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W. H. DOANE.

PLANING AND MATCHING MACHINE.

No. 335,994. Patented Feb. 9, 1886.

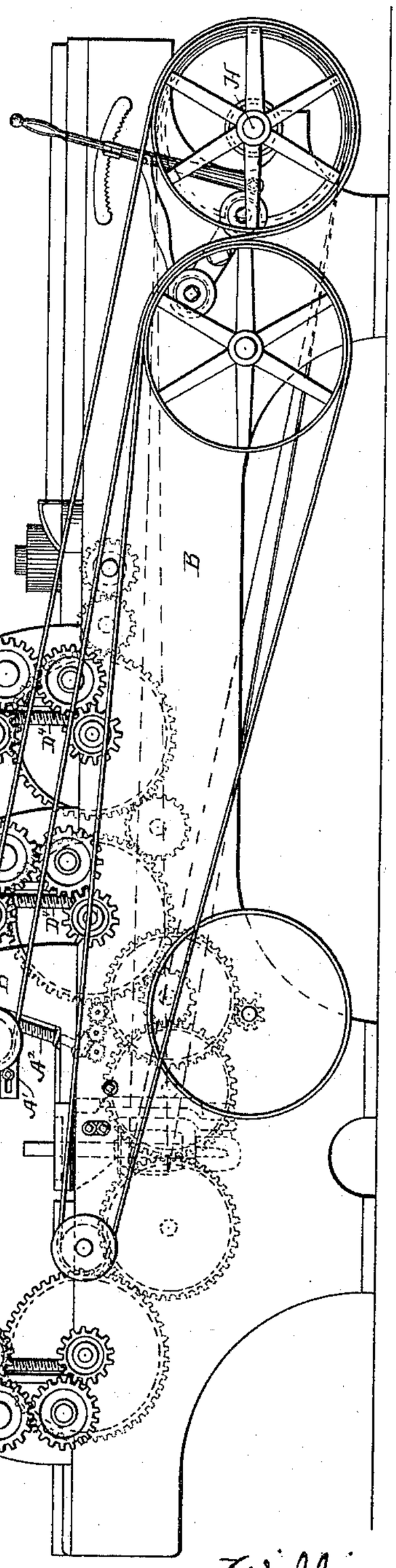

Fig. 1.

Witnesses:
W. C. Tirdinston
C. D. Kerr.
D. D. M. Woodmansee

Inventor
William H. Doane
by R. H. Hooe
Attorney.

(No Model.)

8 Sheets—Sheet 2.

W. H. DOANE.

PLANING AND MATCHING MACHINE.

No. 335,994. Patented Feb. 9, 1886.

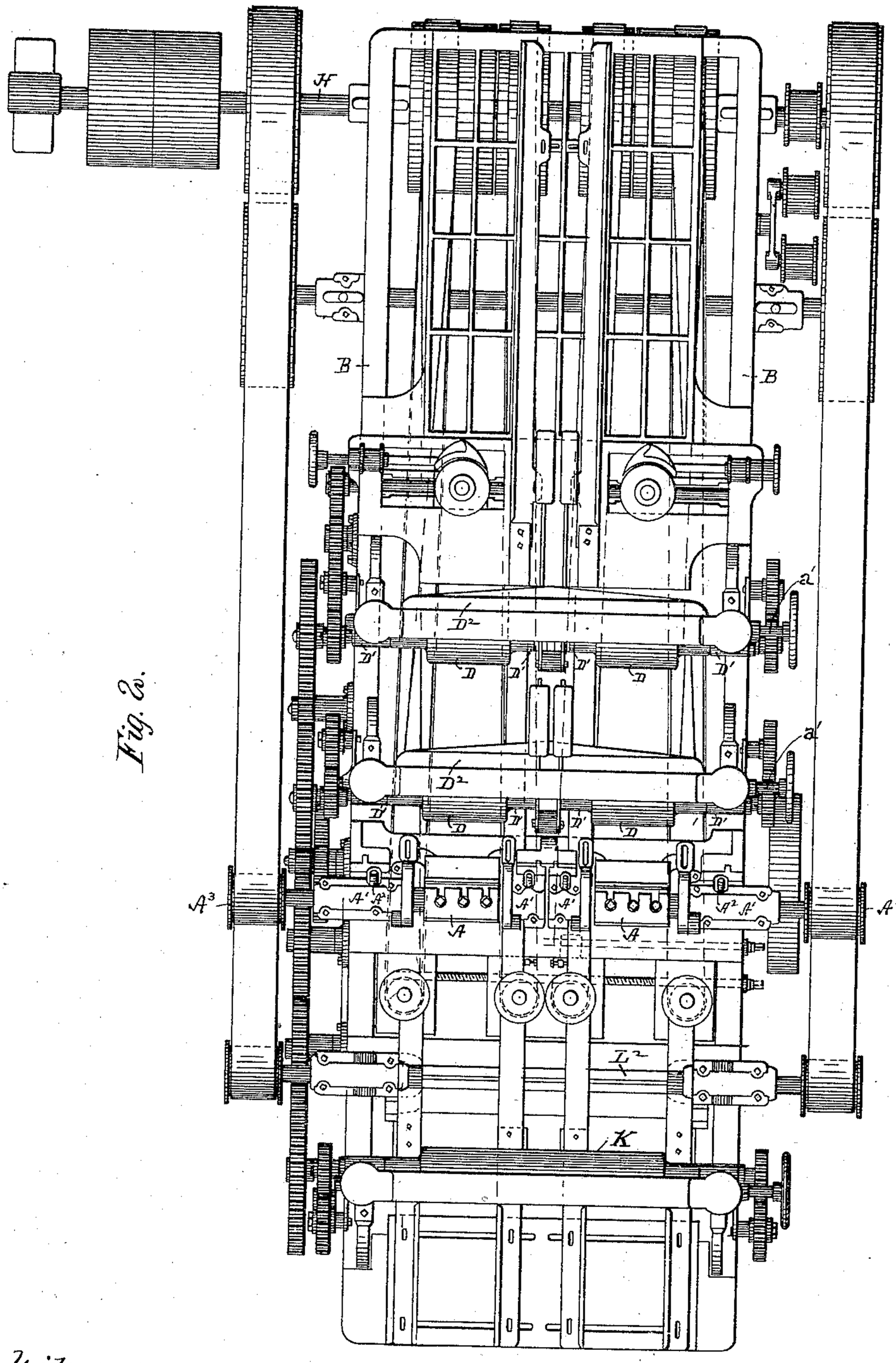

Fig. 2.

Witnesses:
W. C. Tirdinston.
C. D. Kent
D. D. M. Woodmansee

Inventor
William H. Doane
by Lemuel Gress
Attorney

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W. H. DOANE.

PLANING AND MATCHING MACHINE.

No. 335,994. Patented Feb. 9, 1886.

Fig. 3.

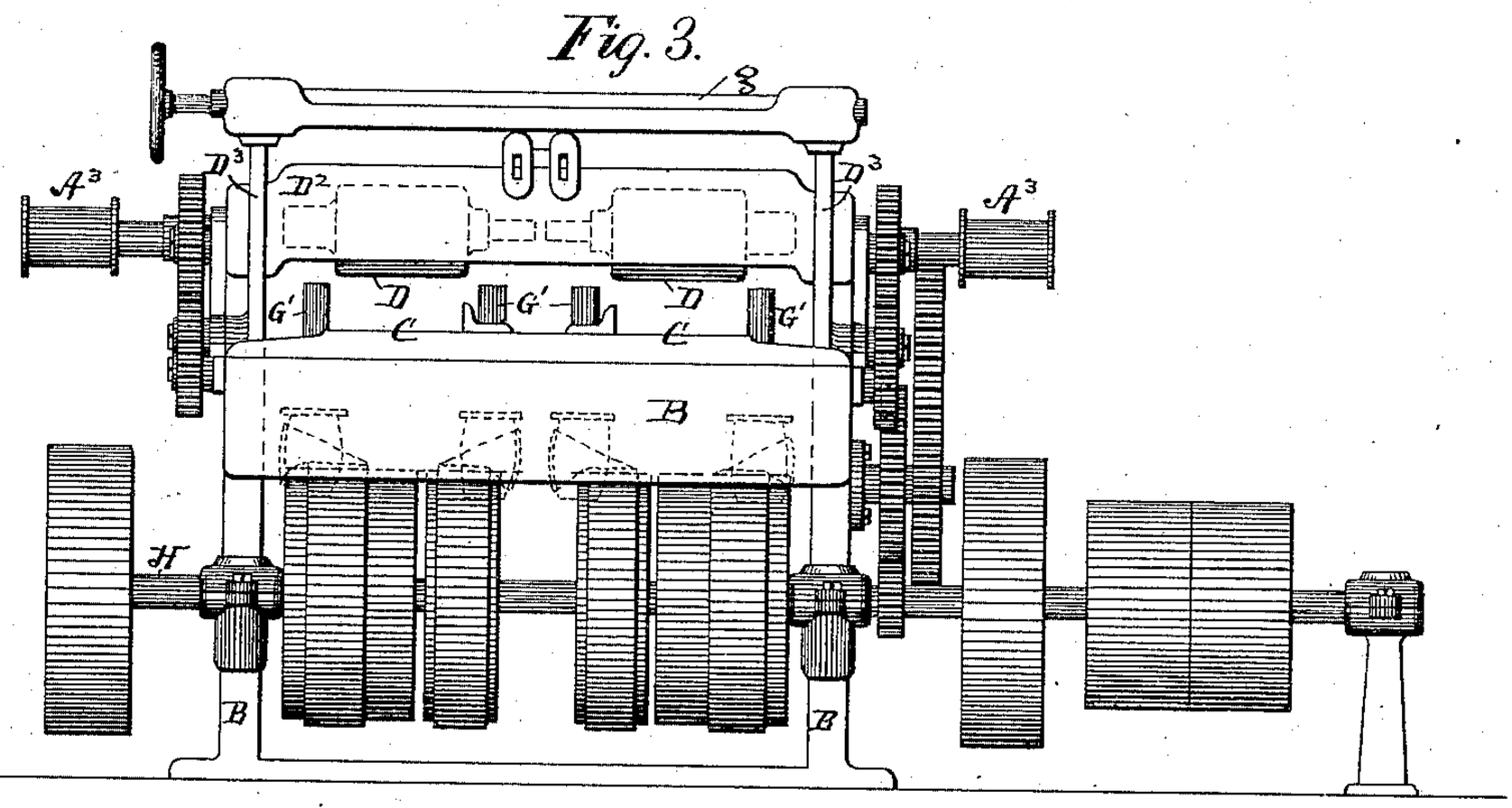


Fig. 4.

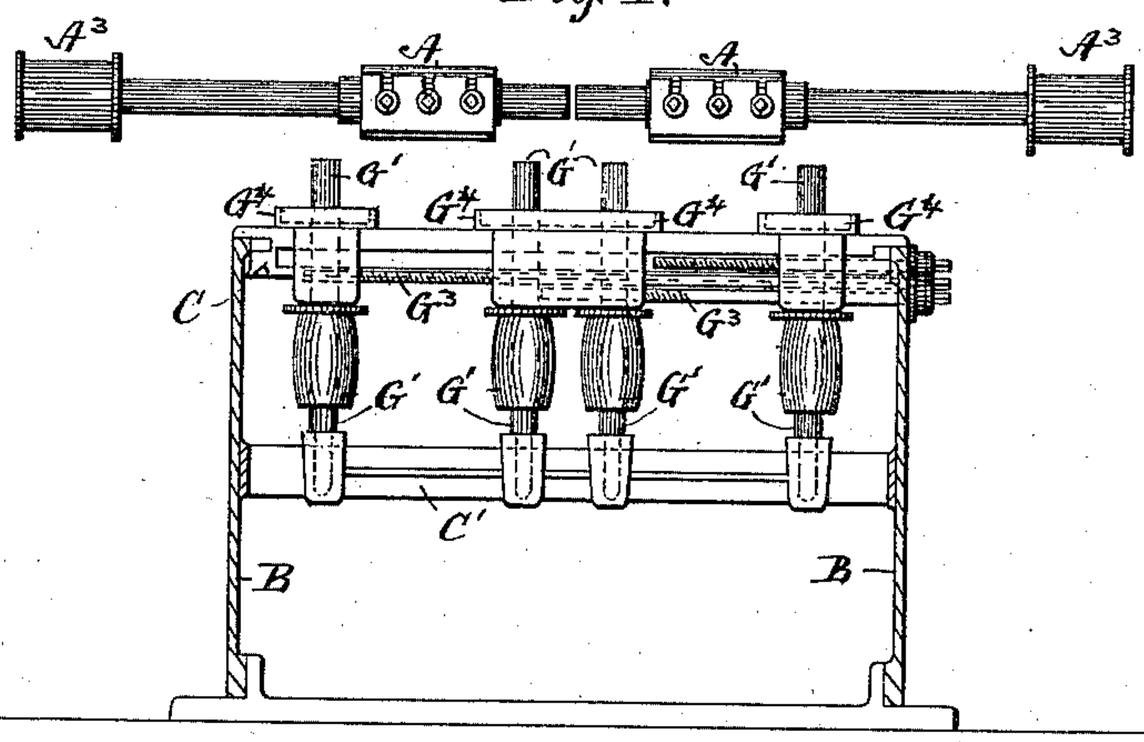
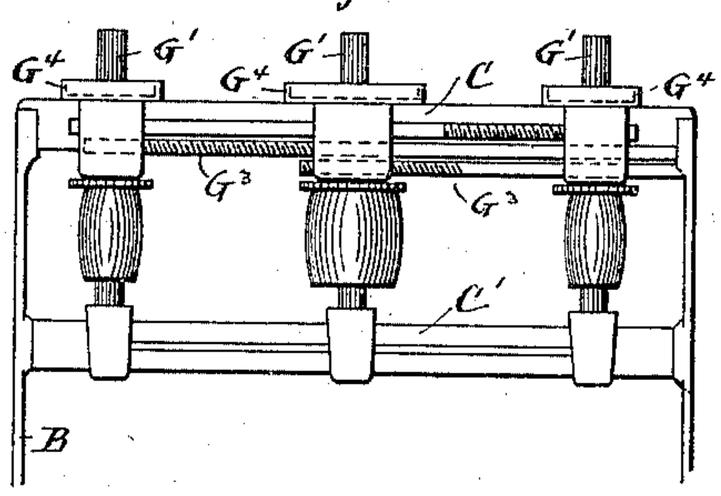


Fig. 7.



Witnesses:
W. C. Tirdinston.
C. D. Kerr
D. D. M. Wadmaurer

Inventor
William H. Doane
by Lemuel Gross,
Attorney

(No Model.)

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W. H. DOANE.

PLANING AND MATCHING MACHINE.

No. 335,994. Patented Feb. 9, 1886.

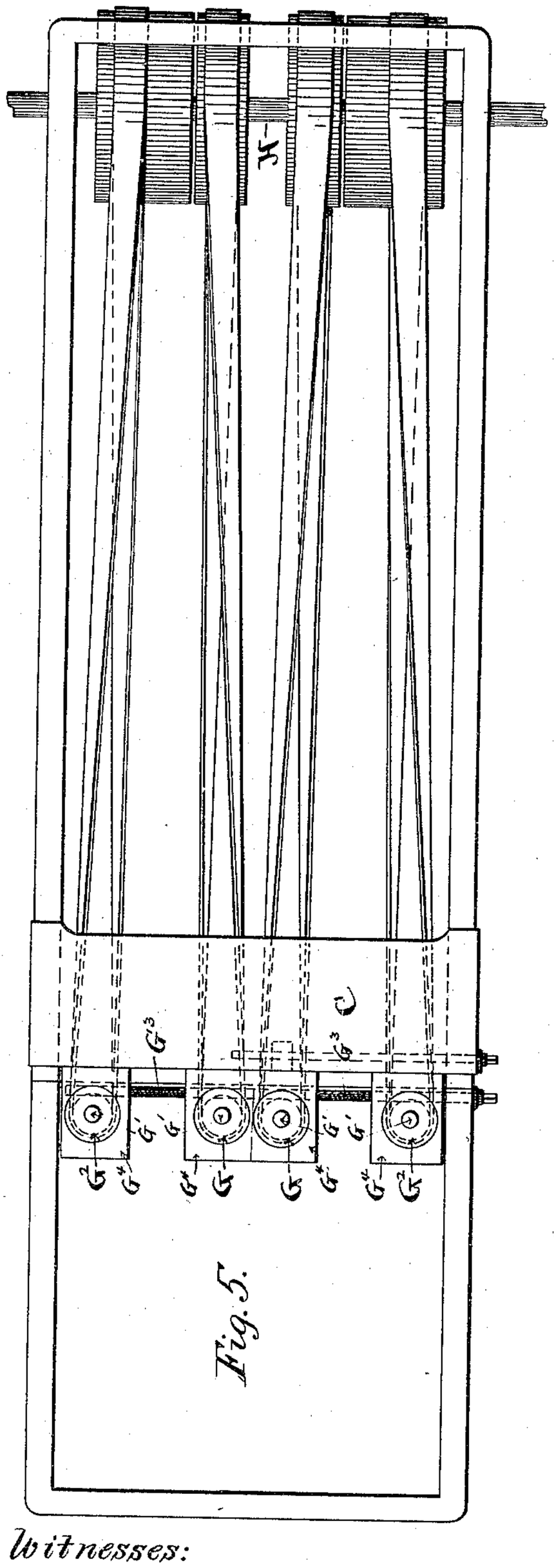


Fig. 5.

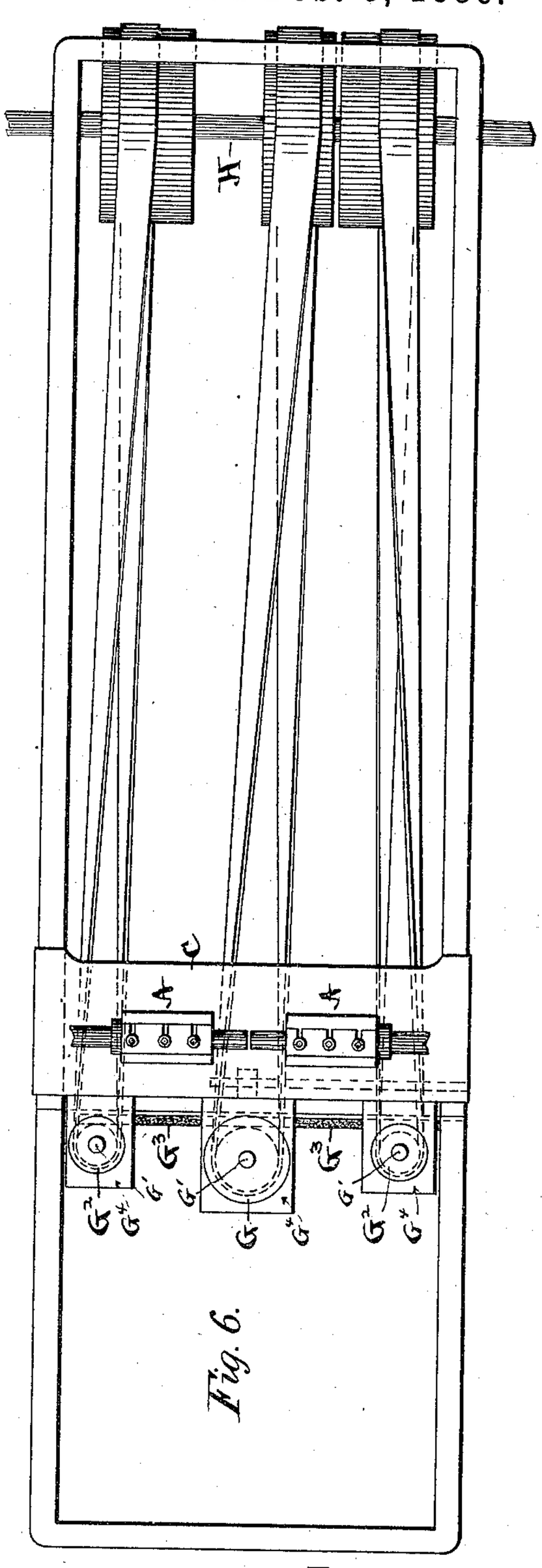


Fig. 6.

Witnesses:
W. C. Jirdinston.
C. W. Kent
D. D. M. Mackenzie

Inventor
William H. Doane
by Robt Howe
Attorney

(No Model.) 8 Sheets—Sheet 5.

W. H. DOANE.

PLANING AND MATCHING MACHINE.

No. 335,994. Patented Feb. 9, 1886.

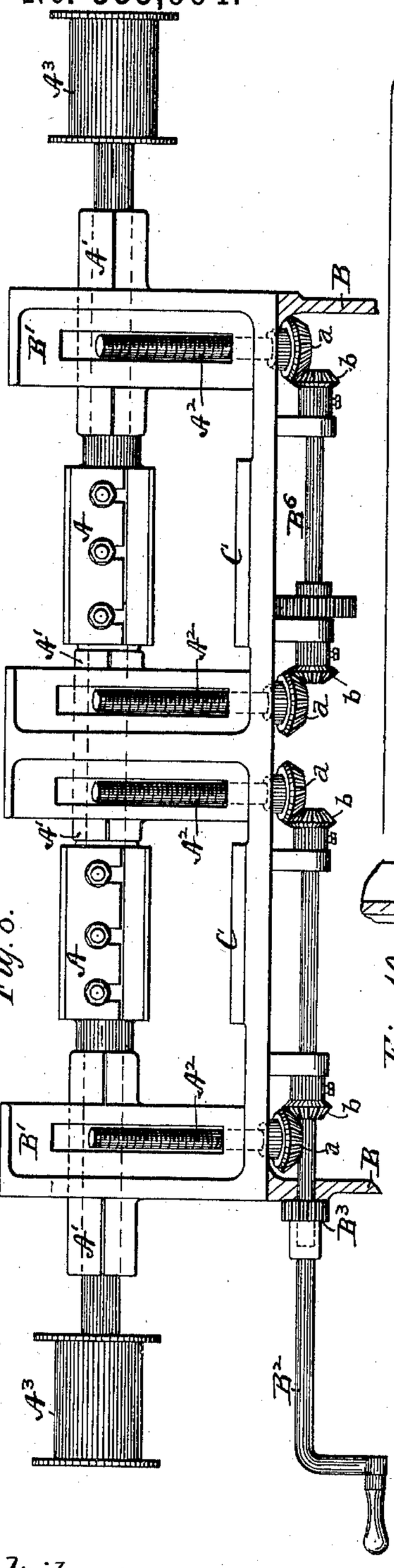


Fig. 8.

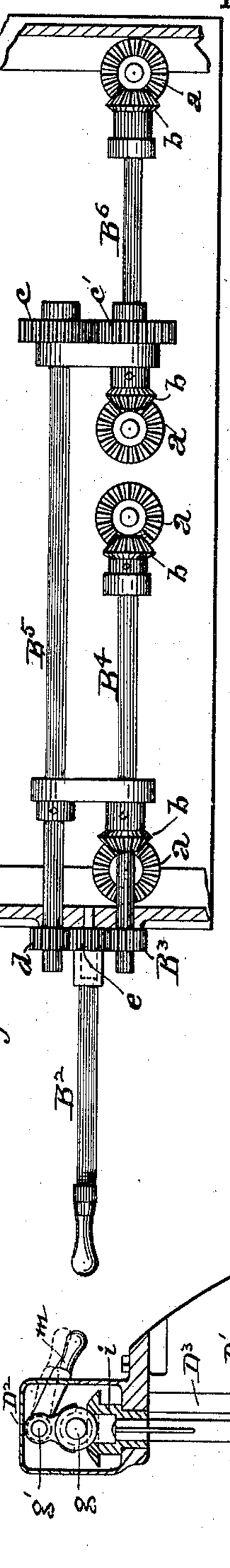


Fig. 10.

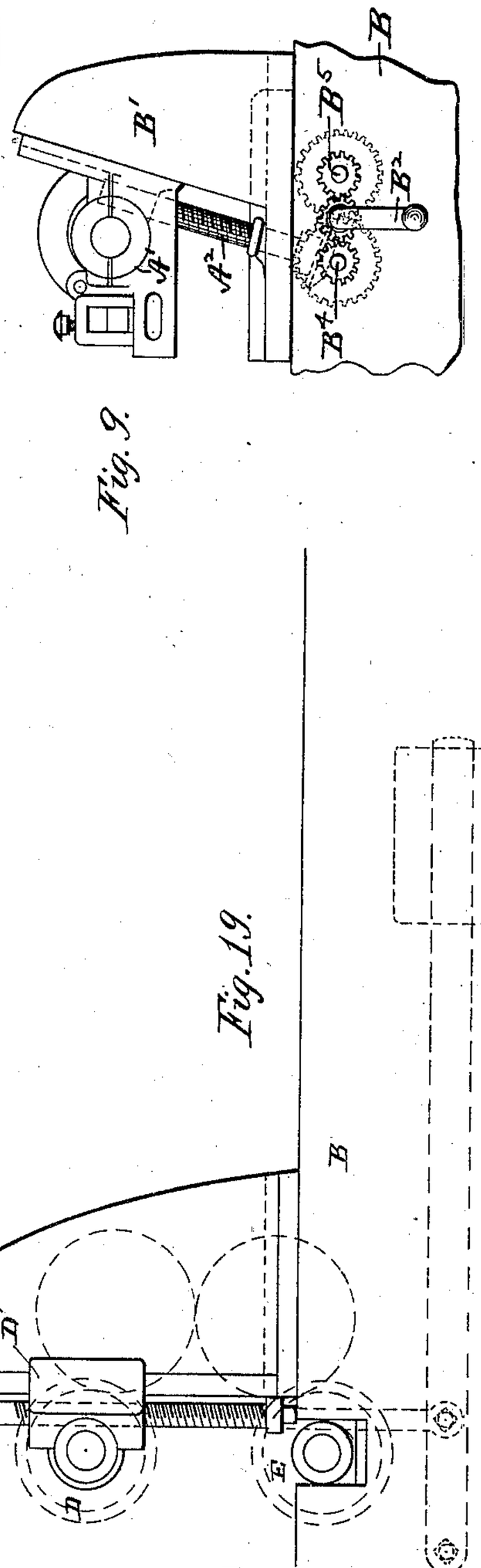


Fig. 9.

Fig. 19.

Witnesses:
W. C. Tirdinston.
C. D. Kerr
D. D. M. Mordmaunee

Inventor
William H. Doane
by R. H. Rose
Attorney.

(No Model.)

8 Sheets—Sheet 6.

W. H. DOANE.

PLANING AND MATCHING MACHINE.

No. 335,994. Patented Feb. 9, 1886.

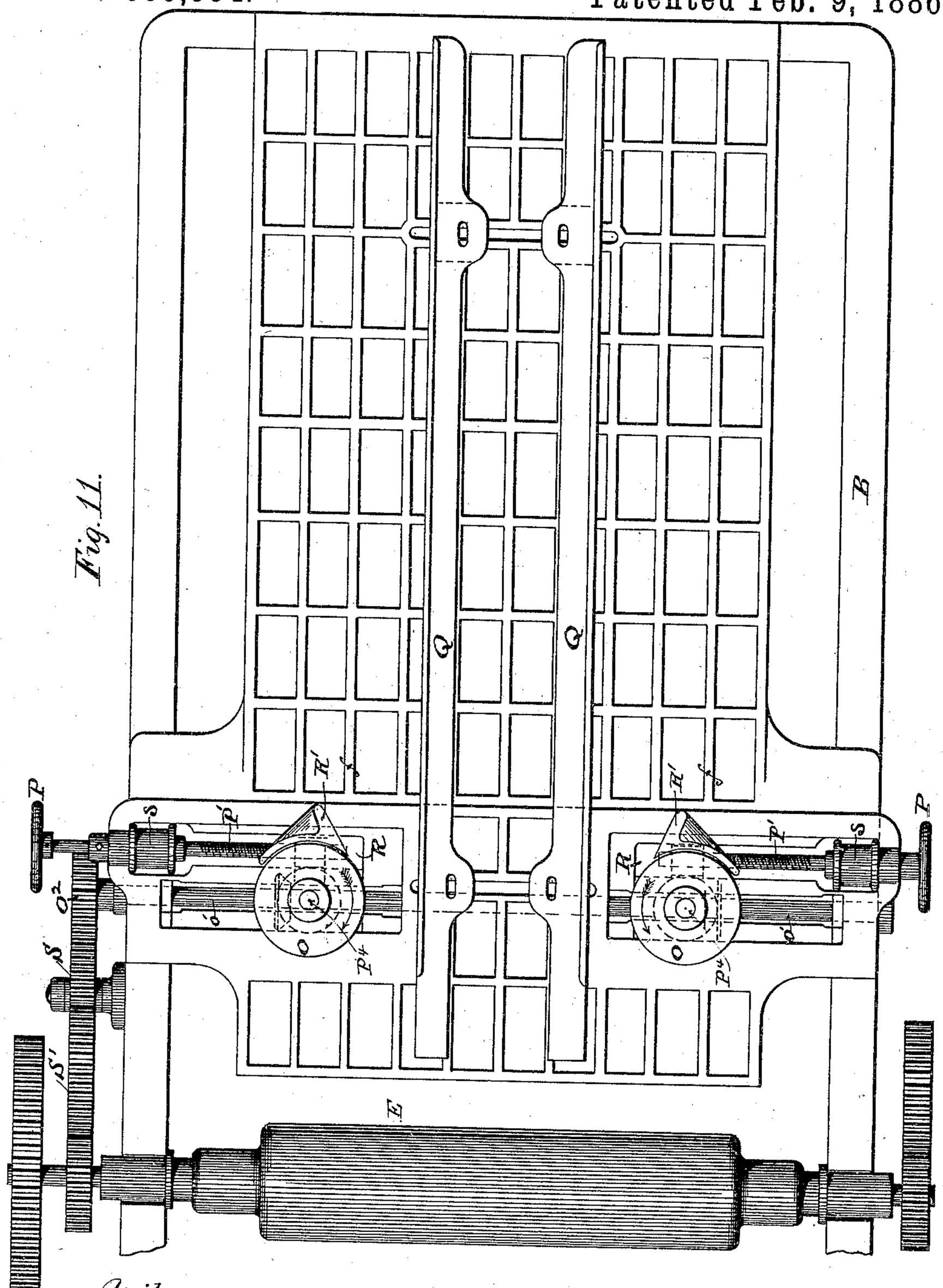


Fig. 11.

Witnesses:
W. C. Jirdinston.
C. D. Kerr
D. D. M. Woodmansee

Inventor
William H. Doane
by Lou. Hoes
Attorney.

(No Model.) 8 Sheets—Sheet 7.

W. H. DOANE.

PLANING AND MATCHING MACHINE.

No. 335,994. Patented Feb. 9, 1886.

Fig. 12.

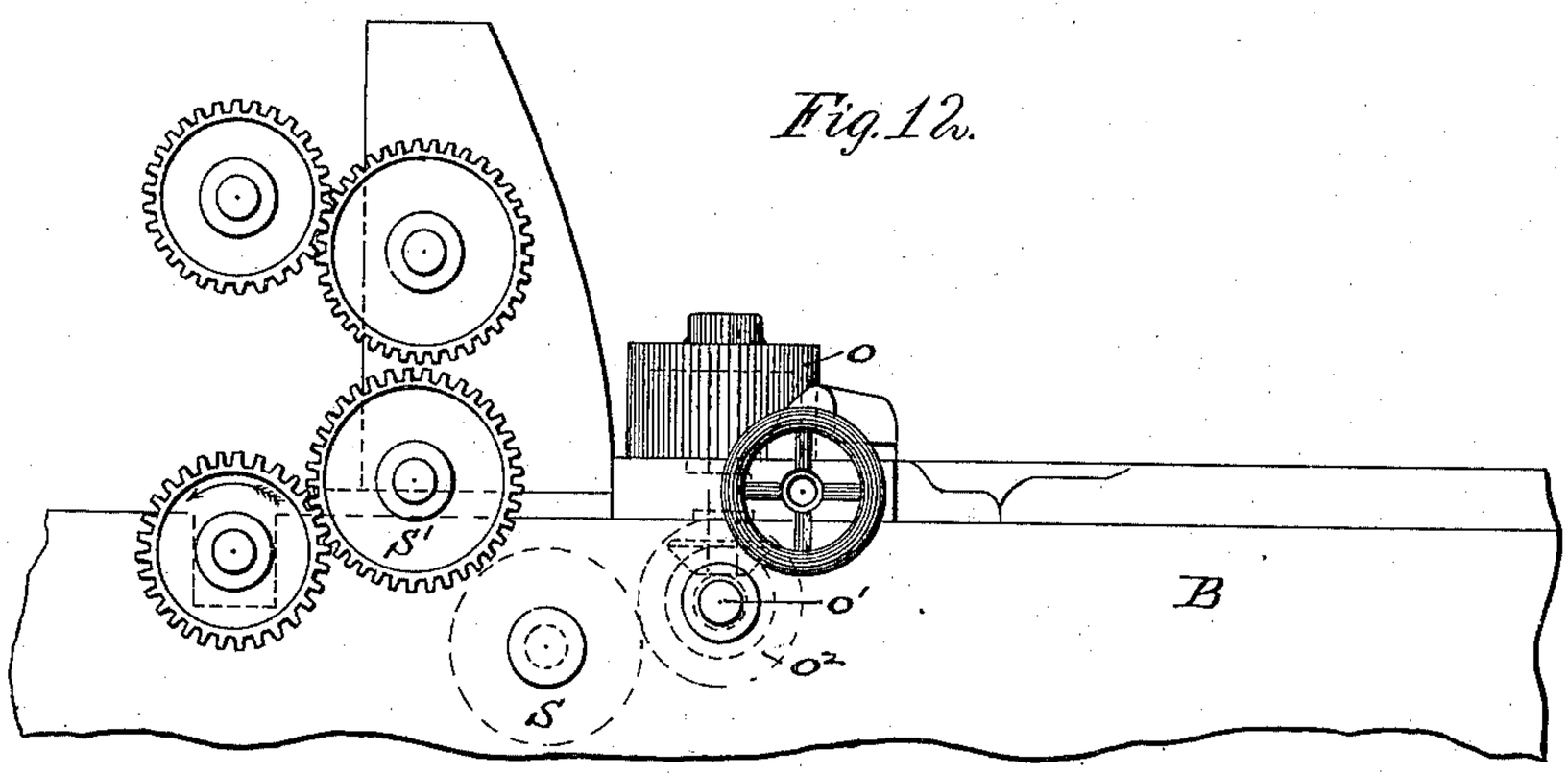


Fig. 13.

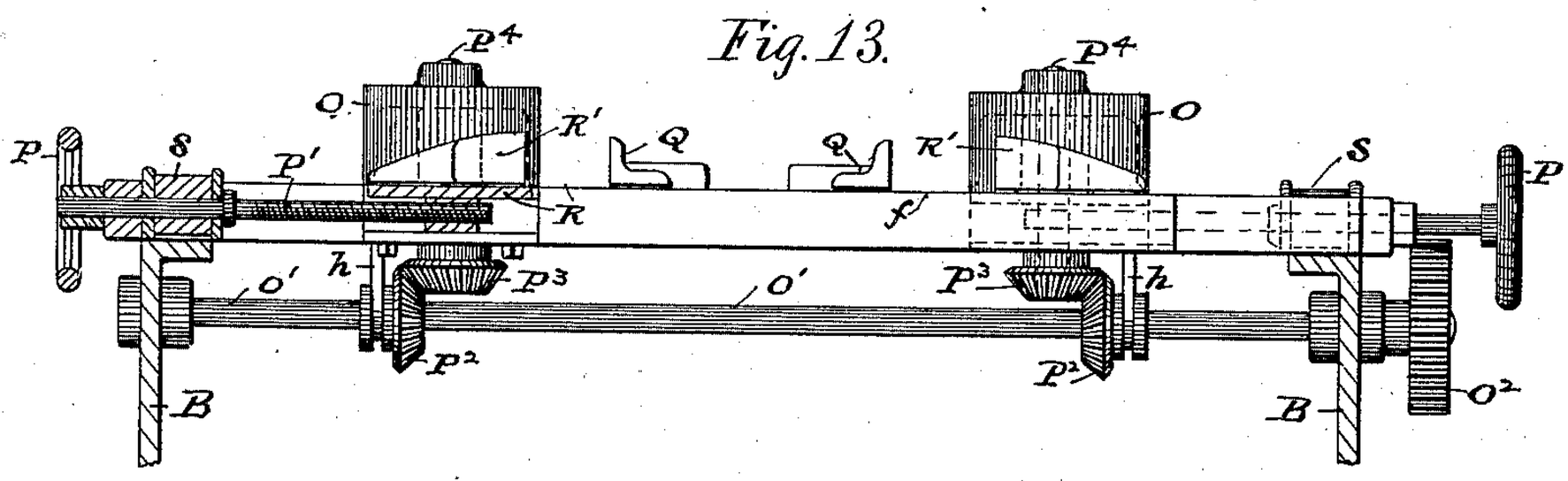
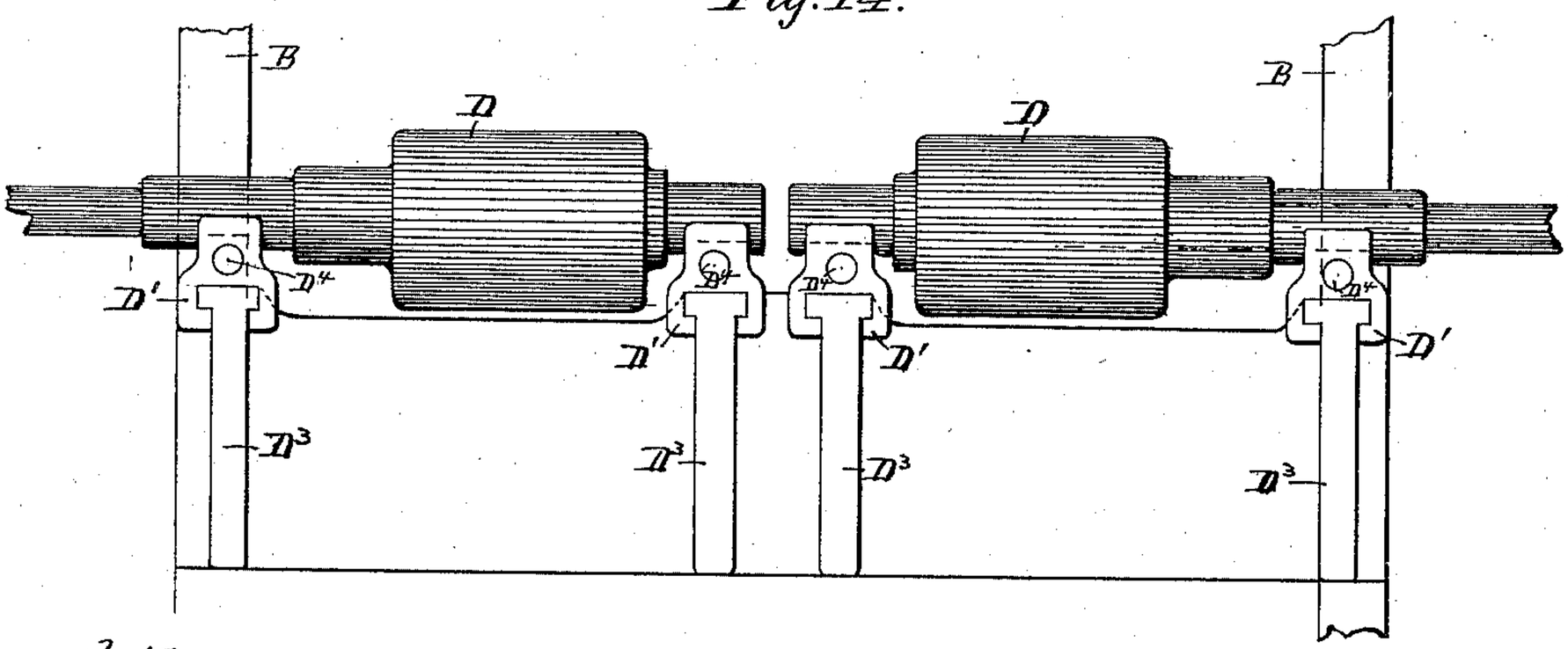


Fig. 14.



Witnesses:

W. C. Jordinston.

C. D. Kent

D. D. M. Woodmansee

Inventor

William H. Doane

by Kellogg

Attorney.

(No Model.) 8 Sheets—Sheet 8.

W. H. DOANE.

PLANING AND MATCHING MACHINE.

No. 335,994. Patented Feb. 9, 1886.

Fig. 15.

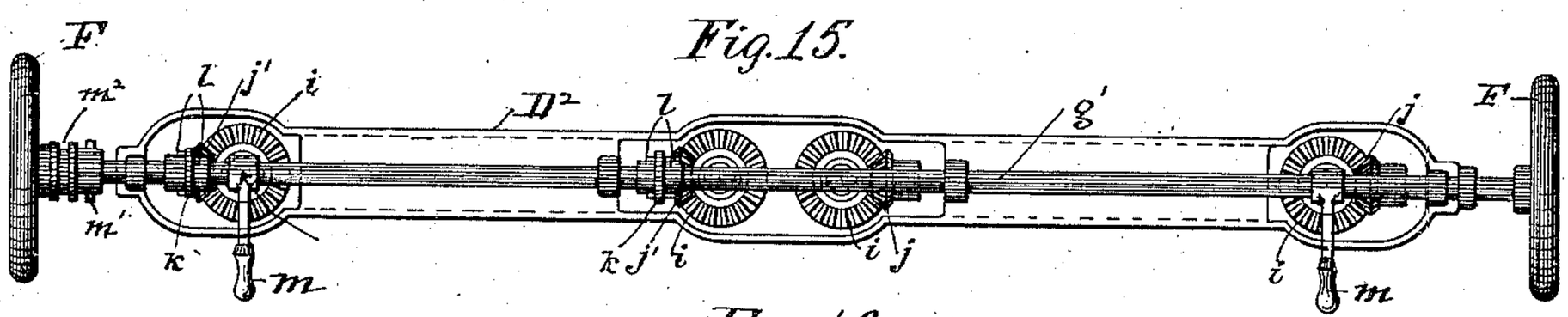


Fig. 16.

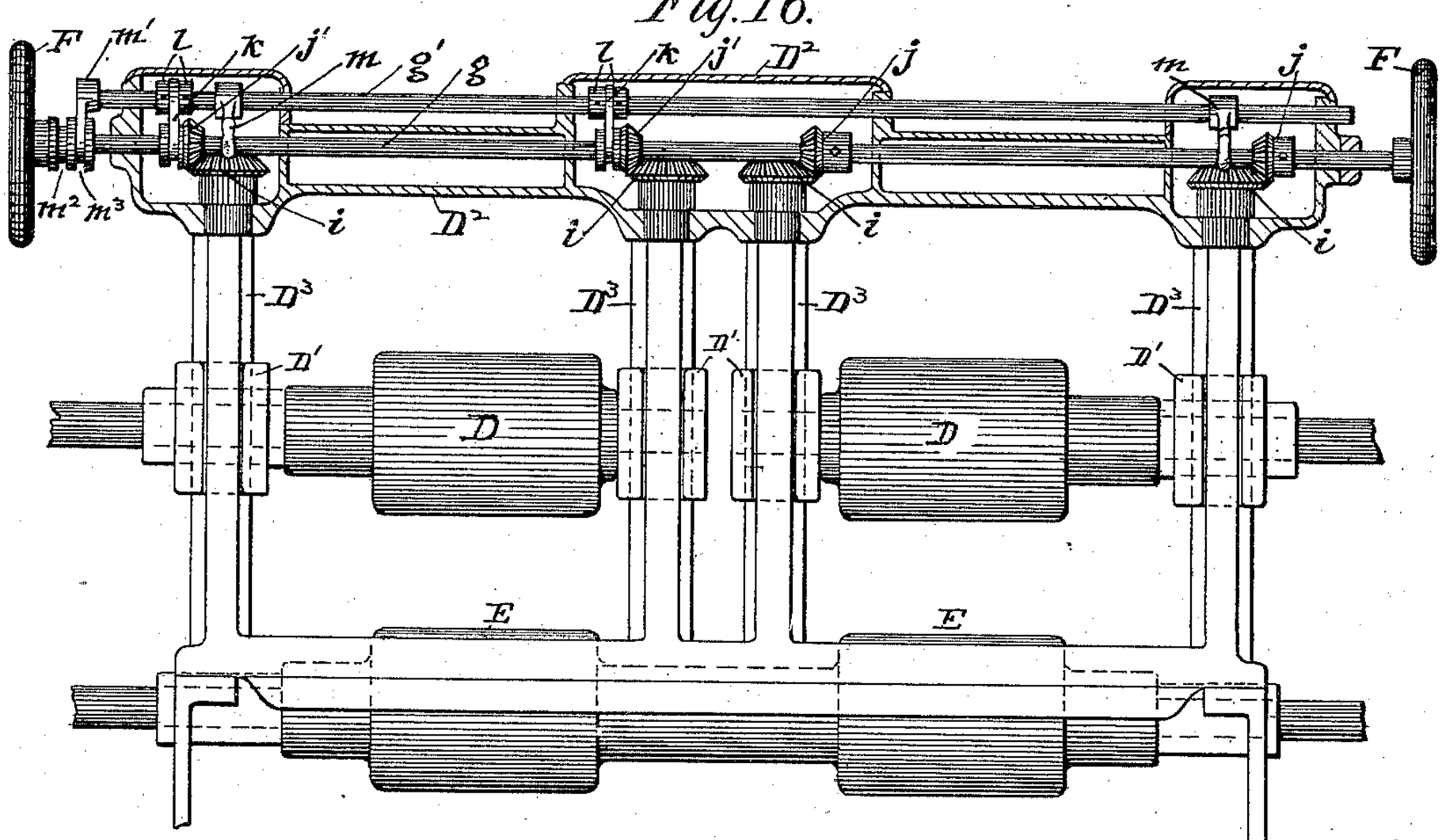


Fig. 17.

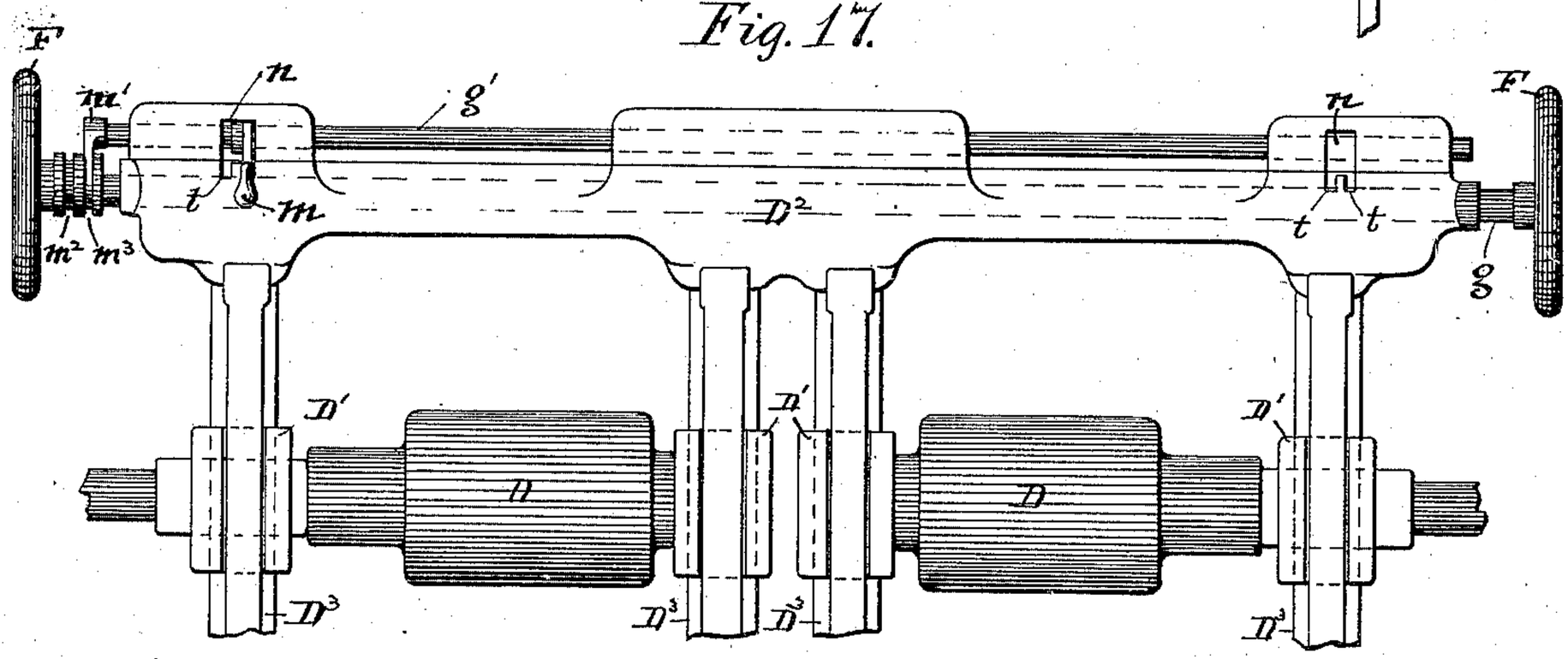
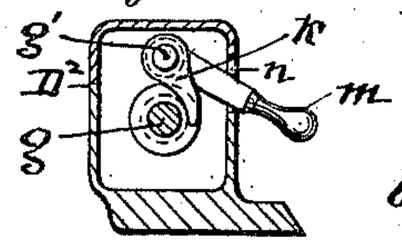


Fig. 18.



Witnesses:
W. C. Jirdinston.
C. N. Kerr.
D. D. M. Woodmancee

Inventor
William H. Doane
by Lockwood
Attorney.

UNITED STATES PATENT OFFICE.

WILLIAM H. DOANE, OF CINCINNATI, OHIO.

PLANING AND MATCHING MACHINE.

SPECIFICATION forming part of Letters Patent No. 335,994, dated February 9, 1886.

Application filed November 7, 1885. Serial No. 182,103. (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 Planing and Matching Machines, of which the following is a specification.

My invention is in the nature of an improvement upon the class of planing and matching machines illustrated and described in Letters Patent No. 213,180, granted to me March 11, 1879, its object being to enlarge the capacity and enhance the efficiency of the class of "duplex" machines.

The improvement relates more particularly to devices for the more efficient treatment and finishing of two boards, whether of the same or different dimensions, at the same operation; and it consists, first, in the employment and constructive arrangement of two separate and independently-adjustable planing-cylinders; second, in the employment and constructive arrangement of two separate independently-adjustable and independently-yielding feeding-in and also feeding-out rolls; third, in the combination, with the duplicated planing-cylinders and the feeding-out rolls, of duplicate sets of feeding-in rolls; fourth, in the constructive arrangement of independent side feeding and guide rolls for starting in the lumber to the feed-rolls, and the combination of the same with the feeding-in and feeding-out rolls and planing-cylinder; and, lastly, in certain other details hereinafter more fully described and claimed.

Some of the separate features of improvement may be used independently, thereby realizing the advantage claimed in a proportionate degree; but the best results are to be obtained by a machine embodying all.

Mechanism embodying my invention is illustrated in the accompanying drawings, in which Figure 1 is a side elevation of a duplex planing and matching machine embodying my invention. Fig. 2 is a plan view of the same. Fig. 3 is an end view or elevation of the same. Fig. 4 is a transverse section and diagram showing the arrangement of the matcher-hangers and planing-cylinders. Fig. 5 is a plan view of the matcher-hangers. Fig. 6 is a plan showing a modification in which three matcher-heads are used instead of four. Fig. 7 is a transverse section and diagram showing the arrangement of matcher-heads as in Fig. 6. Fig. 8 is an end or transverse view of the planing-cylinders, their supporting-bed, and raising mechanism. Fig. 9 is a side view of the same. Fig. 10 is a bottom plan of the gearing for operating the screw-shafts of the planing-cylinder boxes. Fig. 11 is a plan view of the bed or platen of the machine, showing the guide-rails and starting-in rollers. Fig. 12 is a diagram side elevation of the same. Fig. 13 is a transverse section of the machine, showing the adjusting mechanism of the starting-in rollers. Fig. 14 is a diagram plan of the feeding-in rollers and their sliding journal-boxes, sectioned through the guide-stands; Fig. 15, a plan view of the mechanism for revolving the screw-shafts for adjusting the feeding-in rolls, the caps of the stretcher-bar being removed; Fig. 16, a transverse vertical section (longitudinally through the machine-bed and stretcher-bar) showing the mechanism for the independent or simultaneous adjustment of the feeding-in rolls; Fig. 17, a transverse (or side) elevation of the feeding-in rolls and their adjusting mechanism, with the stretcher-bar complete, showing the slots for the adjustment and holding of the catch-lever controlling the coupling-shaft; Fig. 18, a detail cross-section of the stretcher-bar, showing the catch-lever connections; Fig. 19, a side elevation of the feeding-in-roll adjusting mechanism, showing the arrangement of the weight for the automatic adjustment of the same, and other details.

The same letters of reference are used in all the figures to designate identical parts.

The general construction of the machine, in respect to the arrangement of its feeding-rolls, planing-cylinder, &c., in relation to the bed or platen, is similar to other machines of this class, and need not be detailed here.

The planing-cylinders A A, for dressing the top surfaces of the boards, are arranged above the paths of the boards, and are journaled in bearing-blocks A′ A′ A′ A′, having a sliding guide-connection with their supporting-standards B′, upon which they are vertically adjustable to conform the cut to the desired thickness of the boards. The supporting-standards B′ are secured upon the bed-plate, and are vertically slotted to admit adjustment-screws A²

A^2 A^2 A^2, swiveled through the bed-plate and engaging the bearing-blocks A′, to effect the desired adjustment of the planing-cylinders. The projecting ends of the screw-shafts A^2 beneath the bed-plate are provided with bevel-pinions *a*, engaging with similar pinions, *b*, upon shafts B^4 B^6, journaled upon the bed-frame, and gearing the screw-shafts A^2 together in pairs, actuating the rolls separately. Parallel to the shafts B^4 B^6, and extending across their separating interval, is a third shaft, B^5, similarly mounted, having upon one end a spur-gear, *c*, engaging a similar spur-gear, *c′*, upon the shaft B^6, and having upon its outer projecting end a spur-gear, *d*. A similar spur-gear, B^3, is provided upon the projecting end of shaft B^4.

The shafts B^4 and B^5 project outward with squared ends, suitable for the temporary application of a square socketed crank-handle, B^2, for turning the shafts. It will be seen that by the application of the crank-handle B^2 either planing-cylinder may be adjusted independently of the other. Their simultaneous adjustment is accomplished by attaching to the handle B^2 at its socket a spur-pinion, *e*, and attaching to the bed-frame a projecting stud in position to serve as a pivotal support for the crank-handle and its pinion, and, when the handle is applied thereto, to bring the pinion *e* into joint engagement with the pinions B^3 and *d*. The action of the intervening pinion, *e*, in such case operates the three shafts, B^4, B^5, and B^6, simultaneously.

The carrying-shafts of the planing-cylinders A project at opposite sides of the machine-bed through and beyond their journal-bearings A′, and each projecting end is provided with a belt-pulley, A^3, for the application of an independent driving-belt to each cylinder.

Besides the advantages of an independent adjustment, already referred to, by which stuff of different thicknesses may be operated at the same operation, the torsional strains upon a long shaft are by this construction avoided.

The driving-belts are operated from the counter-shaft H, journaled at the end of the bed B, over suitable idler-pulleys, as shown in Figs. 1 and 2. The boards are fed to the planing-cylinders by two short independently-yielding feed-rollers, D D, each operating in conjunction with a counter-roll, which may be either a single long roll E or two separate rolls E E, as preferred, arranged so that the upper surfaces of the same shall be approximately in the horizontal plane of the platen-surface *f*.

I have shown in the drawings two constructions of the feeding-in-roll mechanism, either of which may be used, which I will proceed to describe separately. The first of these is shown in Figs. 1 to 3, inclusive, and is as follows: Each roll D is journaled in a pair of boxes, D′ D′, mounted upon suitable guide-projections of a "stretcher-bar," D^2, connecting the side posts or supporting-stands, D^3, of the machine-bed. The boxes D′ D′ are provided with and mounted upon vertical adjusting-screws D^4, the upper ends of which carry bevel-gears meshing into corresponding bevel-gears of a horizontal cross-shaft, *a*, mounted in fixed bearings between and across the stands D^3, and actuated by a hand-wheel. The revolution of the cross-shaft revolves the screws D^4, and raises or lowers the rolls D simultaneously. The screw-spindles D^4 are adapted to slide to a limited extent through their bevel-gears in order to allow the rolls to adjust themselves automatically and independently to boards of unequal thickness. Weighted levers, pivoted to suitable projections of the cross-bar D^2, may be arranged in the usual manner to bear upon the screw-spindles D^4, and also on the inner end boxes of the rollers D, to equalize the pressure of the rolls upon the work by an adjustable leverage.

The construction and general arrangement of both sets of feeding-in rolls is similar.

The advantage of a duplicate set of independently-adjustable feeding-in rolls will be more apparent when considered in connection with the action of the matcher-heads, and the devices to be described later; but it may be mentioned here that besides producing a more powerful and certain feed, conducing to rapidity and evenness of work, they carry the lumber through the machines always in a straight line. One set of rolls acting against the other prevents any slip or displacement of the lumber, thus requiring less skill and labor on the part of the operator, and consequently enhance the capacity and efficiency of the machine.

The more complete and preferred construction of the feeding-in rolls is exhibited in Figs. 14 to 19, inclusive, and is as follows: The rolls D D are each journaled in boxes D′ D′, having a vertical sliding connection with and upon the stands D^3 D^3, and the screw-spindles D^4 D^4 pass through the boxes adjacent to the stands, terminating above in a hollow stretcher-bar, D^2, in which a bevel-gear, *i*, is placed on the end of each screw-shaft D^4, with a "pin-and-slot" connection permitting the screw-shaft a limited vertical play therein. The horizontal shaft *g* is mounted longitudinally in the hollow stretcher-bar, with bevel-gears *j j j′ j′* attached thereto, meshing with the gears *i i i i* of the screw-shafts, and at each outer projecting end of the shaft *g* is secured a hand-wheel, F, for its rotation. When all the bevel-gears are in mesh, the mechanism operates, substantially as in the arrangement first described, to actuate all the screw-spindles simultaneously. In order that one set or pair of the screw-shafts may be disconnected from the operation of the shaft *g*, the bevel-gears *j′ j′* are provided with grooved hubs, and have a pin-and-slot connection with the shaft *g*, permitting a limited longitudinal play of the gears upon the shaft, or of the shaft in the gears, the journal-bearings of the shaft being arranged to permit a limited longitudinal play. Directly over and parallel with the shaft *g* a

second shaft or shifting bar, g', is journaled in or upon the stretcher-bar D^2, and carries yokes $k\,k$, each with a rotating connection between fixed collars $l\,l$ upon the shaft g', and engaging with the grooved hubs of the corresponding pinions, j', immediately below. A longitudinal movement of the shaft g' thus by means of the shifting-yokes l moves the pinions $j'\,j'$ out of or into mesh with the corresponding pinions, $i\,i$, governing the left-hand feed-roller D, Fig. 16. This movement is accomplished by fixed crank-handles or dogs m upon the shaft g', which project outward through openings n of the hollow stretcher-bar D^2. Two such handles are attached to the shaft—one near to and accessible from each side of the machine. The openings n are provided with rack-recesses $t\,t$ at the bottom, in which the handles engage to hold the shaft g' in its ultimate longitudinal positions. A similar crank-handle or dog, m', is secured at the projecting end of the shaft g', engaging alternately in the grooves m^2 m^3 of a double-grooved collar upon the shaft g. In the position indicated in Fig. 16, all the bevel-gears are in mesh and the rollers will be operated simultaneously. To disconnect the left-hand roll, r, one of the handles m is raised from one notch of its rack-recess, and by means of it the shaft g' moved longitudinally to the left, carrying the gears $j'\,j'$ out of mesh with the corresponding gears, $i\,i$, when the handles are dropped into the adjacent notches and held by gravity. By the partial rotation of the shaft g' in lifting the handle m, the crank or dog m' is also lifted out of one groove of the collar m^3, and by the longitudinal shifting of the shaft g' the dog m' is moved into the adjacent groove m^2, and thus the shafts g and g' are secured in their proper relative positions. When the gears $j\,j$ are thus out of mesh, the corresponding feed-roll D is disconnected from the adjusting mechanism. If, however, the parts being in the position shown in Fig. 16, it is desired to disconnect the right-hand roller, one of the arms m is lifted, (raising the dog m' out of the groove m^3,) and the shaft g is shoved to the right, disengaging the gears $j\,j$, leaving the gears $j'\,j'$ still in mesh, when the arms m are dropped again into their engaging-notches; also dropping the dog m into the groove m.

The same constructive devices are applied to each set of feeding-in rolls, (whether two pairs or sets are employed or but one set,) and may also be applied to the feeding-out rolls.

Any approved construction of weighting mechanism may be employed in connection with the screw-shafts for securing the automatic adjustment desired.

As already indicated, the lower roll may be a single continuous roll extending across the bed of the machine beneath both feeding-in rolls, or two independent rolls arranged in the same axial line with separate shafts and bearings. The same may be said of the lower feeding-out rolls. The latter or duplex construction, in combination with the other improvements herein described, is to be preferred, apart from considerations of economy in construction, since in such case the two operative sides of the machine are then independent of each other, and one or both may be employed, as desired.

In the operation of the machine, after the two boards have had their upper surfaces planed by the planing-cylinders A they pass between two sets of matcher-heads, by which their edges are dressed, tongued, and grooved simultaneously. The matcher-heads G G, operating upon the inside edges of the boards, and G^2 G^2, operating the outside edges of the boards, are attached to spindles G′ G′ G′ G′, mounted on bracket-frames G^4, supported and guided upon the horizontal cross-rails C C′ of the bed B, and are adjustable independently, bodily, in a horizontal plane by screw-shafts G^3, having right and left screw-threads engaging the bracket-frames, respectively. The screw-shafts project beyond the side of the bed-frame respectively, and by the application of a crank-handle to their squared ends, respectively, the relative adjustment of the matcher-heads is effected. The matcher-heads G G are driven by a single belt, or preferably by two belts, as shown in Fig. 5, which, with the belts for driving the outer matcher-heads, G^2 G^2, are given power from the common counter-shaft, H, at the end of the machine by suitable pulleys thereon.

The modification shown in Figs. 6 and 7 substitutes for the two inside matcher-heads a single central one, cutting the corresponding inner edges of the two boards.

As the boards pass beyond the matcher-heads, they are caught between a pair of feeding-out rolls, K K, which may be continuous or divided, the upper edge of which is journaled in vertically-sliding boxes adjustable by screws, actuated by bevel-gearing from a shaft journaled in an upper cross-bar secured upon and between side stands rising from the frame in the same manner as the feeding-in rolls already described.

An under-cutter cylinder may be added to the machine at L^3 to dress the lower side of the boards, if desired, driven by proper driving-belts from an auxiliary counter-shaft, H′, and pulleys, and provided with suitable adjusting devices. The feed-rolls are driven by the usual train of gearing, as may be required.

Figs. 11, 12, and 13 exhibit a power-driven side roll for "starting in" the boards and retaining them against the guide-bar Q until they can be properly seized by the feed-rollers E and D. It consists of a roller, O, upon a vertical spindle, P^4, journaled in a bearing-block adjustable laterally in a cross-slot, recess, or depression of the bed-plate, and having its driving mechanism arranged wholly beneath the bed-plate. The upper surface of the bearing-block is approximately flush with the surface of the bed B, and constitutes a platen, R, for the board to be acted upon by

the roller, as hereinafter described, and a laterally-inclined guide-wing, R′, may be provided to assist in introducing the end of the board to the action of the roller O. The lower end of the spindle P^4 is provided with a bevel-gear, P^3, which meshes with and receives power from a corresponding bevel-gear, P^2, having a pin-and-slot connection with a horizontal shaft, O′, journaled in the main frame. A finger, *h*, depending from the spindle-bearing block, engages a grooved hub of the pinion P^2 upon the shaft O′, without ceasing to transmit the rotation of the shaft to the side roll, O. The block (carrying the side roll) is adjustable laterally by a horizontal screw-shaft, P′, swiveled in the bed-frame and actuated by a hand wheel or crank, P. The screw-shaft P′ is arranged to have a limited longitudinal play in its bearings against a spring, *s*, or counter-weight, in order to allow the side roll, O, to accommodate itself to varying widths of the board. Power is transmitted to the shaft O′ by a spur-gear, O^2, upon its outer projecting end from the train of gearing operating the rolls D D and E through an intermediate gear, S.

In the duplex machine herein described there are two side rolls O and two corresponding sets of driving mechanism, operated by the same shaft O′ in the manner described; but a single guide-rail may be employed, presenting its outer lateral edges for grinding purposes.

Thus constructed the operation of the side roll, O, is as follows: The board is placed flatwise upon the bed of the machine, with its end resting upon the platen R. The position of the roller being properly adjusted to the width of the board, the board, being urged forward between the roller and the fixed guide-rail Q by the friction of the roller against its edge, will be carried forward in proper position by the roller until caught by the feeding-in rolls D E, when it serves as a rear guide until the board passes to and is received by the feeding-out rolls.

It will be understood that the driving mechanism of the side rolls is proportioned and adjusted to act upon the lateral edges of the board at the same relative speed as that of the feed-rolls proper upon the upper and lower sides. It should also be mentioned that a pressure-bar, which may be suitably provided with adjustable holding-surfaces to act upon the boards, is arranged across the machine-bed above the lower surfacing-cylinder, L^2. It has been omitted in the drawings, for convenience of illustration of the other parts described.

Having described my invention, I claim and desire to secure by Letters Patent of the United States—

1. The combination, in a planing and matching machine, of two single planing-cylinders, each extending part way across the lumber-supporting bed from opposite sides of the machine, with adjusting mechanism whereby they may be simultaneously or independently adjusted to suit the thickness of material, so that two pieces of lumber, whether of equal or unequal thickness, may be operated upon at the same time, substantially as set forth.

2. The combination, in a planing and matching machine, of two separate and independently-yielding short feeding-in rolls, each extending part way across the lumber-supporting surface from opposite sides of the machine, two single planing-cylinders corresponding therewith, each acting upon a single board, and two pairs of matcher-heads, with suitable power-driving mechanism, substantially as set forth.

3. The combination, in a planing and matching machine, of two separate and independently-yielding short feeding-in rolls, extending from opposite sides of the lumber-supporting surface for feeding two boards simultaneously to the cutters, two single planing-cylinders extending part way across the lumber-supporting surface, two pairs of matcher-heads, and a set of feeding-out rolls, with suitable power-driving mechanism, substantially as set forth.

4. The combination, in a planing and matching machine, of two separate sets of independently adjustable and yielding short upper feeding-in rolls extending part way across the lumber-supporting surface, lower feed-rolls acting in conjunction therewith, two single planing-cylinders corresponding with the feeding-in rolls, and two pairs of matcher-heads for simultaneously working two pieces of flooring, with suitable power-driving mechanism whereby the two boards, whether of equal or unequal thickness, are surfaced and tongued and grooved at their edges at the same operation, substantially as set forth.

5. In a duplex planing and matching machine, two planing-cylinders, each extending part way across the bed of the machine, mounted upon bearings vertically adjustable by screw-shafts, and provided with actuating mechanism for adjusting either independently or both simultaneously, in combination with power-driving mechanism, substantially as set forth.

6. In a planing and matching machine, the combination of the two planing-cylinders A, provided with their journal-boxes, the screw-shafts A^2, provided with gears *a*, and the counter-shafts B^4 B^5 B^6, provided with gears *b c c′*, arranged and operating substantially as set forth, to adjust either planing-cylinder independently or both simultaneously.

7. In a planing and matching machine, the combination of a fixed or adjustable guide-rail, a power-driven laterally adjustable and yielding guide-roller, and driving mechanism arranged below the platen-surface, said roller being arranged to act upon the edge of the board, retain the same against the guide-rail, and carry the board forward in proper alignment until controlled by the feed-rolls, substantially as set forth.

8. In a duplex planing and matching machine, in combination with duplicated cutting-cylinders and feed-rolls, and with two guide-surfaces extending longitudinally upon the bed-plate, two independently-adjustable side feed-rolls mounted upon vertical spindles extending beneath the platen-surface, and geared to receive power from a common shaft journaled in the bed-frame, substantially as set forth.

9. In a planing and matching machine, in combination with the guide-rail Q, a side feed-roller, O, journaled vertically in a block, R, held and guided in a suitable slot or depression of the platen, and adjustable by screws P′, substantially as set forth.

10. In a planing and matching machine, in combination with the cutting and feeding mechanism, a platen or bed having a crosswise opening or depression adapted to receive a bearing-block carrying a power-driven side roll, and guide-wing whereby said roll may be adjusted laterally in relation to the bed to the width of the material to be worked, substantially as set forth.

11. In a planing and matching machine, the combination of two guide-bars, Q Q, two side feed-rollers, O O, adjustable bearing-blocks R R, adjusting-screws P′ P′, bevel-gears P^2 P^3, and shaft O, arranged and operating substantially as set forth, to act simultaneously upon two boards while permitting an independent adjustment of each.

12. The combination, in a planing and matching machine, of the guide-bar Q, side feed-roll, O, guide-wing R′, and platen-surface block R, substantially as set forth, for guiding the end of the board into proper alignment and carrying the same forward to the regular feed-rolls.

13. The combination, in a planing and matching machine, of the guide-bar Q, roller O, block R, screw *p*, and spring S, for obtaining a fixed and automatic adjustment of the side roll to accommodate various widths of lumber and varying widths of a single board, substantially as set forth.

14. The combination of the guide-bar Q, secured to the platen, vertical roller O, block R, adjusting-screw P′, with a spring for the pressure, gears P^2 P^3, for actuating feed-roll, engaging-finger *h*, and roll-shaft O′, whereby the position of the rolls may be adjusted without interference with the driving-power, substantially as set forth.

15. The combination, in a planing and matching machine, of two separate sets of cutting and feeding mechanism, each set embracing an adjustable cutting-cylinder, adjustable feeding-in and feeding-out rolls, and a pair of matcher-heads, the two sets being arranged side by side and adapted to be adjusted and used either simultaneously or independently, with suitable power-driving mechanism for treating and finishing one board or two, as may be required, whether of the same or different dimensions, at the same operation, substantially as set forth.

16. In a planing and matching machine, the combination of two upper feed-rolls, D D, their vertically-adjustable bearings, and adjusting-screw spindles provided with the bevel-gears *i*, with the cross-shaft *g*, provided with fixed gears *j j* and movable gears *j′ j′*, and the longitudinally adjustable shaft *g*, provided with shifting-yokes *k k*, substantially as and for the purpose set forth.

17. In combination with the screw-spindles D^4, and pinions *i*, and the shaft *g*, provided with fixed gears *j j* and sliding gears *j′ j′*, the shifting bar or shaft *g′*, provided with yokes *k k* and with fixed manipulating-handles or catch-levers *m*, adapted to engage in rack-recesses to retain the shifting-bar in ultimate positions, as set forth.

18. In a planing and matching machine, in combination with the adjustable feed-rolls D, and their elevating screws, shafts, and gears, the shafts *g′ g*, their connecting-gears, and the manipulating-handles *m*, the double-grooved collar upon the shaft *g′*, and the lifting-dog *m′* upon the shaft *g′*, arranged and operating substantially as and for the purposes set forth.

19. In a planing and matching machine, in combination with a power-driven set of feeding-in and feeding-out rolls, planing-cylinder, and a horizontal guide-bar, a power-driven guide-roll arranged upon the platen-surface to act upon the lateral edge of the board and retain the same against the guide-bar in entering the feed-rolls, substantially as set forth.

20. In a planing and matching machine, the combination of two independent upper-cutting cylinders, for operating upon two boards at the same time, whether of equal or unequal thickness, a long under-cutting cylinder for surfacing the under sides of said boards, and matcher-heads for tonguing and grooving the lateral edges of said two boards, with suitable driving mechanism, whereby the various operations are attained during a single passage of the board through the machine, 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,
J. E. CASSERLY.