of the said saw band wheels in the frame, as set forth.

7. In a gang band saw mill, the combination, with the main saw band driving wheel secured on the main driving shaft, of a frame fitted to slide longitudinally, saw band wheels held on the said frame and located one above the other and in alignment with the main saw band driving wheel, a mechanism for adjusting the said frame longitudinally, the mechanism being adapted to be actuated from the said main saw band driving wheel, and the said adjusting mechanism for the frame being provided with a reversing device for imparting motion to the said frame in either direction, substantially as shown and described.

8. In a gang band saw mill, the combination with a frame carrying band wheels of which one is provided with bearings fitted to slide vertically in the said frame, of the screw rods arranged at opposite sides of the frame and engaging the under sides of the respective bearings, a nut block screwing on each of said screw rods, a yoke or guide arm encircling each of said nut blocks at its lower end, and provided with a set screw for fastening the nut block to the guide arm, the said guide arms engaging guideways formed in the sides of the frame, and a weighted lever having a forked end, each member of which is provided with an eye encircling the respective screw rods and engaging the under side of the nut block, substantially as shown and described.

9. In a gang band saw mill, the combination, with a main driving shaft, a main saw band driving wheel secured on the said shaft and provided on its hub with bearings, of a frame fitted to slide longitudinally on the said bearings, screw rods held on the said bearings, and nut worm wheels screwing on the said screw rods and adapted to be driven from the said main saw band driving wheel, the said nut worm wheels engaging the sides of the frame, to push the latter longitudinally either to the right or to the left according to the motion given to the said worm wheels, substantially as shown and described.

10. In a gang band saw mill, the combination, with a main driving shaft and a main saw band driving wheel provided on its hub with bearings, of a frame carrying saw band wheels and fitted to slide longitudinally on the said bearings, screw rods held on the said bearings, nut worm wheels screwing on the said screw rods and engaging recesses in the said frame, to move the latter longitudinally, worms in mesh with the said worm wheels, a friction disk held on the shaft of the said worms, the latter being journaled in the said frame, a friction roller adapted to be thrown in frictional contact with the said disk, and means, substantially as described, for driving the said friction roller from the main saw band driving wheel, as set forth.

11. In a gang band saw mill, the combination, with a main driving shaft and a main saw band driving wheel provided on its hub with bearings, of a frame carrying saw band wheels and fitted to slide longitudinally on the said bearings, screw rods held on the said bearings, nut worm wheels screwing on the said screw rods and engaging recesses in the said frame, to move the latter longitudinally, worms in mesh with the said worm wheels, a friction disk held on the shaft of the said worms, the latter being journaled in the said frame, a friction roller adapted to be thrown in frictional contact with the said disk, means, substantially as described, for driving the said friction roller from the main saw band driving wheel, and a shifting mechanism for the said friction roller, to move the latter to either side of the center of the said friction disk, to rotate the latter in either direction, substantially as set forth.

12. In a gang band saw mill, the combination with vertically adjustable bearings carrying a saw band wheel, of screw rods engaging the said bearings at their under side, nut blocks in which screw the said screw rods, worm wheels mounted on the lower ends of the screw rods, the said worm wheels being held in recesses formed in the frame, and the said screw rods turning with the worm wheels and having free vertical movement therein, worms in mesh with the said worm wheels, a transversely extending shaft carrying the said worms and journaled in stationary bearings, and means, substantially as described for turning the said shaft in either direction to raise and lower the said bearings, as and for the purpose set forth.

13. A gang band saw mill, provided with a pillow block, a wedge engaging the under side of the pillow block, a foundation plate in which the said wedge is fitted to slide and a bolt fitted to slide vertically in guideways formed in the pillow block and adapted to en-

gage the wedge and foundation plate and means for holding the bolt out of engagement with the said wedge and foundation plate, as and for the purpose set forth.

14. A gang band saw mill, provided with a pillow block, a wedge engaging the under side of the pillow block, a foundation plate carrying the said wedge, and a bolt adapted to engage the said wedge and foundation plate, the upper end of the bolt being provided with a cross arm fitted to move in a vertical slot arranged in the pillow block, and means for engaging the outer ends of the cross arm when the bolt is raised, as and for the purpose set forth.

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Witnesses:
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