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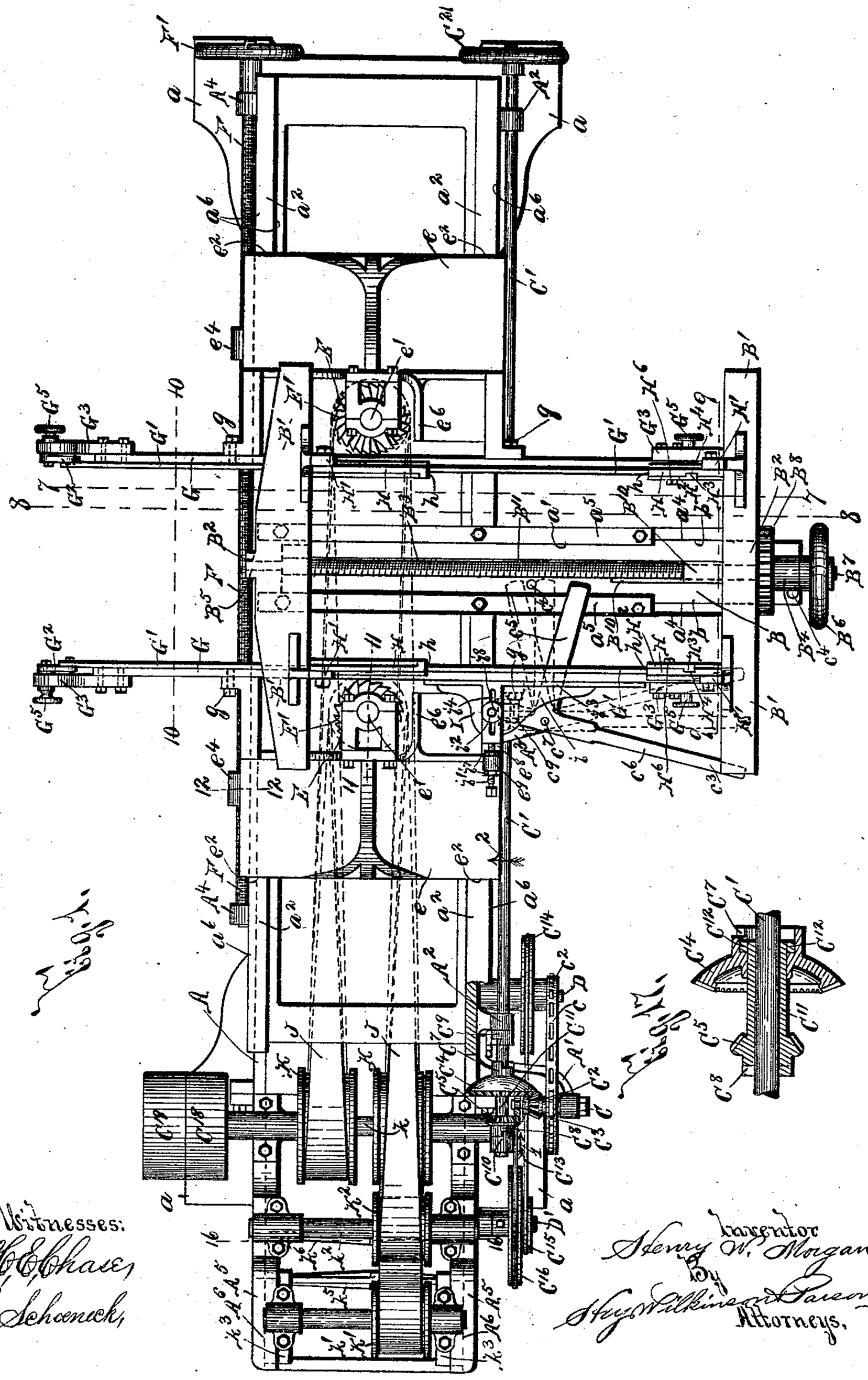
GROOVING MACHINE.

No. 517,705. Patented Apr. 3, 1894.



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C. Schoenck,

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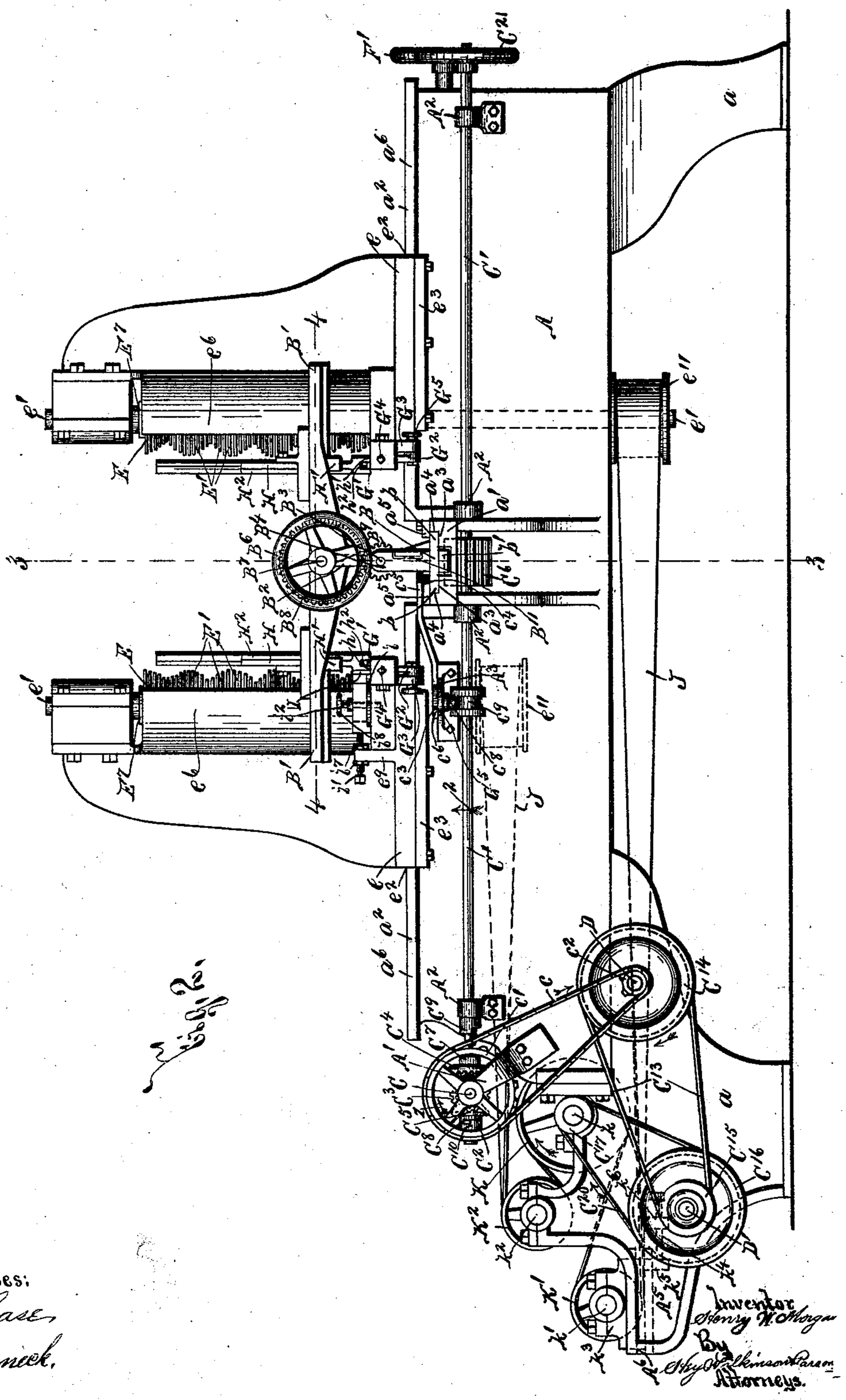

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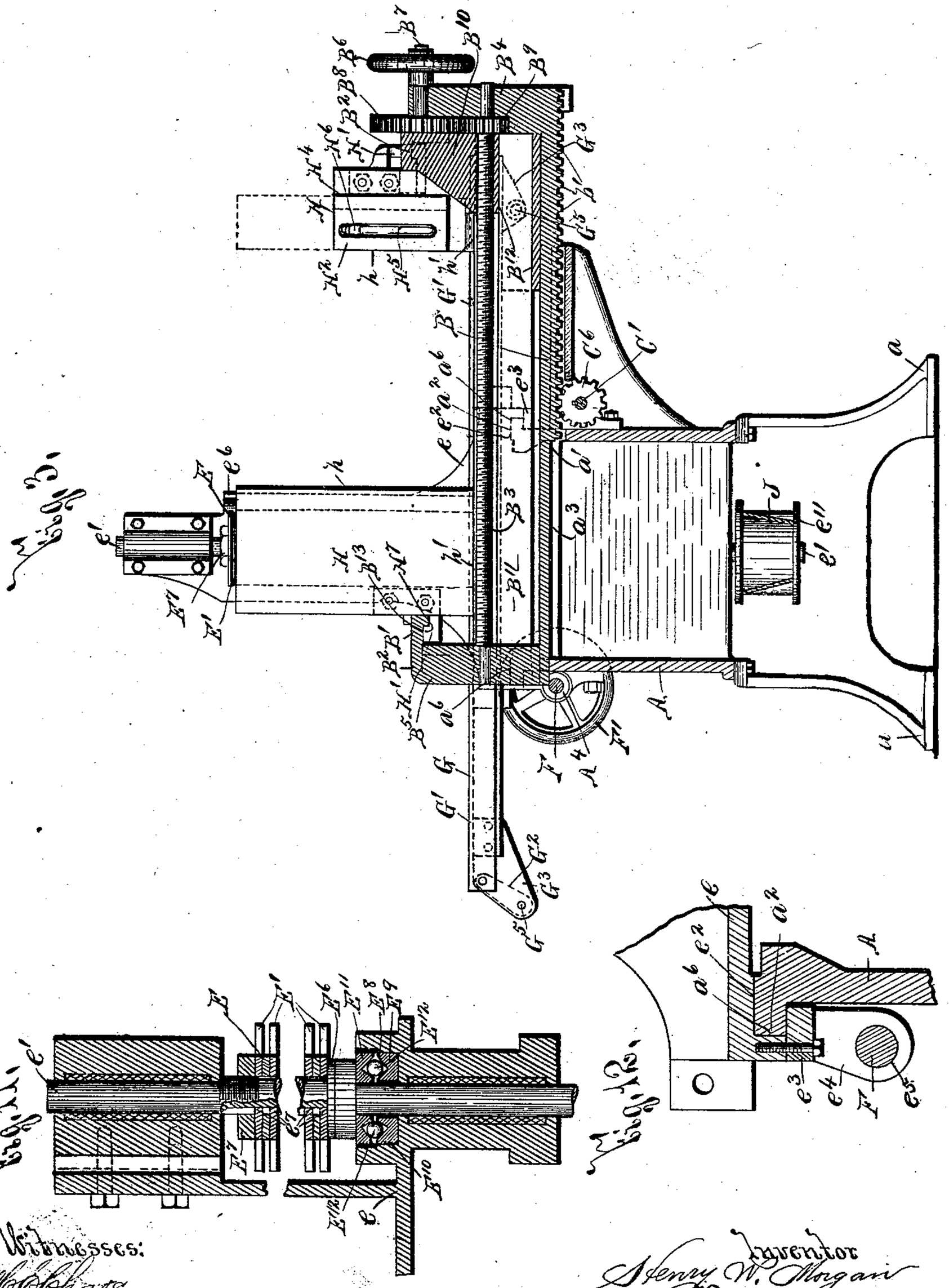

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Fig. 4.

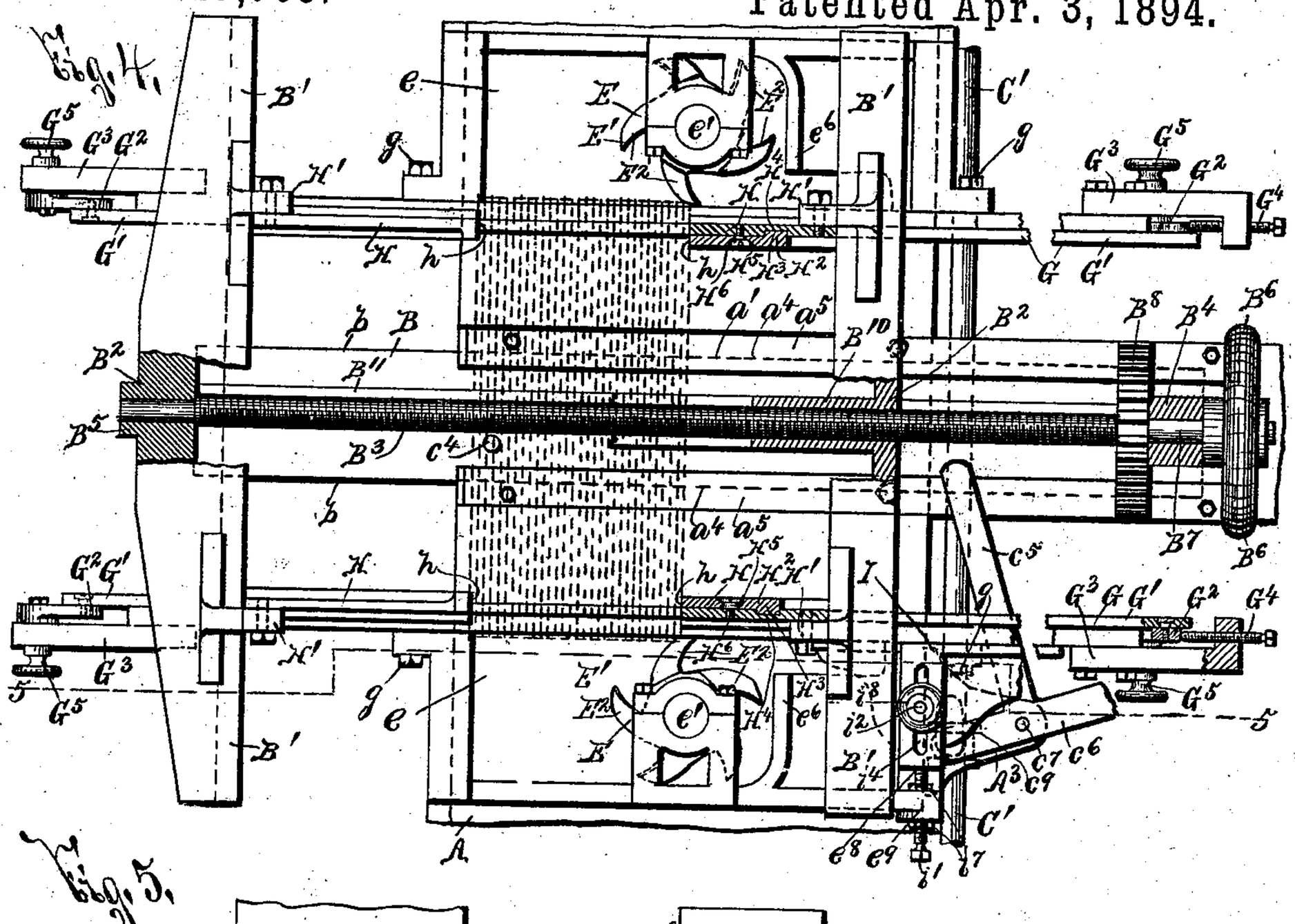

Fig. 5.

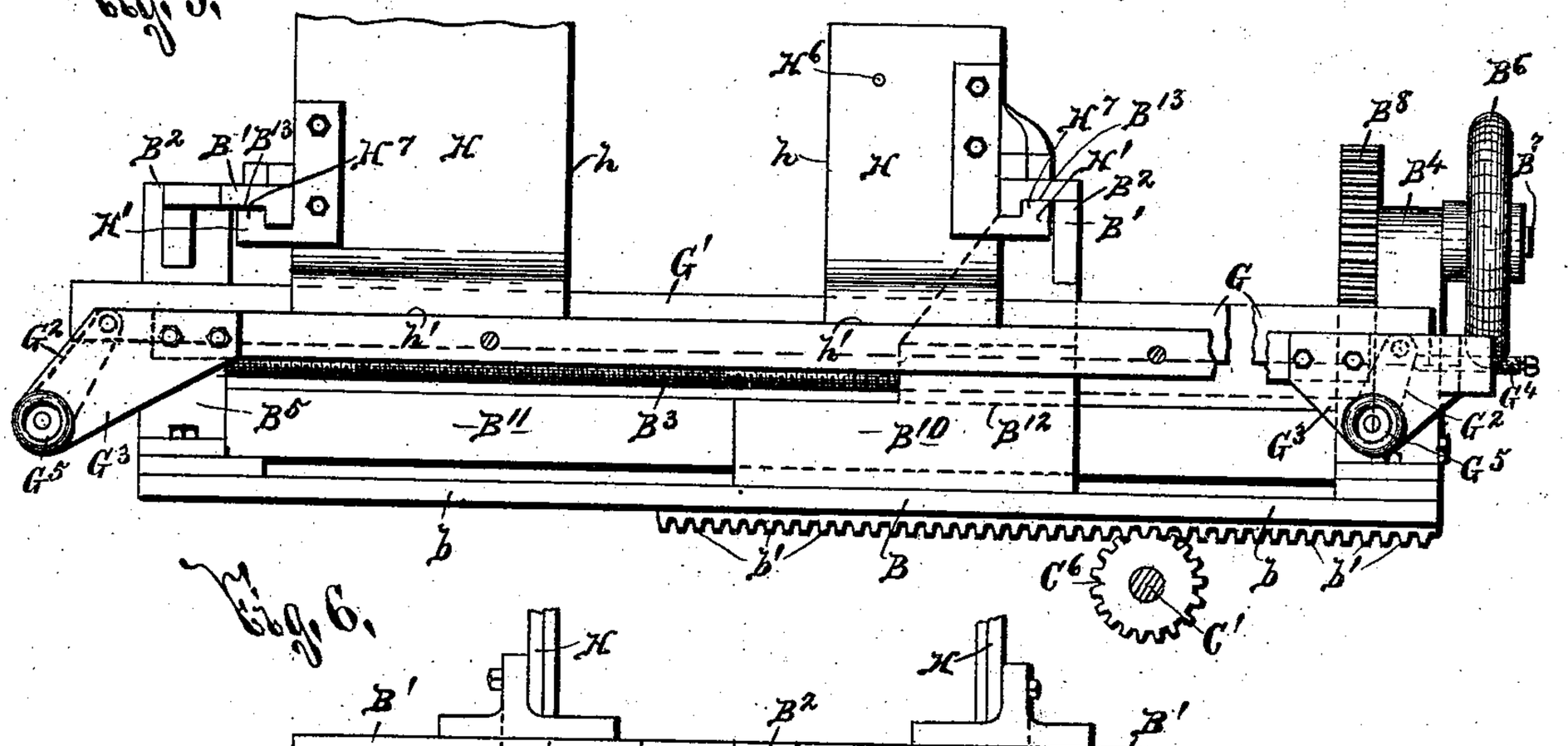

Fig. 6.

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Fig. 7.

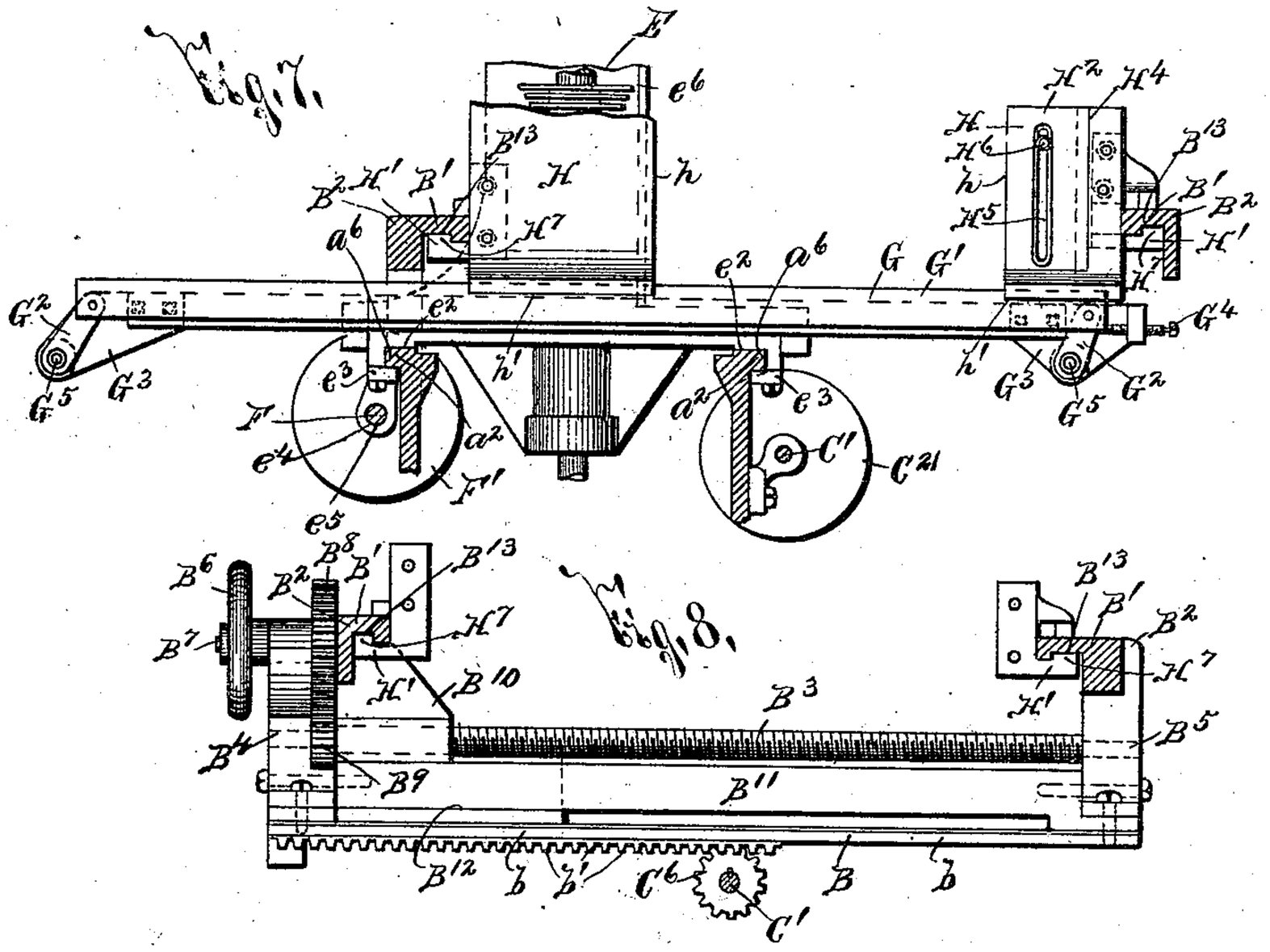


Fig. 8.

Fig. 9.

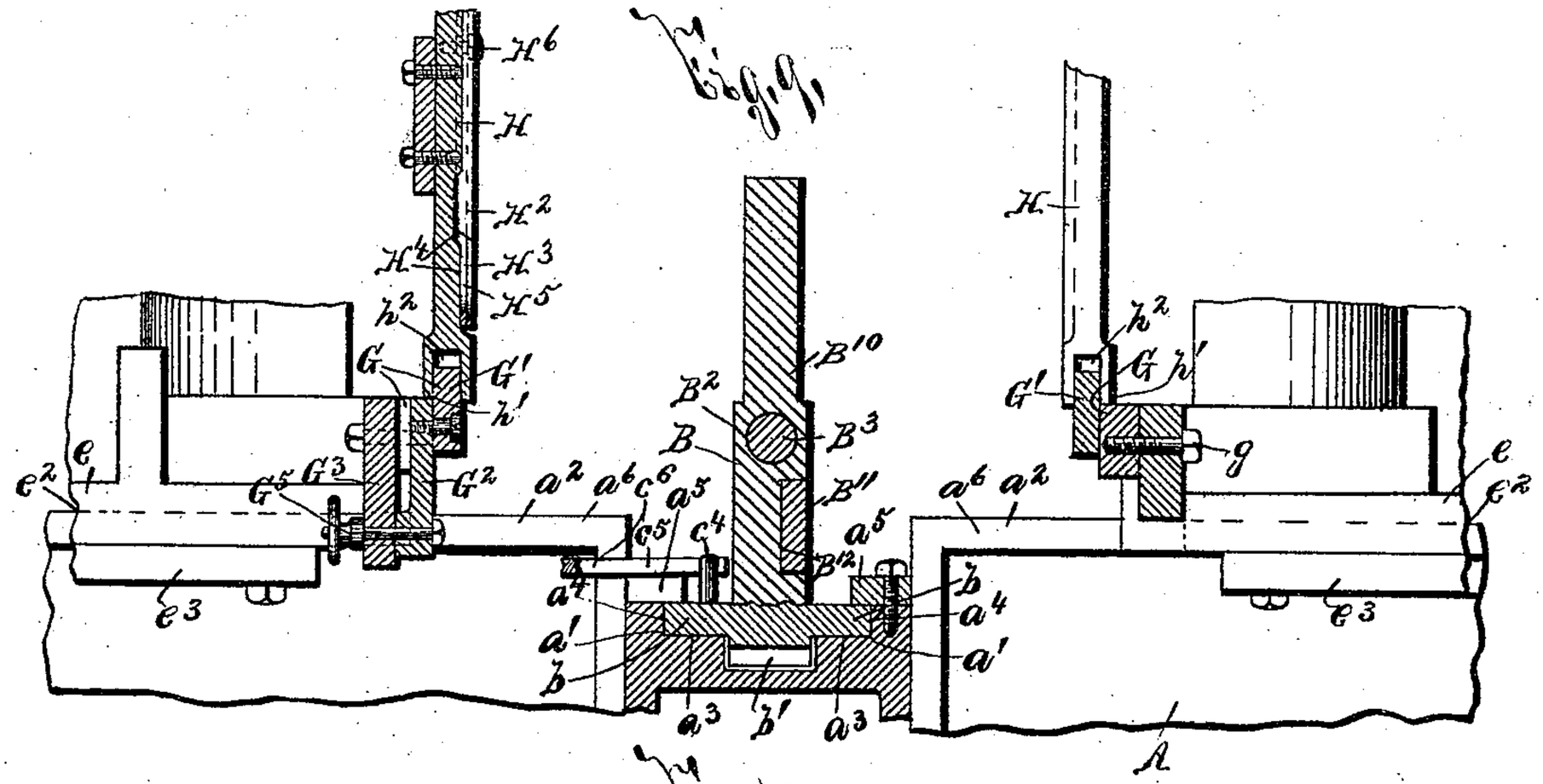
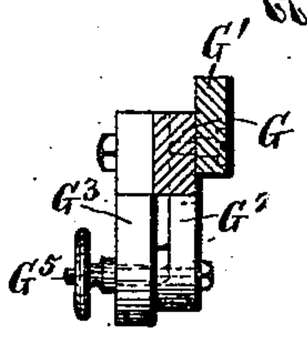
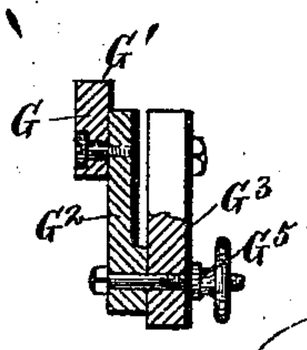


Fig. 10.





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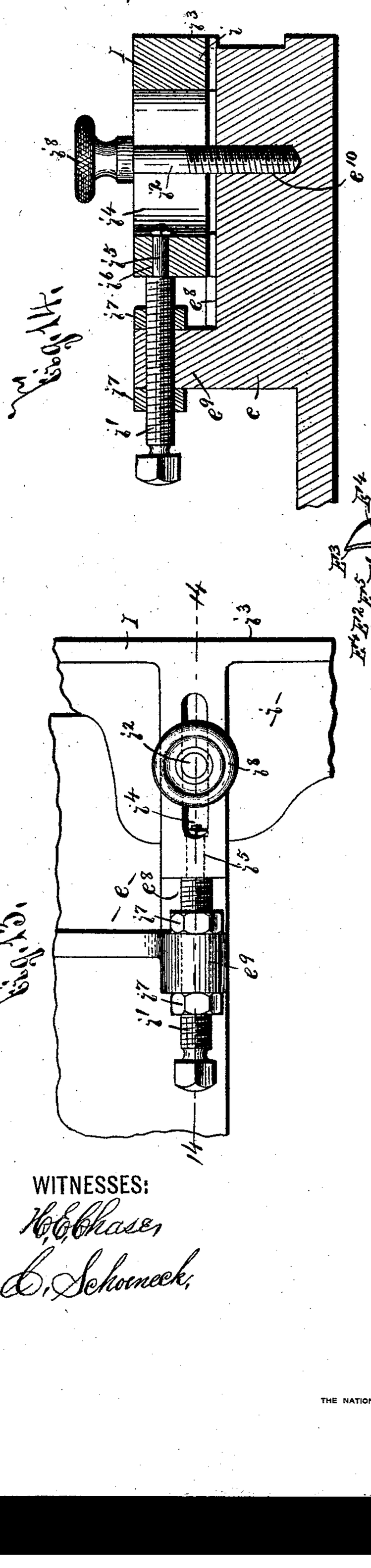

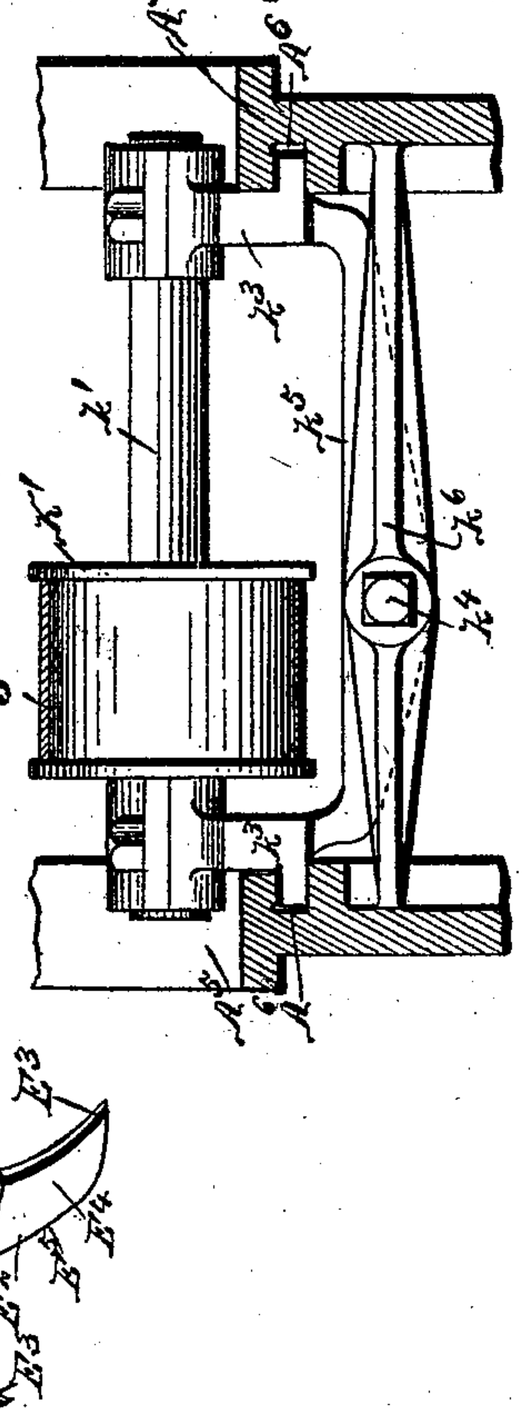

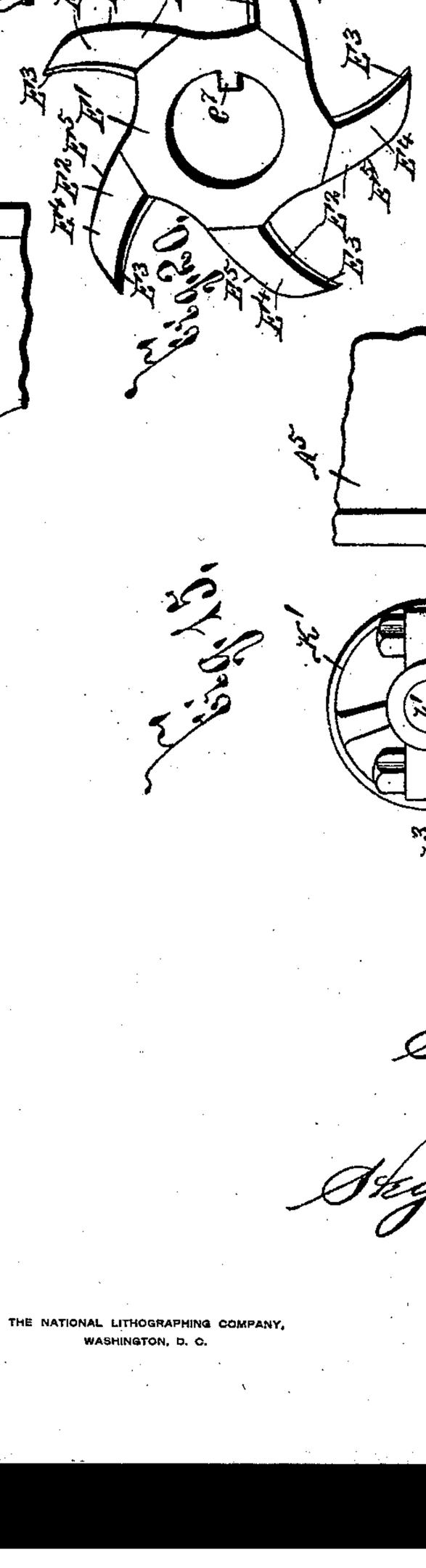

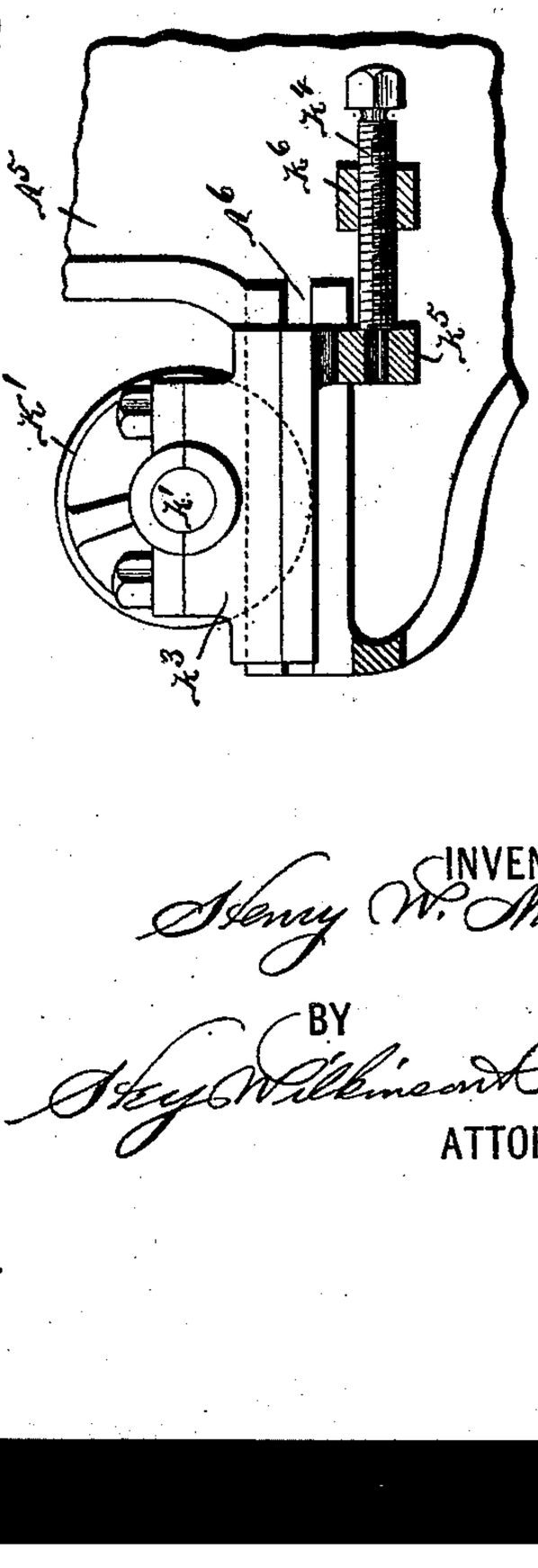

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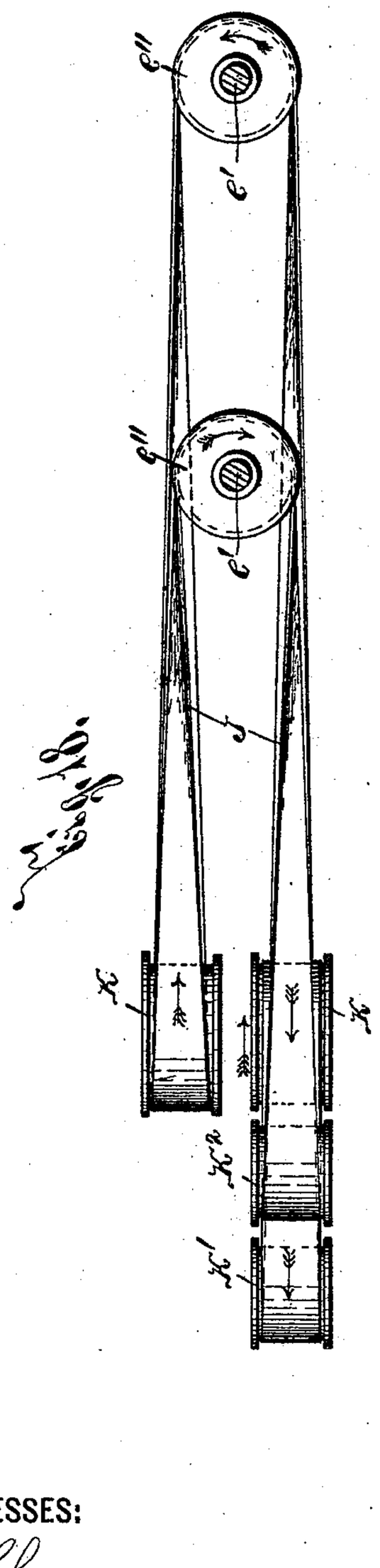

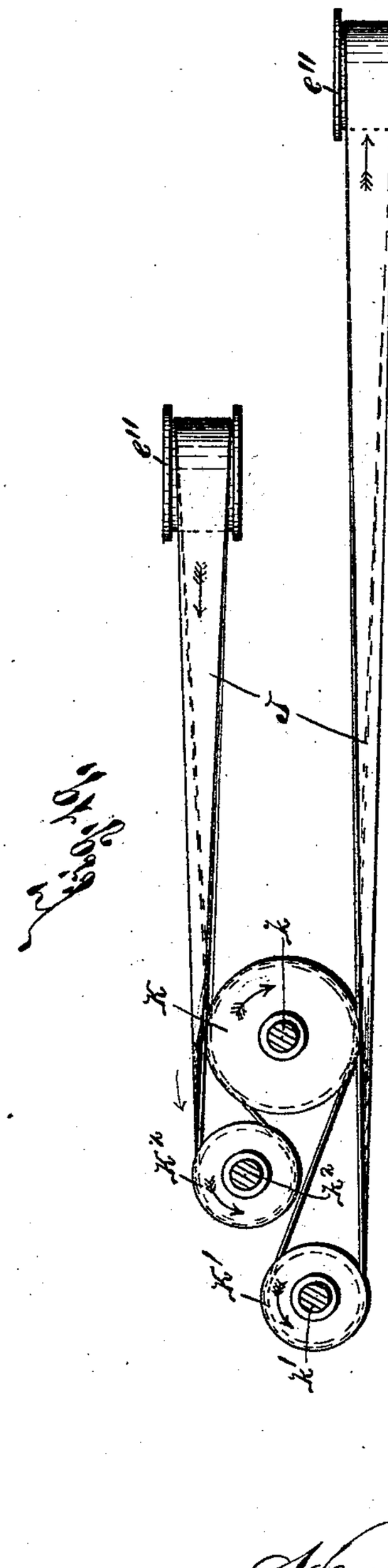

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Fig. 21.

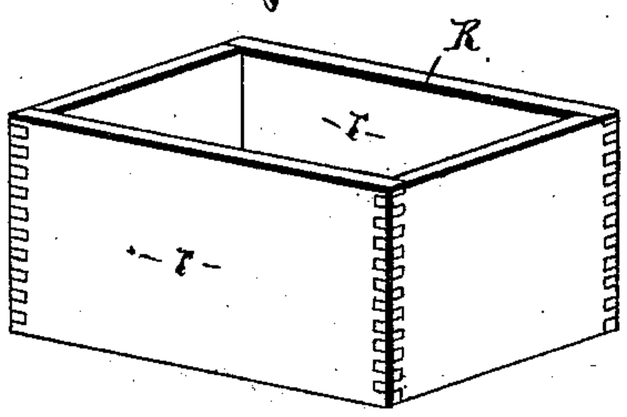


Fig. 22.

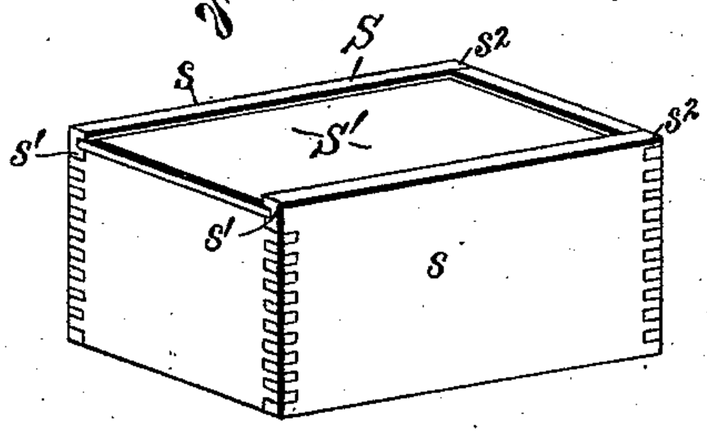


Fig. 23.

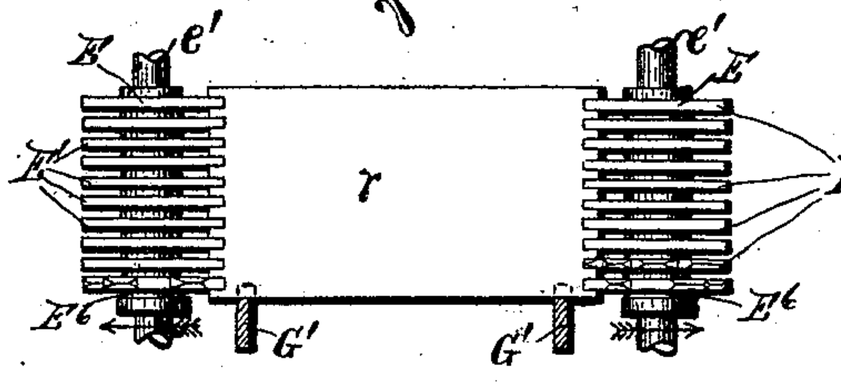


Fig. 24.

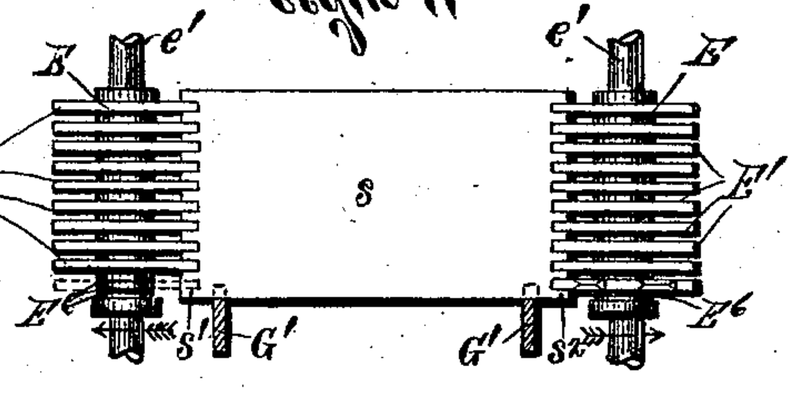


Fig. 25.

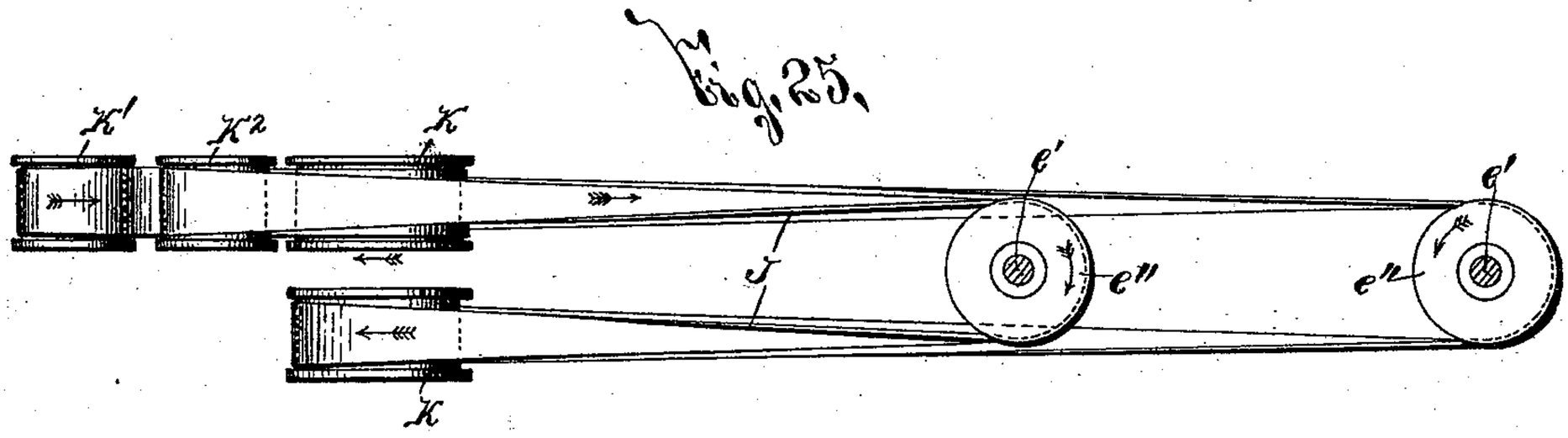
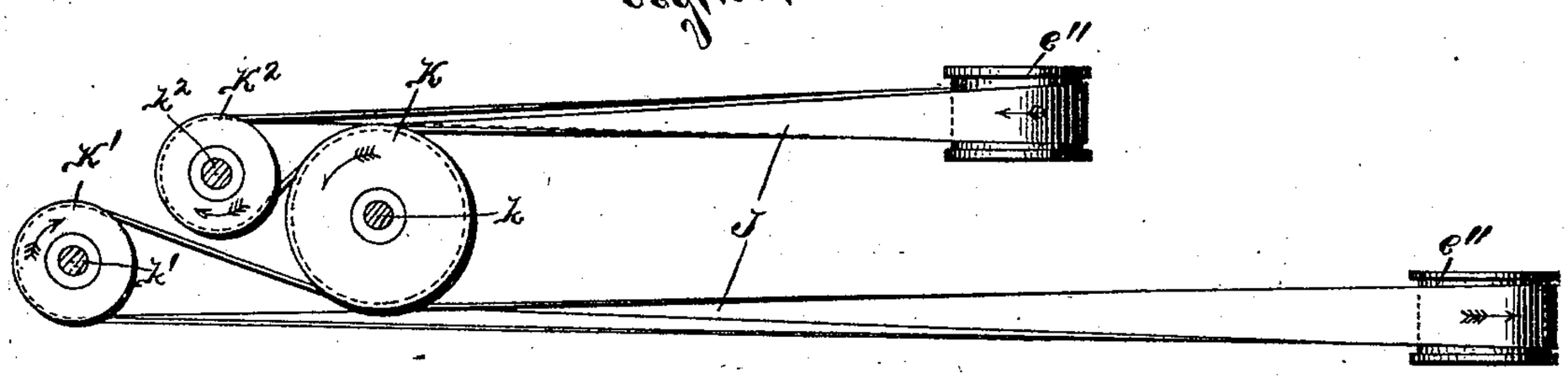


Fig. 26.



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UNITED STATES PATENT OFFICE.

HENRY W. MORGAN, OF ROCHESTER, NEW YORK.

GROOVING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 517,705, dated April 3, 1894.

Application filed December 29, 1892. Serial No. 456,631. (No model.)

To all whom it may concern:

Be it known that I, HENRY W. MORGAN, of Rochester, in the county of Monroe, in the State of New York, have invented new and useful Improvements in Grooving-Machines, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

My invention relates to improvements in grooving machines particularly designed for cutting the grooves in the ends of boards or shooks for forming boxes having their corners joined together; and to this end it consists, essentially, in a frame, a carriage movable upon the frame, a bearing movable toward and away from the carriage, a cutter-head journaled in the bearing, and having its axis disposed in a plane at substantially right angles with the plane of movement of the carriage, a support secured to the bearing and formed with a face disposed in a plane substantially parallel with the plane of movement of the carriage for supporting the boards or shooks arranged edgewise thereon, and clamping jaws movable upon the said support arranged to move simultaneously with the carriage.

The invention furthermore consists in the detail construction and arrangement of the parts, all as hereinafter more particularly described and pointed out in the claims.

In describing this invention, reference is had to the accompanying drawings, forming a part of this specification, in which like letters indicate corresponding parts in all the views.

Figures 1 and 2 are respectively top plan view and front elevation of my improved invention, illustrating the general construction and arrangement of its component parts. Fig. 3 is a transverse vertical sectional view, taken on line —3—3—, Fig. 2. Fig. 4 is an enlarged horizontal sectional view of the central portion of the parts as shown at Fig. 1, taken on line —4—4—, Fig. 2. Fig. 5 is a vertical sectional view, taken on line —5—5—, Fig. 4. Fig. 6 is a rear elevation of the parts as shown at Figs. 4 and 5. Fig. 7 is a transverse vertical sectional view, taken on line —7—7—, Fig. 1, the upper portion of the rear clamping jaw and the lower portion of the frame and the cutter-head shaft being broken away. Fig. 8 is a transverse vertical sectional view, taken on line —8—8—, Fig. 1, looking toward the left-hand, the frame being omitted. Fig. 9 is an enlarged vertical sectional view, taken on line —9—9—, Fig. 1. Fig. 10 is a similar vertical sectional view, taken on line —10—10—, Fig. 1. Fig. 11 is a vertical sectional view, taken on line —11—11—, Fig. 1, illustrating particularly the ball bearing for supporting the weight of the cutter-head and its shaft. Fig. 12 is a detail vertical sectional view, taken on line —12—12—, Fig. 1, illustrating the ear on the cutter-head bearing for receiving the screw that shifts said bearing toward and away from the carriage. Fig. 13 is a top plan view of a detached portion of the cutter-head bearing and the gage arranged at one side of the support and carriage. Fig. 14 is a vertical sectional view, taken on line —14—14—, Fig. 13. Fig. 15 is a detail sectional view of the adjustable bearing for one of the idlers around which the driving belt is passed. Fig. 16 is a vertical sectional view, taken on line —16—16—, Fig. 1. Fig. 17 is a detail horizontal sectional view of a portion of the feeding mechanism for the carriage. Figs. 18 and 19 are respectively top plan view and side elevation of the detached pulleys on the cutter-head shafts, the actuating belt passed around said pulleys, the driving wheels for moving said belt, and the idlers for supporting and guiding the belt. Fig. 20 is a top plan view of one of the detached saws composing the cutter-heads. Fig. 21 is an isometric perspective of an ordinary box having the adjacent ends of its sides joined together. Fig. 22 is an isometric perspective of a similar box provided with a sliding cover. Fig. 23 is a detail view showing one of the longitudinal sides of the box illustrated at Fig. 21 and the detached cutter-heads and the box shook supports as in their operative position assumed when the ends of said side are being grooved. Fig. 24 is a similar detail view showing one of the longitudinal sides of the box illustrated at Fig. 22, and the cutter-heads and supports as in operative engagement therewith, the lower saw of the left-hand cutter-head being removed for forming a wider tenon at the base of the left-hand edge of said box side, and Figs. 25 and 26 are respectively top plan view and side elevation

of the parts shown in Figs. 18 and 19, the idlers being moved into alignment with the rear driving pulley and the belt being shown as wound around said idlers when in said position.

The frame —A— may be of any desirable form, size, and construction, and is formed with standards or legs —*a*—, a crosswise guide —*a'*—, and a lengthwise guide —a^2—. The guide —*a'*— consists of separated horizontal shoulders —a^3—a^3—, separated upright shoulders —a^4—a^4— at the outer edges of the shoulders —a^3—a^3—, and gibs or top shoulders —a^5—a^5— arranged above and projecting beyond the shoulders —a^4—a^4—. The guide —a^2— consists of lenthwise ribs or shoulders —a^6—a^6— arranged along the tops of the longitudinal sides of the frame above the shoulders —a^5—a^5—.

Movable within the guides —*a'*— is a carriage —B— formed with lateral shoulders —*b*—*b*— interposed between the shoulders —a^3—a^3—a^5—a^5— of the guide —*a*—. The feeding mechanism for the carriage —B— consists of a driving shaft or spindle —C— supported in a bracket —A'— projecting from the left-hand end of the frame —A—, a shaft —C'— arranged lengthwise of the front face of the frame —A— beneath the guide —a^2—, and journaled in bearings —A^2—A^2— on the front face of said frame, bevel-pinions —C^2—C^3—, bevel-gear wheels—C^4—C^5— upon the driving shaft or spindle —C— and shaft —C'— for connecting said driving shaft or spindle and shaft, and the pinion —C^6— fixed upon the shaft —C'— and engaged with rack teeth —*b'*— upon the under face of the carriage —B—.

The gear wheel —C^5—, as shown at Fig. 17, is loose upon the shaft —C'—, and is formed with a hub —C^{11}—, which projects from one of its faces and is formed with a shoulder —C^{12}—; and the gear wheel —C^4— revolves loosely upon the hub —C^{11}— on the inside of the shoulder —C^{12}—. The gear-wheels —C^4—C^5— are formed at their outer faces with the respective clutch sections —C^7—C^8— for engaging clutch sections —C^9—C^{10}— fixed upon the left-hand end of the shaft —C'—, which is movable lengthwise in its bearings —A^2—A^2— for alternately engaging the clutch sections —C^7—C^9— and —C^8—C^{10}—. When, as illustrated at Fig. 1, the clutch section —C^8— is engaged with the clutch section —C^{10}—, the pinion —C^3—, which revolves in the direction indicated by arrow —1— at Figs. 1 and 2, is engaged with the gear wheel —C^5—, and drives the shaft —C'— in the direction shown by arrow —2— at Figs. 1 and 2, thus feeding the carriage —B— to the rear of the frame —A—, owing to the engagement of the pinion —C^6— with the rack teeth —*b'*— upon the carriage. During this engagement of the pinion —C^3— and the gear wheel —C^5— the gear —C^4— on the shaft —C'—, although engaged with the pinion —C^2— on the driving shaft or spindle —C—, revolves loosely on the hub —C^{11}— of the gear wheel —C^5—. As soon as the shaft —C'— is moved lengthwisely, so as to engage the clutch section —C^9— with the clutch section —C^7— on the gear wheel —C^4— and to disengage the clutch section —C^{10}— from the clutch section —C^8—, the shaft —C'— is, as is evident to one skilled in the art, revolved in a reverse direction for feeding the carriage —B— forwardly. These clutch sections —C^8—C^{10}— and —C^7—C^9— are so relatively arranged that one pair of said clutch sections may be entirely disengaged without the engagement of the other pair in order that both gear-wheels —C^4—C^5— may be revolved loosely on the shaft —C'— by the pinions —C^2—C^3— without affecting the revolution of the shaft —C'—. It is evident, however, that, as the shaft —C'— is moved lengthwise in either direction from its position assumed when neither pair of the clutch sections is in engagement, one pair thereof is brought into engagement, and the shaft —C'— is then revolved either forward or backward.

The driving shaft or spindle —C— may be revolved by any suitable construction of power transmitting mechanism, here shown as a link belt —*c*— passed over the sprocket wheel —*c'*— upon the driving shaft or spindle —C— and over the sprocket wheel —c^2— upon a spindle —D—, a belt —C^{13}— running over pulleys —C^{14}—C^{15}— mounted respectively upon the spindle —D— and a second spindle —D'—, and a belt —C^{20}— passing over a pulley —C^{16}— upon the spindle —D'—, and a pulley —C^{17}— mounted upon the main driving shaft —*k*—. Upon this shaft —*k*— are tight and loose pulleys —C^{18}—C^{19}—, to which power is transmitted by any suitable construction of power transmitting mechanism, not necessary to herein illustrate or describe.

As previously stated the shaft —C'— may assume such a position that the bevel gear-wheels —C^4—C^5— revolve loosely thereon without effecting the revolution of said shaft, and I preferably provide my invention with an automatically operating shifting device by the position of the carriage —B— for forcing the shaft to said position when being revolved either in the direction shown by arrows —2— at Figs. 1 and 2 for feeding the carriage rearwardly, or in the reverse direction for feeding the carriage forwardly. This shifting device consists of a lever —c^6— pivoted at —c^7— to an arm —A^3— on the frame —A— and formed with an arm —c^5— for engaging a pair of faces or pins —c^4—c^4— upon the carriage —B—. The lever —c^6— is provided at one end with a lug —c^8— engaged with a grooved collar —c^9— fixed upon the shaft —C'— and at its other end with a hand engaging portion —c^3—.

When the carriage is feeding rearwardly, owing to the engagement of the clutch sections —C^8—C^{10}— the parts of the shifting device for the feeding mechanism of the carriage are in the position shown at Fig. 1. As

the carriage —B— reaches the limit of its rearward movement, the front pin or face —c^4— engages the end of the arm —c^5— and rocks said arm backwardly toward the frame —A— into a plane substantially parallel with said frame —A— and thereby swings the lever —c^6— upon its pivot, so as to move the shaft —C′— lengthwisely within its bearings —A^2—A^2— a sufficient distance to disengage the clutch sections —C^8—C^{10}— without engaging the clutch sections —C^7—C^9—. The shaft —C′— then stops its revolution and the rearward feeding of the carriage —B— is automatically checked.

When desired to feed the carriage forwardly the operator engages the outer end —c^3— of the lever —c^6— and rocks said lever a greater distance than it was automatically rocked by the engagement of the front pin or face —c^4— with the arm —c^5—, thus engaging the clutch sections —C^7—C^9—. The shaft —C′— then revolves in a reverse direction from that indicated by arrows —2— at Figs. 1 and 2, and feeds the carriage forwardly until the rear pin or face —c^4— engages the end of the arm —c^5— and automatically rocks the lever —c^6— in an opposite direction to that in which it was rocked by the engagement of the forward pin —c^4— with the arm —c^5— and thereby disengages the clutch sections —C^7—C^9— for stopping the forward movement of said carriage. When desired to again feed the carriage rearwardly the operator rocks the lever —c^6— to its position shown at Fig. 1, and engages the clutch sections —C^8—C^{10}—.

It is frequently desirable to feed the carriage —B— by hand, and accordingly I provide upon the right hand end of the shaft —C′— a hand engaging wheel or piece —C^{21}—, which may be readily engaged for rotating the shaft —C′— when in such position that neither pair of the clutch sections —C^7—C^9— and —C^8—C^{10}— are engaged. This particular construction of mechanism for feeding the carriage —B— backwardly and forwardly and for automatically disengaging the feeding mechanism so as to prevent its action, is very simple in construction, practical and effective in operation, and durable in use.

Movable along the guides —a^2— upon opposite sides of the carriage —B— are bearings —e—e—, which are of any desirable form, size, and construction suitable for supporting the shafts —e'—e'— of the cutter-heads —E—E—. The bearings —e—e— are, as best seen at Fig. 7, formed with separated faces —e^2—e^2— bearing upon the top faces of the ribs —a^6—a^6— of the guide —a^2— and are formed with longitudinal shoulders —e^3—e^3— bearing against the under faces of said ribs —a^6—a^6—. These bearings —e—e— are moved toward and away from each other by a screw —F—, which is arranged lengthwisely beneath the guide —a^2— at the outside of the rear wall of the frame —A—, and is journaled in bearings —A^4—A^4— projecting from said rear wall of the frame —A—. Formed at the rear sides of the bearings —e—e— are depending lugs —e^4—e^4— having screw threaded apertures or eyes —e^5— for receiving the screw —F—.

—F′— is a hand-piece or wheel provided upon the right-hand end of the screw —F— for facilitating the rotation of said screw. The screw —F— is provided at its opposite ends with right and left hand threads, and consequently, as said screw is revolved by the hand-piece —F′— in either direction, the bearings —e—e— are moved lengthwisely of the guide —a^2—, and approximate or separate the cutter-heads —E—E—, thereby adjusting the distance between said cutter-heads to the length of the boards or shooks interposed between the clamping jaws presently described.

In order to obviate liability of contact with the cutter-heads when removing the grooved boards, or placing in position boards about to be grooved I provide the bearings —e—e— with upright guard walls —e^6—e^6— arranged in front of the cutter-heads —E—E—, and having their inner edges extending almost to the plane of the inner face of the adjacent cutter-head.

As best seen at Figs. 2, 11, and 20 the cutter-heads —E—E— are formed of a series of oppositely arranged circular saws —E′— fixed upon the shafts —e'—e'—, as by splines —e^7—e^7—, and provided with projecting teeth —E^2— having their front faces or edges —E^3— of substantially the same thickness as the groove to be formed in the ends of the boards or shooks. These saws are arranged in the usual manner one above the other so that the outer edges of the front faces E^3 of the teeth of any one of the saws are slightly at one side of the vertical plane of the front edges of the corresponding teeth formed upon the saw next beneath or above said saw. Beneath the lower saw —E′— are one or more washers —E^6—, and above the upper saw —E′— is a shoulder —E^7— adjustable upon the shaft —e'— for firmly clamping the saws in position.

At Fig. 23 I have shown the cutter-heads as operatively engaged with the adjacent ends of an interposed board —r— of substantially the same size as either of the longitudinal sides —r—r— of the box —R—, shown at Fig. 21. It is frequently desired to provide a box —S— with a sliding cover —S′—, as shown at Fig. 22, and in that case, the upper tenon —s'— at one end of the longitudinal sides —s—s— of the box —S— must be formed of greater width than the corresponding tenon —s^2— at the opposite end of the box sides. To effect this result the lower saw —E′— of the cutter-head for grooving the ends to be provided with the wide tenons is removed, and a washer —E^6— is substituted as shown at Fig. 24.

The cutter-heads —E—E— are arranged vertically, and, as they revolve in practice at rapid speed, there is great liability of the bearings —e—e— becoming heated. To ob-

viate this result I support the weight of the shafts —*e'*—*e'*— by ball bearings —E⁸—E⁸. These bearings may be of any desirable form, size, and construction, and are composed of opposite sections —E⁹—E⁹— fitting sockets —E¹⁰—E¹⁰— in the bearings —*e*—*e*—, sections —E¹¹—E¹¹— fixed upon the shafts —*e'*—*e'*—, and balls —E¹²— interposed between said sections. It is evident that, instead of the ball bearings E⁸ E⁸, any other desirable form and construction of bearings may be used.

The illustrated and described construction of the cutter-heads, their supporting bearings, and the mechanism for moving said bearings toward and away from each other is also simple, practical, effective and durable.

The boards or shooks are arranged edgewise between the cutter-heads —E—E— with their ends toward said cutter-heads, and are mounted upon the upper horizontal faces of supports —G—G—, which consist of rails secured at —*g*—*g*— to the bearings —*e*—*e*—, so as to be moved toward and away from each other as simultaneously said bearings —*e*—*e*— are approximated or separated. Each of the supports —G—G— is preferably provided with a movable rail or bar —G'— arranged at the inner side of said support and hinged at its opposite extremities to the upper ends of links —G²—G²— having their lower ends hinged to downwardly extending arms —G³—G³— upon said supports. These movable rails are elevated or depressed by adjusters —G⁴—G⁴— secured to the forward ends of the supports —G—G—, and bearing against the forward links —G²—G²—, and said rails are held in their adjusted position by suitable clamps —G⁵—G⁵—, which, in the preferable construction of my invention, consist of the bolts forming the lower hinge pins for the links —G²— and nuts movable upon said bolts.

In practice the longitudinal edges of the boards or shooks to be grooved are usually supported directly upon the rails —G'—G'—, and said rails are readily adjusted up and down to regulate the size of the tenon or groove upon the opposite extremities of the lower edges of said boards or shooks, and are then firmly held in their adjusted position. It will be readily understood, by one skilled in the art, that after the ends of the longitudinal sides for the boxes, shown at Figs. 21 and 22, have been grooved, as shown at Figs. 23 and 24, that the lower saw —E'— shown by dotted lines at Fig. 24, is replaced in position, and the adjustable rails —G'—G'— are then adjusted upwardly to the position shown at said Figs. 23 and 24, whereupon the boards for forming the end sides of said boxes are then placed upon the supports —G'—G'— and grooved by the cutter-heads. It will also be evident to one skilled in the art that the bars or rails G' G' may be dispensed with, and that, although in the preferable construction of my invention, I use said bars or rails, the essential supports for the lower edges of the box shooks are the rails or supports G G. It will also be evident that the supports or rails G G may be formed integral with the bearings for the cutter-heads, and that the supports G G are not necessarily of the same length as the bars or rails G' G'.

Movable lengthwisely upon each of the supports —G— is a pair of clamping jaws —H—H—, which are formed with clamping faces —*h*—*h*— at their adjacent edges disposed in planes substantially parallel with the axes of the cutter-heads —E—E—. The lower edges of these jaws —H—H— are formed with shoulders —*h'*—*h'*— bearing upon the support or rail —G— and with grooves —*h*²—*h*²— for permitting the up and down movement of the movable rail —G'— mounted upon said support. Secured to the outer face of each of the jaws —H— are laterally-extending arms —H'—H'—, which engage laterally extending arms —B'—B'— upon the carriage —B— for supporting the jaws in an upright position, and move lengthwisely of said arms as the supports —G—G— are adjusted toward and away from each other.

As clearly seen at Fig. 3 the rear clamping jaws —H—H— are of substantially the same height as the cutter-head —E—E— in order that, when the carriage —B— is in its forward position, as shown at Fig. 1, the inner faces of the cutter-head may be guarded, for preventing contact therewith of the operator or his clothing when handling the boards or shooks. The forward clamping jaws —H—H— are provided with lengthwisely adjustable inner face plates —H²—H²—, which are formed on their outer faces with ribs —H³—H³— movable in upright grooves —H⁴—H⁴— in the adjacent faces of said clamping jaws. These face plates are also formed with upright slots —H⁵—H⁵— for receiving clamping bolts —H⁶—H⁶— secured to the forward clamping jaws —H—H— for clamping said face plates in position.

The arms —B'—B'— upon the carriage —B— are formed upon heads or bars —B²—B²—, and are adjustable toward and away from each other for simultaneously adjusting the front and rear clamping jaws —H—H— so as to force their adjacent faces —*h*—*h*— against the outer faces of the interposed boards or shooks. This adjustment of the heads —B²—B²— is effected by moving the front head toward the rear head by means of a screw —B³— arranged lengthwise of the carriage —B— with its opposite ends supported in front and rear uprights —B⁴—B⁵— upon the front and rear extremities of said carriage.

—B⁶— is a hand-piece or wheel fixed upon a spindle —B⁷— journaled in the upper end of the front upright —B⁴—, and —B⁸— is a gear fixed upon said spindle and meshing with the gear —B⁹— upon the feeding screw —B³—, whereby, when the hand-piece —B⁶—

is rotated in either direction, the screw —B³— is simultaneously rotated.

—B¹⁰— is a nut mounted upon the feeding screw —B³— and guided lengthwise upon the carriage —B—. The guide for the nut —B¹⁰— preferably consists of a bar —B¹¹— having its opposite ends supported upon the opposite extremities of the carriage —B—, and, as clearly seen at Fig. 9, the nut —B¹⁰— is formed with a lengthwise guideway or groove —B¹²— in one face for registering with the central portion of said bar B¹¹.

The front and rear heads —B²—B²— are respectively fixed upon and preferably formed integral with the nut —B¹⁰— and the rear upright —B⁵— upon the carriage —B—, and are each formed on their lower face with a lengthwise groove —B¹³— in which are movable upturned ribs —H⁷—H⁷— upon the adjacent clamping jaws —H—H—.

As the supports —G—G— are moved toward and away from each other, as previously described, the opposite clamping jaws —H—H— movable upon said supports are also moved laterally upon the arms of the heads —B²—B²—, as previously described, and, during said movement, the ribs —H⁷— are moved lengthwise within the grooves —B¹³—B¹³— in the heads —B²—B²—. Moreover, as the carriage —B— moves to and fro within its guide —*a'*—, the clamping jaws —H—H— are moved simultaneously with said carriage along the supports —G—G—, and thereby move the ends of the interposed boards or shooks across the cutter-heads —E—E—, since the ribs —H⁷— formed upon said jaws interlock with the grooves —B¹³— upon the heads —B²—B²—, as clearly illustrated at Fig. 8. It will also be noted that, as the nut —B¹⁰— is adjusted lengthwisely of the carriage, it carries with it the front clamping jaws interlocked with said head, and thereby efficiently clamps said jaws against the adjacent faces of the boards or shooks.

In order to regulate the depth of the groove to be formed by the cutter-heads —E—E— I provide upon one of the bearings —*e*— in front of the corresponding cutter-head a gage —I—, Figs. 1, 2, 13, and 14, which consists of a movable plate —*i*—, an adjuster —*i'*—, and a clamp —*i*²—. The plate —*i*— is formed with an inner face —*i*³— disposed in a plane substantially parallel with the line of movement of the carriage —B—, and its outer end is movable in a guide —*e*⁸— in the bearing —*e*—, and is formed with a slot —*i*⁴—. The adjuster —*i'*— is movable through an ear —*e*⁹— upon the bearing —*e*—, and its inner end bears against the adjacent face of the outer end of the plate —*i*—, and is formed with a nipple —*i*⁵—, which enters an aperture —*i*⁶— in the plate —*i*—, and serves to support said plate in its movement. The adjuster —*i'*— is held in its adjusted position by nuts —*i*⁷— bearing against the opposite faces of the ear —*e*⁹—. The fastener —*i*²— is passed through the slot —*i*⁴— in the plate —*i*—, and one extremity is screw-threaded and engaged with a screw threaded socket —*e*¹⁰— in the bearing —*e*—, and the other extremity is formed with a hand engaging portion or shoulder —*i*⁸— bearing against the upper face of the plate —*i*—.

The supports for the lower edges of the boards or shooks, the clamping jaws for engaging the outer faces of the interposed boards, the means for feeding the jaws lengthwise of the supports, and the gage for regulating the depth of the grooves to be formed in the end edges of boards or shooks are simple in construction, are easily adjusted and operated, and are strong and durable in use.

As best seen at Figs. 1, 2, 18, and 19 the cutter-head shafts —*e'*—*e'*— are formed at their lower extremities with pulleys —*e*¹¹—*e*¹¹—, around which is passed a belt —J— for rotating said cutter-heads, so that their adjacent faces move in the same direction, as shown by arrows at Figs. 18 and 19. The belt —J— is driven in the direction also shown by arrows at Figs. 18 and 19 by front and rear driving pulleys —K—K— fixed upon the shaft —*k*—, and is passed around idlers —K'—K²— fixed respectively upon the shafts —*k'*—*k*²—. The opposite ends of the shafts —*k*—*k*²— are journaled in the opposite walls —A⁵—A⁵— of the left-hand extremity of the frame —A—, and the shaft —*k'*— is journaled in a supporting bearing —*k*³—, which is movable in guides —A⁶—A⁶— in the inner faces of the walls —A⁵—A⁵—, and is forced to the desired position by a suitable adjuster —*k*⁴— Figs. 15 and 16 having one end bearing against a downturned arm —*k*⁵— upon the bearing —*k*³—, and the other movable in a supporting bar —*k*⁶— interposed between the frame walls —A⁵—A⁵—. The belt —J— is passed beneath the idler —K'—, is twisted a quarter turn and extended to the right-hand, so as to pass around the right-hand pulley —*e*¹¹—, is then twisted a quarter turn and extended to the left-hand so as to pass beneath the rear driver —K—, is then passed upwardly from the rear driver, twisted a quarter turn, and extended to the right-hand so as to pass around the left-hand pulley —*e*¹¹—, is again twisted a quarter turn and extended to the left-hand and passed over and beneath the idler —K²—, is then extended to the right-hand and passed over and beneath the front driver —K—, and is finally extended to the left-hand and passed over the idler —K'—. The idler —K'—, being mounted on a movable bearing, is readily adjusted to properly tension the belt —J—, and, as is evident to one skilled in the art, this tension is uniform irrespective of the amount of separation of the cutter-heads —E—E—, since, as one cutter-head moves away from the driving pulleys and the idlers, the other cutter-head moves an equal distance toward said driving pulleys and idlers.

As previously stated the shaft —*k*— is revolved by the tight and loose pulleys —C¹⁸—C¹⁹— in the direction shown by arrow —3—

at Fig. 1, and the belt—J— and idlers —K′—K²— are then arranged as just described. It sometimes happens, however, that the power transmitting mechanism for revolving the pulleys —C¹⁸—C¹⁹— is arranged to revolve the same in the opposite direction, and, instead of re-arranging said mechanism, I preferably slide the idlers —K′—K²— lengthwise of the shafts —*k*′—*k*²— into alignment with the rear driver —K— instead of the front driver. The belt —J—, is then revolved in the direction shown by arrows at Figs. 25 and 26, and is then passed beneath the front driver —K—, is twisted a quarter turn, and extended to the right-hand so as to pass around the right-hand pulley —*e*¹¹—, is then twisted a quarter turn and extended to the left-hand so as to pass beneath and over the idler —K′—, is then extended to the right-hand and passed beneath and over the rear driver —K—, is then extended to the left hand, and passed beneath and over the idler —K²—, is then twisted a quarter turn and extended to the right-hand so as to pass around the left-hand pulley —*e*¹¹—, and is then twisted a quarter turn, extended to the left-hand and passed beneath the front driver —K—. This is a particularly simple, practical, and effective construction of power transmitting mechanism for driving the adjacent faces of the cutter-heads in the same direction, and permitting of any desired adjustment thereof without varying the action of the power transmitting mechanism or necessitating its adjustment and is particularly applicable for use with my grooving machine. It will be understood, however, that said power transmitting mechanism forms no part of my present invention, and that it is here illustrated and briefly described merely for the purpose of more clearly and explicitly setting forth the operation of my grooving machine.

The operation of my invention will be readily perceived from the foregoing description and upon reference to the drawings, and it will be particularly noted that the boards or shooks are readily adjusted in position upon their supports, are firmly clamped in their adjusted position, and that their ends are quickly and practically provided with grooves, which are exactly true, and facilitate the ready assemblage of the box shooks, and that the parts of my invention are simple in construction, economically manufactured, readily assembled, easily and practically operated, are efficient in operation, and durable in use. It is evident, however, that considerable change may be made in the relative construction and arrangement of the parts of my grooving machine, hence I do not herein limit my invention to the described construction and arrangement of its parts.

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

1. In a grooving machine, the combination of a cutter head, a support having a bearing face disposed at an angle to the axis of the cutter head for supporting the boards, jaws for clamping said boards in position upon the support, a driving shaft, a second shaft connected to said jaws for feeding the same along said face of the support, and thereby moving the boards across the face of the cutter head, and for returning said jaws to their normal position, connections between the driving shaft and the latter shaft for rotating the latter shaft in one direction, and connections between said driving shaft and the latter shaft for rotating the latter shaft in the opposite direction, substantially as and for the purpose described.

2. In a grooving machine, the combination of a cutter head, a support having a bearing face disposed at an angle to the axis of the cutter head for supporting the boards, jaws for clamping said boards in position upon the support, a shaft connected to said jaws for feeding the same along said face of the support, and thereby moving the boards across the face of the cutter head, and for returning said jaws to their normal position, and wheels revolving in opposite directions detachably connected to said shaft for revolving the same in opposite directions, substantially as and for the purpose specified.

3. In a grooving machine, the combination of a cutter head, a support having a bearing face disposed at an angle to the axis of the cutter head for supporting the boards, jaws for clamping said boards in position upon the support, wheels revolving in opposite directions, a shaft connected to said jaws and connected to one of said wheels for feeding the jaws along said face of the support, and thereby moving the boards across the face of the cutter head, and a shifting device connected to the shaft for disconnecting the same from said wheel and connecting the same to the other wheel, said shifting device being connected to said jaws whereby the movement of the jaws automatically actuates said shifting device, substantially as and for the purpose described.

4. In a grooving machine, the combination of a cutter head, a support having a bearing face disposed at an angle to the axis of the cutter head for supporting the boards, jaws for clamping said boards in position upon the support, a shaft connected to said jaws, a wheel connected to said shaft for rotating the shaft in one direction to feed the jaws along said face of the support, and to move the boards across the face of the cutter head, a second wheel connected to said shaft for rotating the same in the reverse direction and returning the jaws, and a shifting device having an engaging arm connected to said jaws for automatically limiting the return movement of said jaws, substantially as and for the purpose specified.

5. In a grooving machine, the combination of a cutter head, a support having a bearing face disposed at an angle to the axis of the cutter head for supporting the boards, jaws

for clamping said boards in position upon the support, a driving shaft, a second shaft connected to said jaws for feeding the same along said face of the support and thereby moving the boards across the face of the cutter head, connections between the driving shaft and the latter shaft for rotating the latter shaft in one direction, connections between said driving shaft and the latter shaft for rotating the latter shaft in the opposite direction, and a shifting device connected to said connections for bringing the same into action and connected to the jaws, whereby the retractive movement of the jaws automatically actuates said shifting device, substantially as and for the purpose described.

6. In a grooving machine, the combination of a cutter-head, a support having a bearing face disposed at an angle to the axis of the cutter-head for supporting the bcards, jaws for clamping said boards in position upon the support, a driving shaft provided with pinions, a second shaft connected to said jaws for feeding the same along said face of the support and thereby moving the boards across the face of the cutter-head and for returning said jaws to their normal position, a sleeve loosely mounted on said second shaft and provided with a clutch section and with a gear wheel for meshing with one of the pinions on the driving shaft, a gear wheel for meshing with the other pinion on the driving shaft formed of greater diameter than the gear wheel provided on said sleeve and loosely mounted on the sleeve and provided with a clutch section, and clutch sections secured to said second shaft for alternately engaging the former clutch sections, substantially as and for the purpose described.

7. In a grooving machine, the combination of a frame, a cutter head mounted on the frame, a carriage provided with jaws for clamping the boards and moving the same across the face of the cutter head and provided with separated engaging faces, gear wheels revolving in opposite directions, a shaft connected to said jaws and connected to one of said gear wheels for moving the carriage in one direction, and a lever pivoted to the frame and having an arm connected to the shaft for disengaging the same from said gear wheel and engaging the same with the other gear wheel and for disengaging the shaft from the other gear wheel, said lever being provided with an arm interposed between said separated faces of the carriage for engaging the same, substantially as and for the purpose specified.

8. In a grooving machine, the combination of a frame, opposite cutter head bearings mounted on the frame, a support rigidly secured to one of said bearings for supporting the bottom edges of the boards, a carriage movable lengthwise of said support and provided with opposite heads or bars, clamping jaws connected to said carriage heads or bars and movable laterally on the carriage heads or bars for approximating their adjacent faces and movable lengthwise of said support for feeding the boards to be grooved across the adjacent faces of the cutter head, substantially as and for the purpose described.

9. In a grooving machine, the combination of a frame provided with guide-ways, bearings simultaneously movable toward and away from each other along said guides, oppositely arranged cutter-heads journaled in said bearings, a support rigidly secured to one of said bearings for supporting the bottom edges of the boards, a carriage movable lengthwise of said support and provided with opposite heads or bars, clamping jaws connected to said carriage heads or bars and movable laterally on the carriage heads or bars for approximating their adjacent faces and movable lengthwise of said support for feeding the boards to be grooved across the adjacent faces of the cutter head, substantially as and for the purpose described.

10. In a grooving machine, the combination of a frame provided with a guide, a bearing movable along said guide, a cutter head journaled in the bearing, reciprocally moving clamping jaws for feeding the boards across face of the the cutter head, gear wheels revolving in opposite directions, a shaft connected to said jaws and connected to one of the gear wheels for feeding the jaws in one direction, and a shifting device connected to the shaft for disconnecting the same from said gear wheel and connecting the same to the other gear wheel and connected to said jaws, whereby the movement of the jaws automatically actuates said shifting device, substantially as and for the purpose described.

11. In a grooving machine, the combination of a frame provided with guides, bearings movable simultaneously toward and away from each other along said guides, opposite cutter heads journaled in said bearings, reciprocally moving clamping jaws for feeding the boards across the adjacent faces of said cutter heads, gear wheels revolving in opposite directions, a shaft connected to said jaws and connected to one of the gear wheels for feeding the jaws in one direction, and a shifting device connected to the shaft for disconnecting the same from said gear wheel and connecting the same to the other gear wheel and connected to said jaws, whereby the movement of the jaws automatically actuates said shifting device, substantially as and for the purpose specified.

12. In a grooving machine, the combination of a frame, opposite cutter head bearings mounted on the frame, one of said bearings being provided with a support, a bar or rail adjustably mounted on said support for engaging the bottom edges of the boards to be grooved, a carriage movable lengthwise of said support and provided with opposite heads or bars, clamping jaws connected to said carriage heads or bars and movable laterally on the carriage heads or bars for approximating

their adjacent faces and movable lengthwise of said support for feeding the boards to be grooved across the adjacent faces of the cutter head, substantially as and for the purpose described.

13. In a grooving machine, the combination of a frame provided with rectilinear guides, bearings movable simultaneously toward and away from each other along said guides, oppositely arranged cutter heads journaled in said bearings, a support for the boards to be grooved secured to each of said bearings and projecting on opposite sides of the cutter heads, a rail or bar extending on opposite sides of the cutter heads and movably mounted on each of said supports and having its face projecting beyond the face of the corresponding support, and jaws for clamping said boards movable lengthwise along said supports for feeding the boards across the adjacent faces of the cutter heads, substantially as and for the purpose set forth.

14. In a grooving machine, the combination of a frame, a bearing mounted on the frame, and provided with a support a cutter head journaled in the bearing, a rail or bar for supporting the boards, a link having one end movably mounted on the support of said bearing for the cutter-head and the other end pivoted to the rail for raising and lowering said rail, a clamp for retaining the rail in its adjusted position, and jaws movable along said rail for clamping the boards and moving the same across the face of the cutters, substantially as and for the purpose described.

15. In a grooving machine, the combination of a frame, a bearing mounted on the frame and provided with a support, a cutter head journaled in the bearing, a rail or bar for supporting the boards, links having corresponding ends movably mounted on the support of said bearing for the cutter-head and their other ends pivoted to the opposite ends of the rail, a screw for adjusting the rail, clamps for holding the rail in its adjusted position, and clamping jaws movable lengthwise of said rail, substantially as and for the purpose specified.

16. In a grooving machine, the combination of a frame having a longitudinal guide and a transverse guide arranged at substantially right angles to the former guide, a cutter head supporting bearing movable along the longitudinal guide and having a support for the boards to be grooved secured thereto, and arranged in a plane, substantially parallel with the transverse guide, a pair of rocking levers or links having corresponding ends pivoted to the opposite ends of said support, a rail or bar pivotally supported upon the other ends of said links for engaging said boards, means for retaining said rail in its adjusted position, and jaws for clamping said boards movable lengthwise along said support for feeding the boards across the adjacent face of the cutter head, substantially as and for the purpose described.

17. In a grooving machine, the combination of a frame provided with a guide, bearings movable along the guide, a support for the articles to be grooved, a cutter head journaled in the bearing, a carriage movable on the frame in a plane arranged at substantially right angles with the plane of movement of the bearing, and jaws for clamping the articles to be grooved mounted on the carriage and movable lengthwise of said support for feeding said articles across the face of the cutter head, said jaws being connected to the movable bearing whereby the jaws are moved transversely on said carriage, substantially as and for the purpose specified.

18. In a grooving machine, the combination of a frame provided with a guide, a bearing movable along the guide, a support for the articles to be grooved, a cutter head journaled in the bearing, a carriage movable on the frame in a plane arranged at substantially right angles with the plane of movement of the bearing, jaws for clamping the articles to be grooved mounted on the carriage and movable lengthwise of said support for feeding said articles across the face of the cutter head, said jaws being connected to the movable bearing, whereby the jaws are moved transversely on said carriage, a driving shaft, a second shaft connected to said carriage for feeding the same, connections between the driving shaft and said second shaft for rotating the second shaft in one direction, and connections between said driving shaft and the second shaft for rotating the second shaft in the opposite direction, substantially as and for the purpose set forth.

19. In a grooving machine, the combination of a frame provided with a guide, a bearing movable along the guide, a support for the articles to be grooved, a cutter head journaled in the bearing, a carriage movable on the frame in a plane arranged at substantially right angles with the plane of movement of the bearing, jaws for clamping the articles to be grooved mounted on the carriage and movable lengthwise of said support for feeding said articles across the face of the cutter head, said jaws being connected to the movable bearing whereby the jaws are moved transversely on said carriage, a driving shaft, a second shaft connected to said carriage for feeding the same, connections between the driving shaft and said second shaft for rotating the second shaft in one direction, connections between said driving shaft and the second shaft for rotating the second shaft in the opposite direction, and a shifting device for automatically limiting the return movement of the carriage, substantially as and for the purpose specified.

20. In combination, a frame, a carriage movable upon the frame, a cutter head supported by the frame in a plane at substantially right angles to the plane of movement of the carriage and movable toward and away from said carriage, a support mounted upon the frame and movable simultaneously with the

cutter head and formed with a face disposed in a plane substantially parallel with the plane of movement of the carriage, and clamping jaws mounted on the opposite ends of the support and the carriage and movable lengthwise of the support and transversely of the carriage and having engaging faces disposed in planes substantially parallel with the axis of the cutter head for engaging the interposed boards, substantially as and for the purpose specified.

21. In combination, a frame, a carriage movable upon the frame, a cutter head supported by the frame, in a plane at substantially right angles to the plane of movement of the carriage and movable toward and away from said carriage, a support mounted upon the frame and movable simultaneously with the cutter head and formed with a face disposed in a plane substantially parallel with the plane of movement of the carriage, clamping jaws mounted on the support and having engaging faces disposed in planes substantially parallel with the axis of the cutter head for engaging the interposed boards, and laterally extending arms on the carriage for guiding the jaws as the support is moved, substantially as and for the purpose set forth.

22. In combination, a frame, a carriage movable upon the frame, a bearing movable upon the frame in a plane at substantially right angles to the plane of movement of the carriage, a cutter head journaled in said bearing, a support secured to said bearing and formed with a face disposed in a plane substantially parallel with the plane of movement of the carriage, clamping jaws mounted on the support and having engaging faces disposed in planes substantially parallel with the axis of the cutter head for engaging the interposed boards, means for adjusting said jaws toward and away from each other, and laterally extending arms on the carriage adjustable toward and away from each other for supporting the clamping jaws during the movement of the support, substantially as and for the purpose set forth.

23. In combination, a frame, a carriage movable upon the frame, a bearing movable upon the frame in a plane at substantially right angles to the plane of movement of the carriage, a cutter head journaled in said bearing, a support secured to said bearing and formed with a face disposed in a plane substantially parallel with the plane of movement of the carriage, clamping jaws mounted on the support and having engaging faces disposed in planes substantially parallel with the axis of the cutter head for engaging the interposed boards, means for adjusting said jaws toward and away from each other, laterally extending arms on the carriage adjustable toward and away from each other for supporting the clamping jaws during the movement of the support, means for feeding the carriage to and fro, and means for preventing the action of said feeding mechanism, substantially as and for the purpose specified.

24. In a grooving machine, the combination of a cutter head, a support having a face disposed in a plane at substantially right angles to the axis of the cutter head for supporting the boards arranged edgewise thereon, clamping jaws one of which is formed with a face plate adjustable lengthwise thereon said jaws having engaging faces disposed in planes substantially parallel with the axis of the cutter head for engaging the interposed boards, said jaws being movable along said face of the support for moving the ends of the boards across the cutter head, substantially as and for the purpose specified.

25. In a grooving machine, the combination of a frame, a pair of bearings movable toward and away from each other, means, substantially as described, for rotating the adjacent faces of the cutter heads in the same direction, a pair of supports secured to said bearings and formed with faces for supporting the boards arranged edgewise thereon, a carriage interposed between the bearings and movable in a plane at substantially right angles to the axes of the cutter heads, laterally extending arms mounted on the carriage and movable toward and away from each other, and clamping jaws movable lengthwisely of said supports and lengthwisely of said arms and formed with engaging faces disposed in planes substantially parallel with the axes of the cutter heads for engaging the interposed boards, substantially as and for the purpose specified.

26. In a grooving machine, the combination of a frame, a cutter head mounted on the frame, a screw threaded spindle at one side of the cutter head, a nut for engaging said spindle, separated movable jaws for clamping the boards arranged on opposite sides of the spindle and connected to the nut, and means for moving said jaws, substantially as and for the purpose set forth.

27. In a grooving machine, the combination of a frame, a cutter head mounted on the frame, a screw threaded spindle arranged at one side of the cutter head, a nut movably mounted on the spindle and provided with a guideway, a guidebar registered with said guideway, separated movable jaws for clamping the boards arranged on opposite sides of said spindle and connected to the nut, and means for rotating said spindle and moving the nut along the guidebar, substantially as and for the purpose described.

In testimony whereof I have hereunto signed my name, in the presence of two attesting witnesses, at Rochester, in the county of Monroe, in the State of New York, this 6th day of December, 1892.

HENRY W. MORGAN.

Witnesses:
DE LANCY CRITTENDEN,
ALFRED WINTERROTH.