No. 701,623. Patented June 3, 1902.

C. E. SANDSTROM.

SAWING, JOINTING, AND BORING MACHINE.

(Application filed Jan. 30, 1899.)

(No Model.) 6 Sheets—Sheet 1.

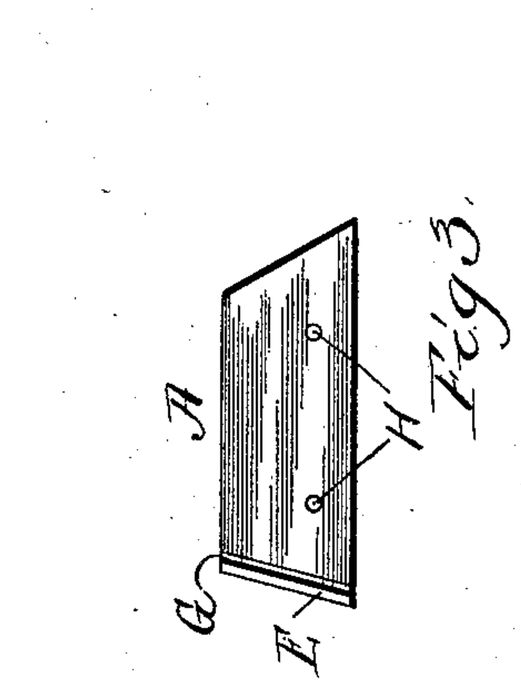

Fig 3.

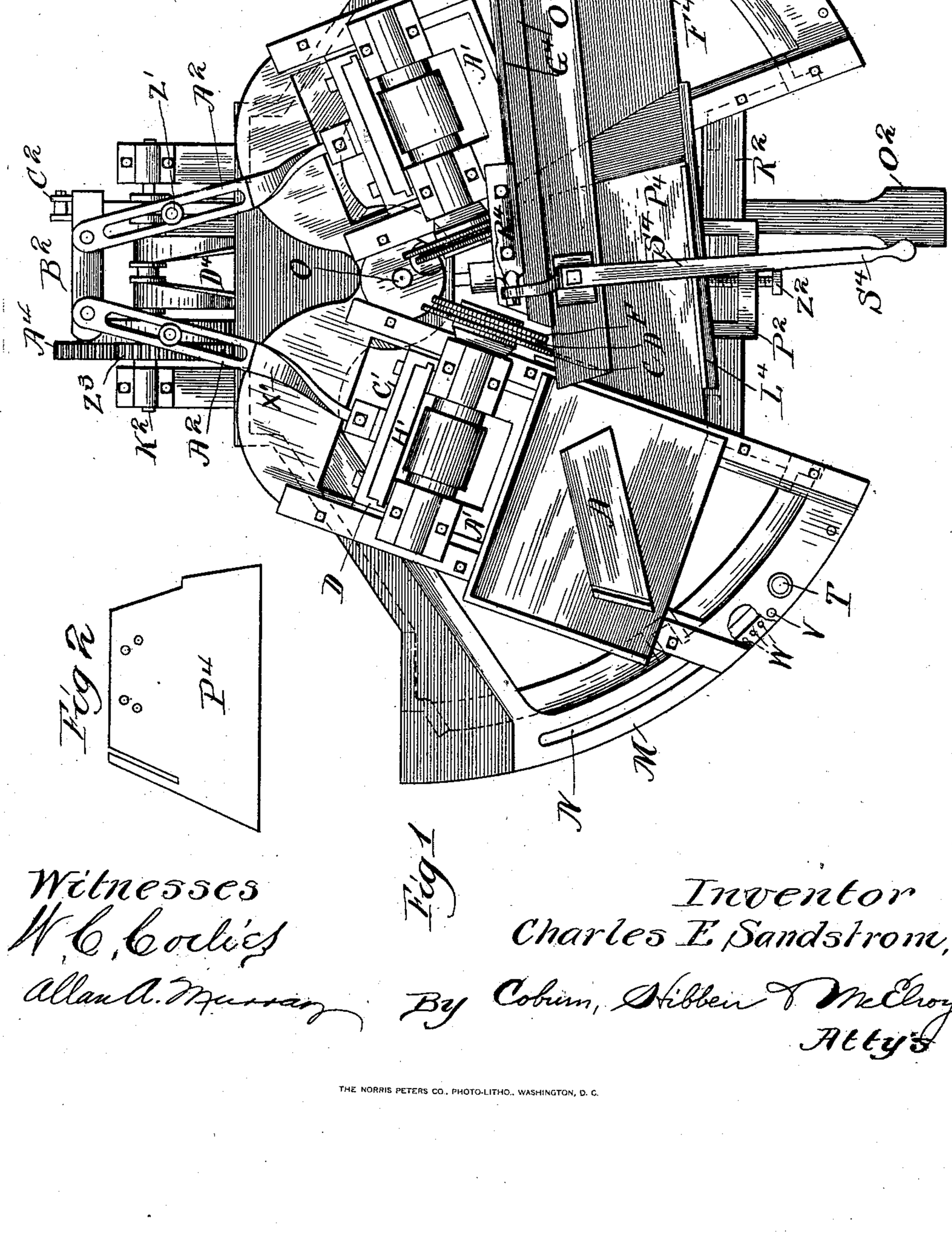

Fig 1.

Fig 2.

Witnesses
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Atty's

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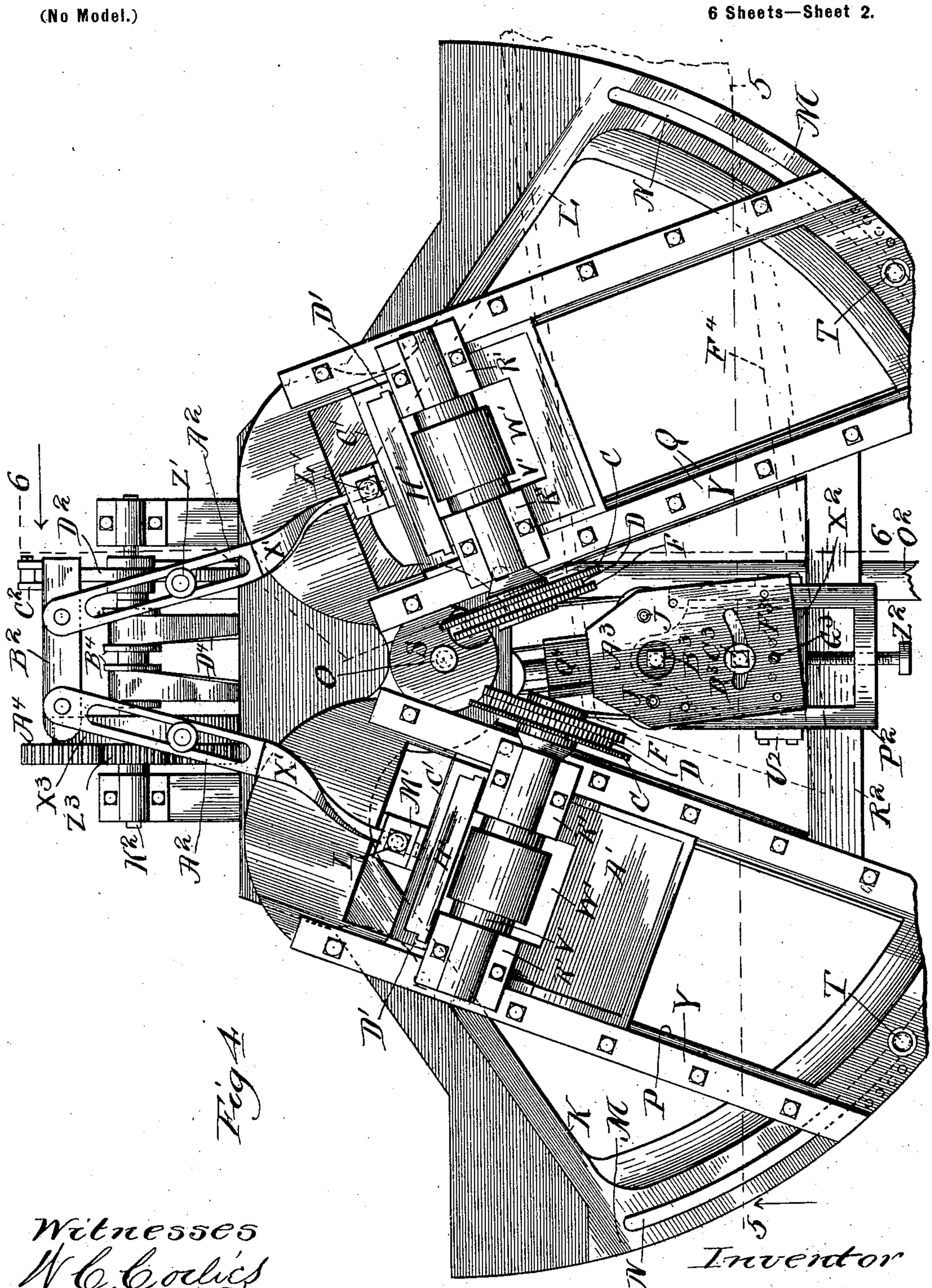

Fig 4.

Witnesses
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Attys

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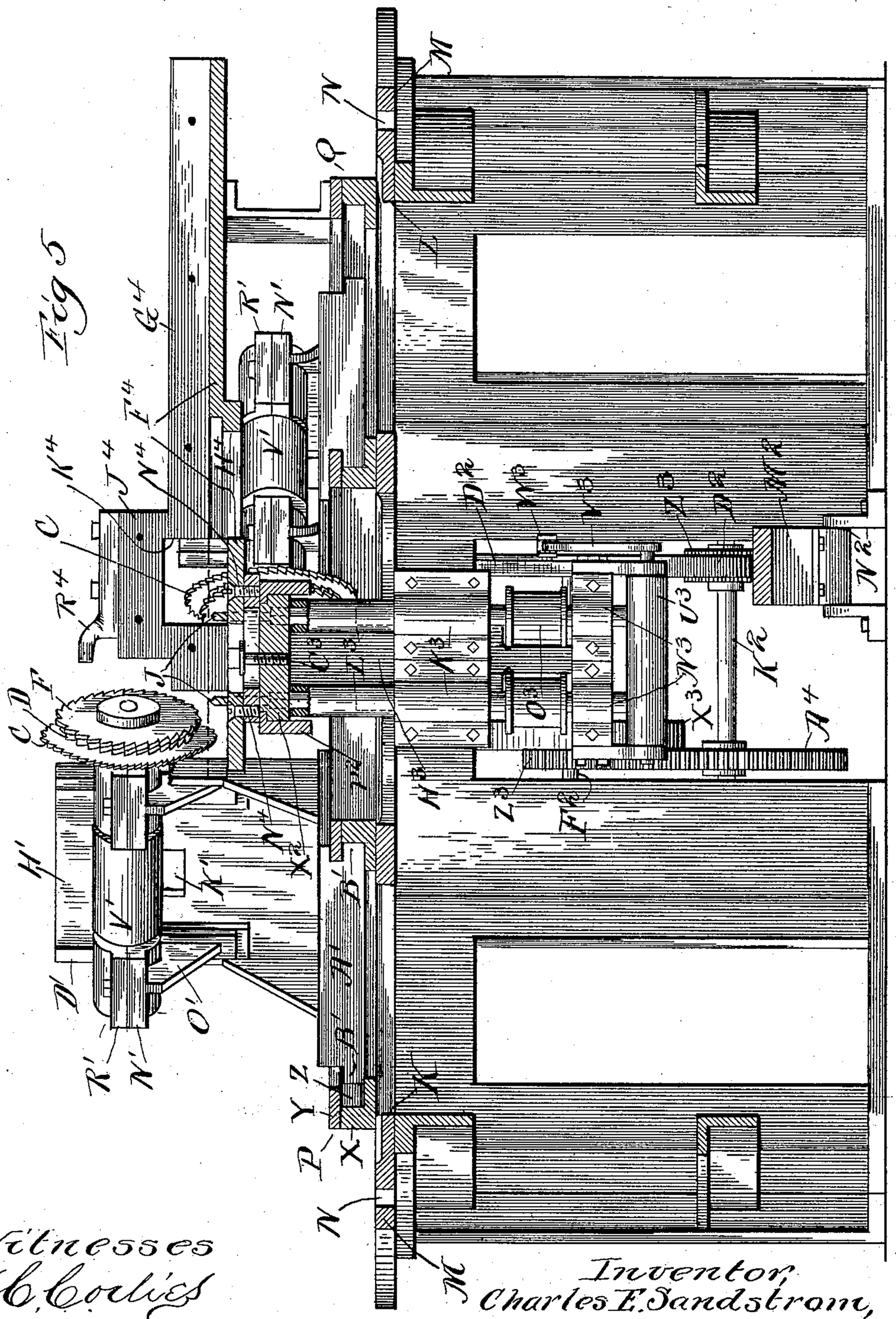
(No Model.) 6 Sheets—Sheet 3.



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(No Model.) 6 Sheets—Sheet 4.

Fig 6

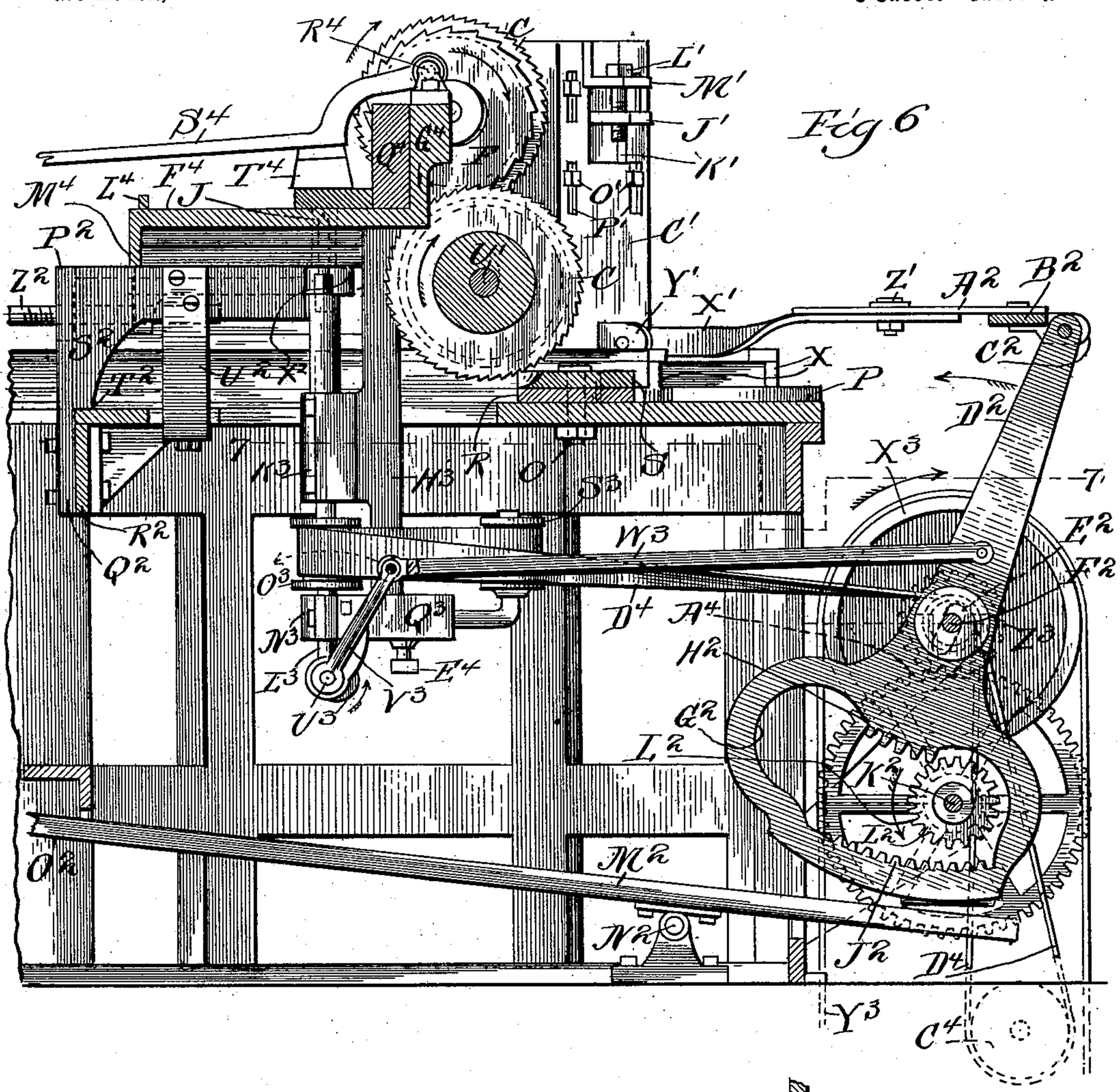
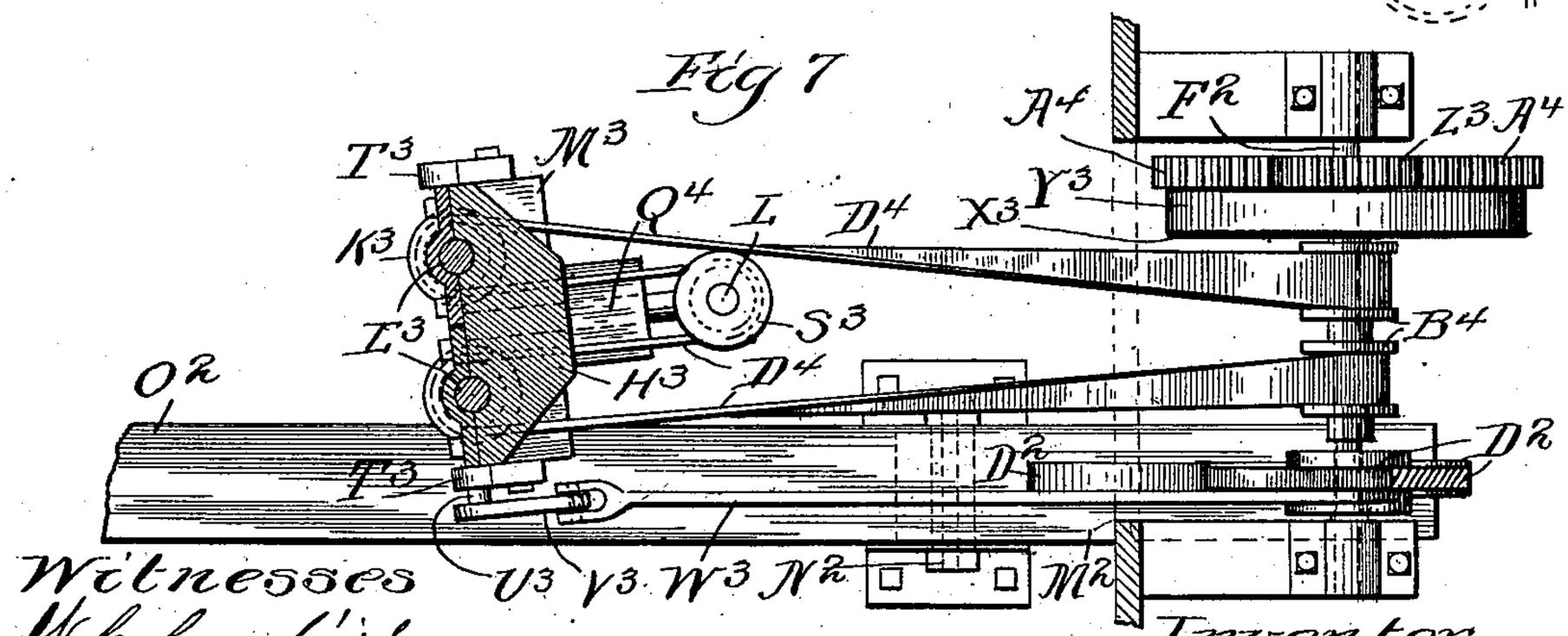


Fig 7



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SAWING, JOINTING, AND BORING MACHINE.

(Application filed Jan. 30, 1899.)

(No Model.) 6 Sheets—Sheet 5.

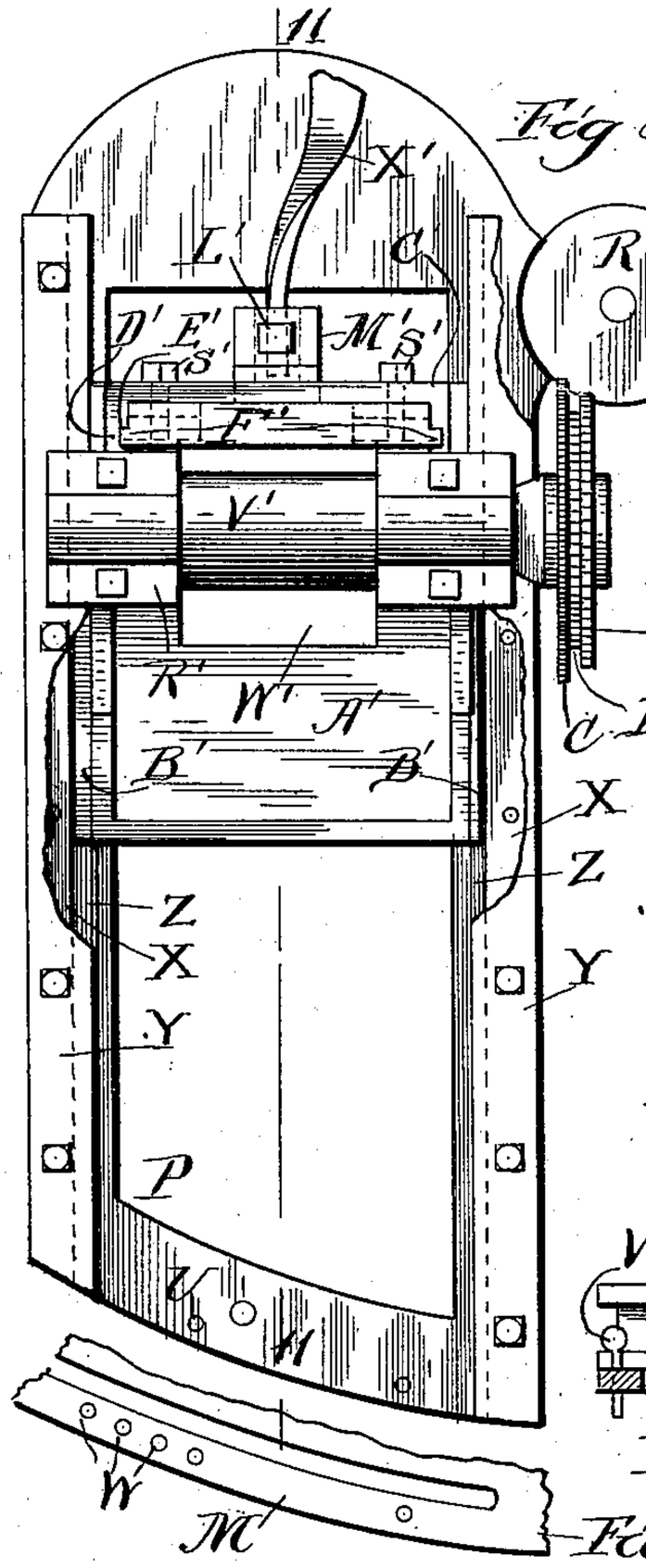

Fig 8a

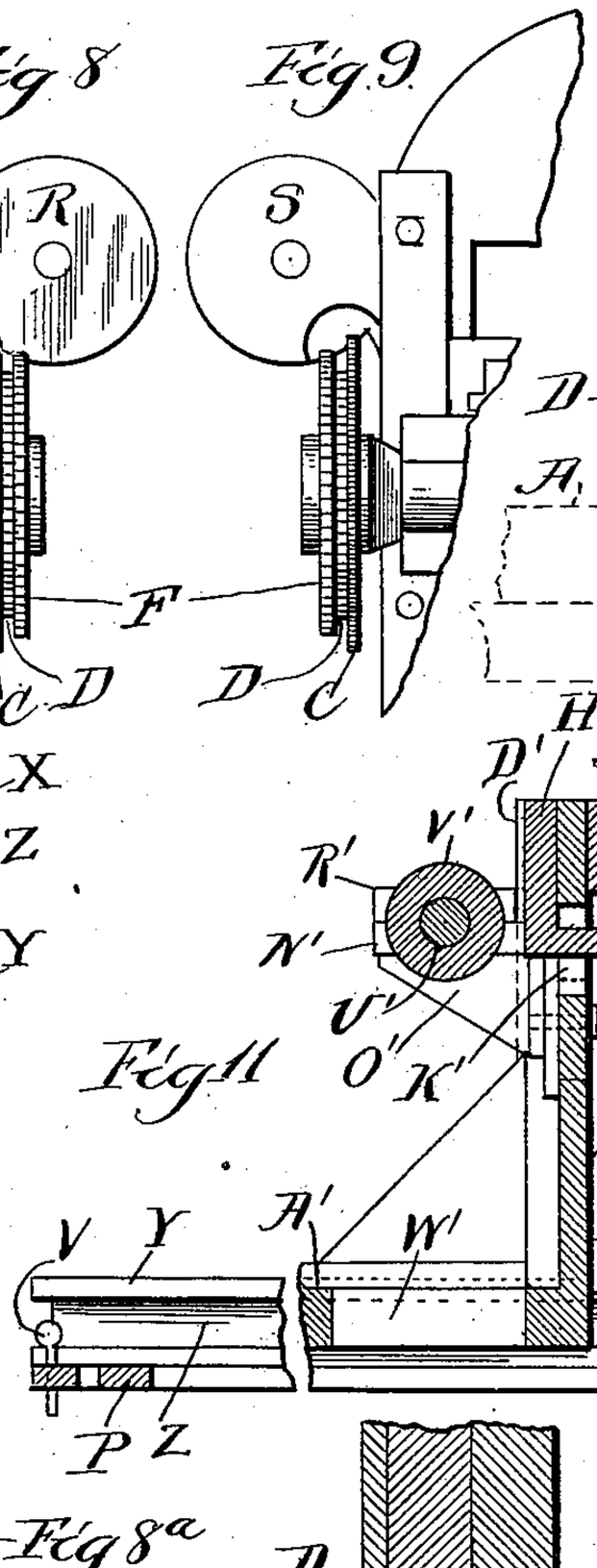

Fig 8

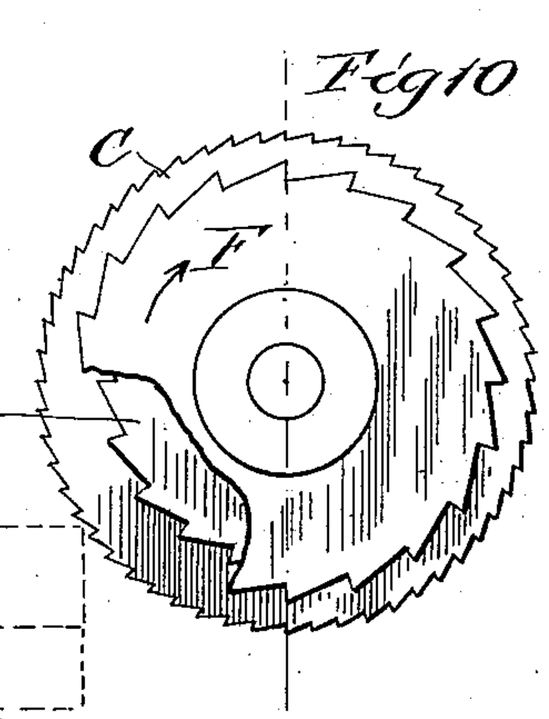

Fig 9.

Fig 10

Fig 11

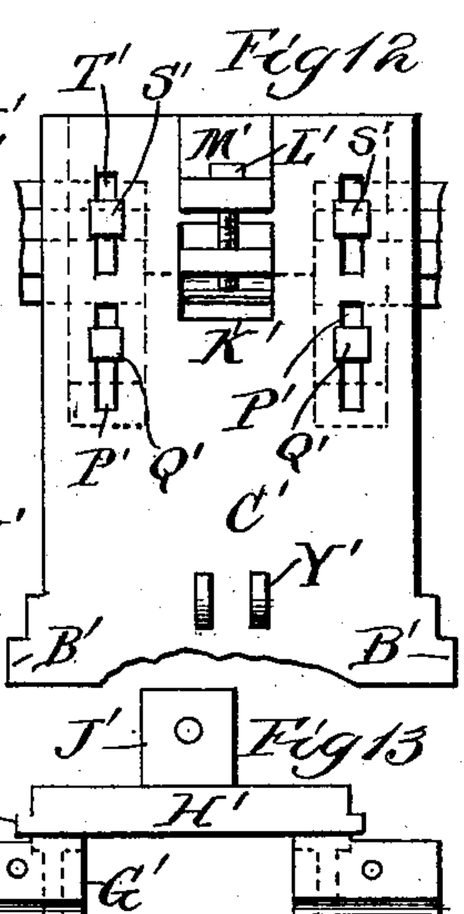

Fig 12

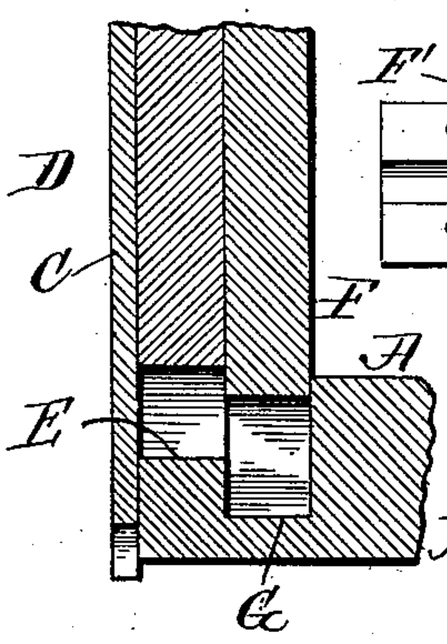

Fig 13

Fig 15

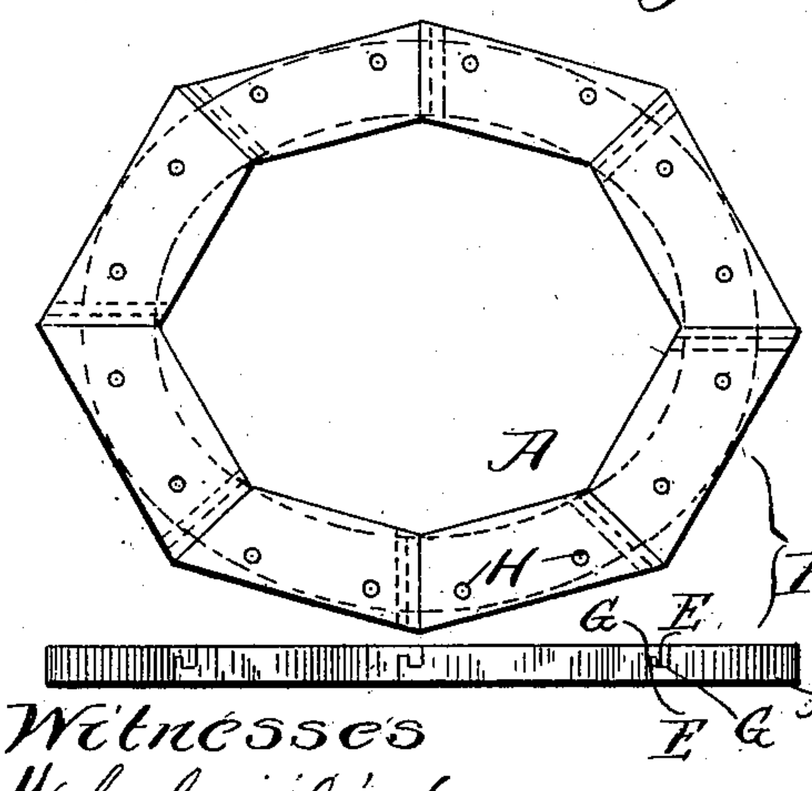

Fig 14

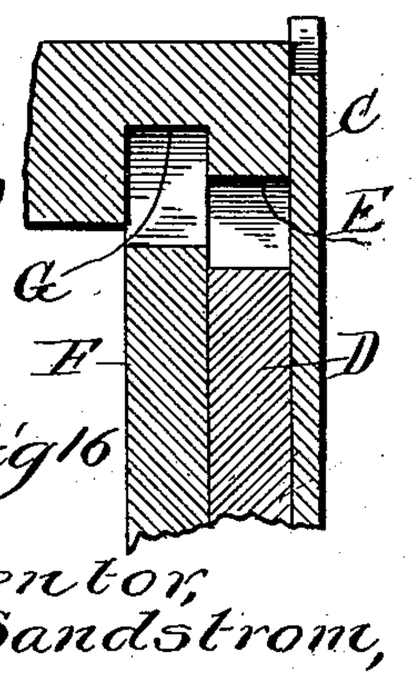

Fig 16

Witnesses
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No. 701,623. Patented June 3, 1902.

C. E. SANDSTROM.

SAWING, JOINTING, AND BORING MACHINE.

(Application filed Jan. 30, 1899.)

(No Model.) 6 Sheets—Sheet 6.

Fig 17

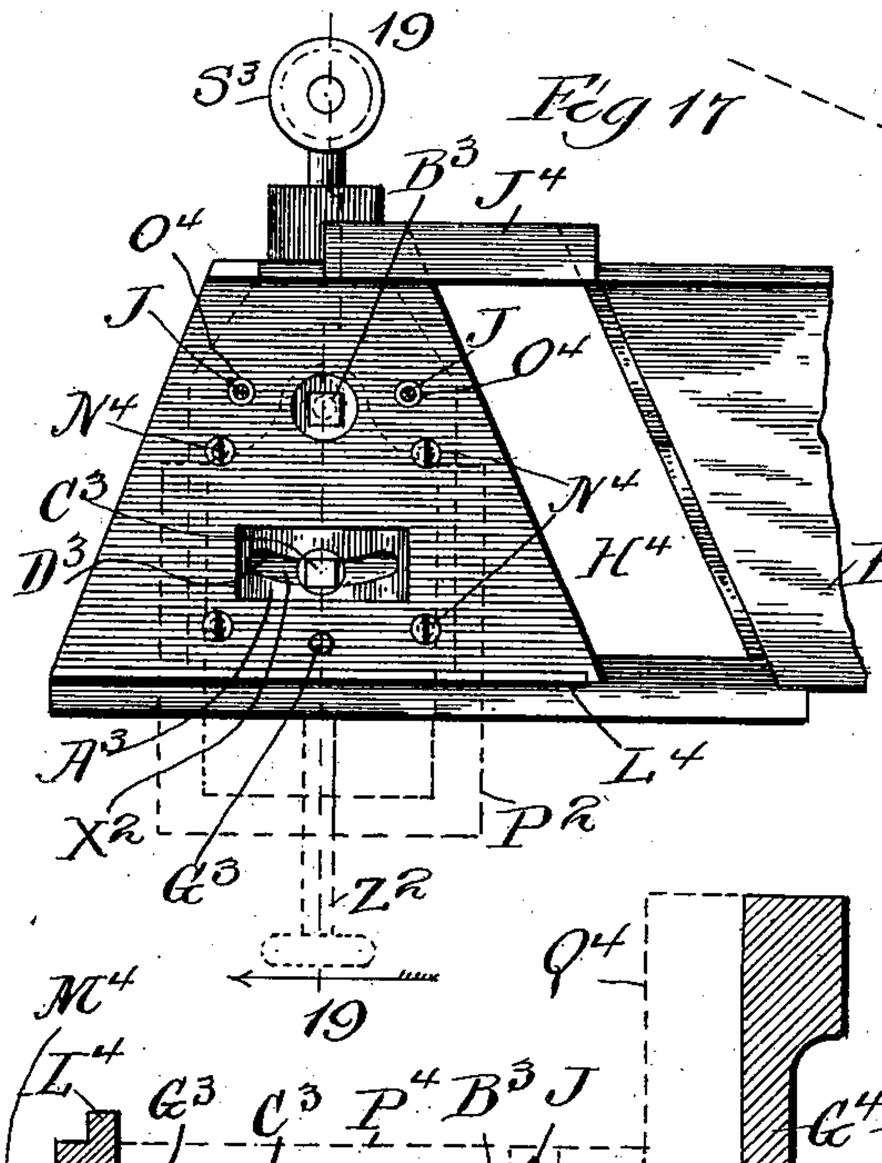


Fig 18

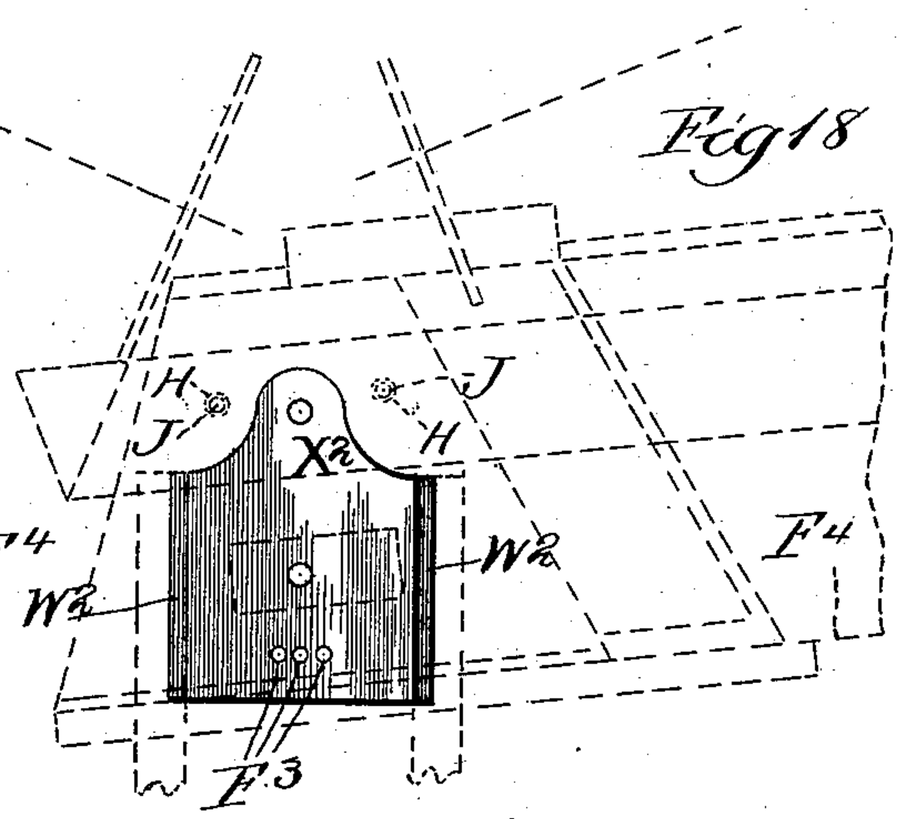
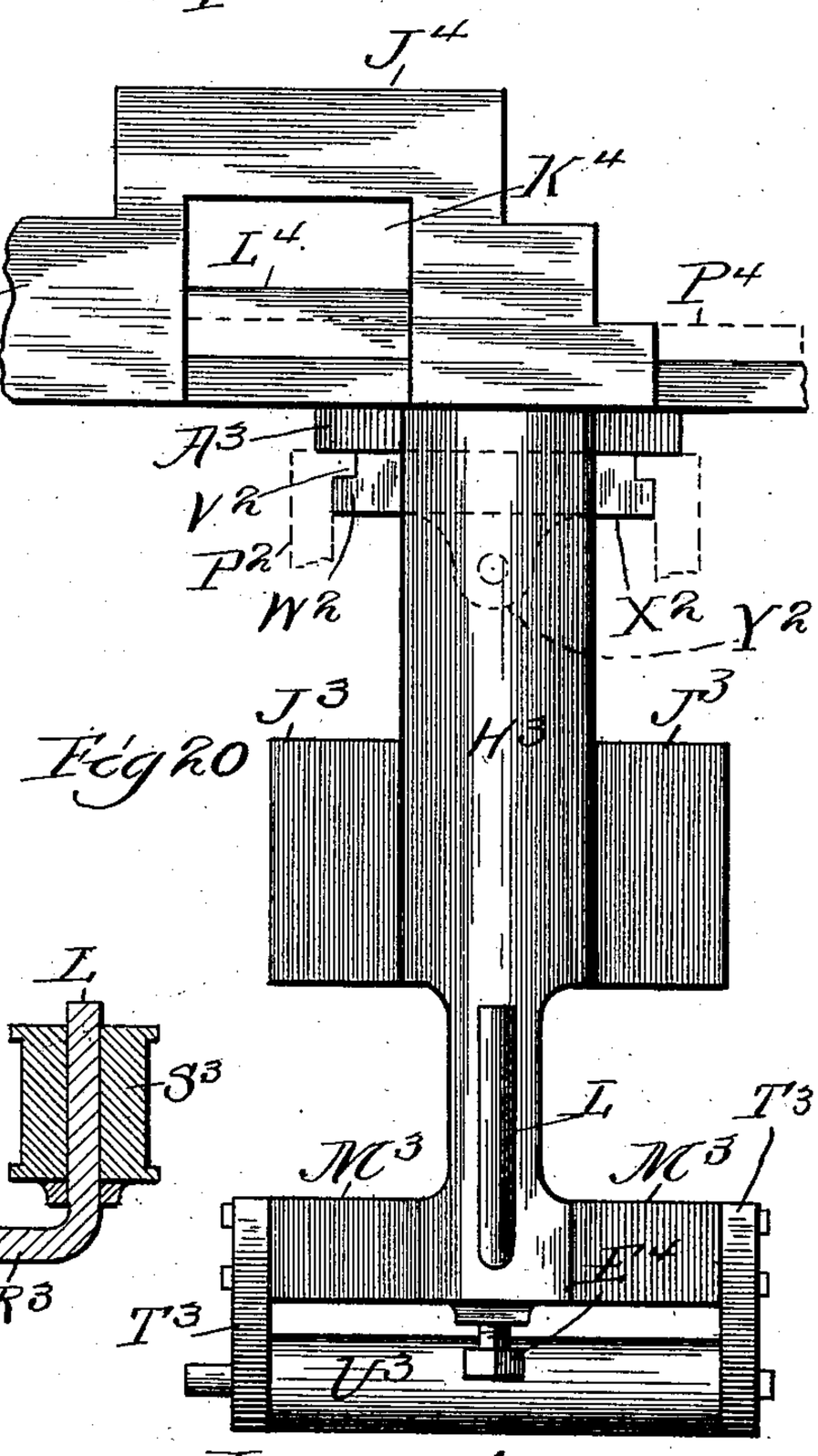


Fig 20



Witnesses
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Allan A. Murray

Inventor
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By Coburn, Stibbens & McElroy
Atty's.

UNITED STATES PATENT OFFICE.

CHARLES E. SANDSTROM, OF CHICAGO, ILLINOIS.

SAWING, JOINTING, AND BORING MACHINE.

SPECIFICATION forming part of Letters Patent No. 701,623, dated June 3, 1902.

Application filed January 30, 1899. Serial No. 703,870. (No model.)

To all whom it may concern:

Be it known that I, CHARLES E. SANDSTROM, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Sawing, Jointing, and Boring Machines, of which the following is a specification.

My present invention relates to one of the several machines which I may use to carry out my new and improved process of making elliptical picture-frames. The function of the present machine is to produce several quadrilaterals, usually in the shape of trapezoids, which are of a certain definite shape and which may have their ends cut with certain grooves to form what I may call a "hooked rabbet-joint" and have two or more holes bored into one of the surfaces to secure exact registration of the parts in all subsequent operations to which they are subjected.

It will be seen that the machine has three principal functions, first, to cut the trapezoids, ordinarily from a board of the width of the pieces; second, to cut the peculiar grooves in the ends of the pieces if said grooves are used, which grooves when united form the hooked rabbeted joint, and, third, to bore the holes in one of the surfaces of each piece.

In carrying out my invention to cut the trapezoids, two sides of which are not parallel, it becomes necessary to hold the material and advance the saws upon the material in the line of the cut to be made. As the holes to be bored in the trapezoids must occupy a certain definite relation relative to the sides thereof, it becomes necessary to bore the holes in the stationary material, preferably at the time the saws are cutting it off, so that by no possibility of disarrangement between the time the material is cut off and the holes bored can the holes be misplaced. As the two cutting-off saws act during the same operation, it also becomes necessary to cause one saw to act at least slightly in advance of the other in order that the outermost saw (from the direction the material is being fed to the machine) shall have completed cutting off its end before the other saw has severed the trapezoid from the strip from which it is being cut.

In the annexed sheets of drawings, in which the same letters of reference are used to designate identical parts in all the figures, I have shown my invention as embodied in one form.

Figure 1 is a plan view of the complete machine. Fig. 2 is a plan view of a filling-board used on the guide-table. Fig. 3 is a view of the under side of one of the trapezoids. Fig. 4 is a plan view similar to Fig. 1, but on a larger scale and with the guide-table removed. Fig. 5 is a front elevation of the machine, in vertical section, on the line 5 5 of Fig. 4. Fig. 6 is a vertical section of the machine substantially on the line 6 6 of Fig. 4. Fig. 7 is a plan view of a portion of the machine in section on the line 7 7 of Fig. 6. Fig. 8 is a plan view of the adjustable guide-plate for the upper saws. Fig. 8ª is a detail thereof. Fig. 9 is a similar view of a portion of the adjustable guide-plate for the lower saws. Fig. 10 is a side elevation of the lower set of saws. Fig. 11 is a sectional view with the central part broken out on the line 11 11 of Fig. 8. Fig. 12 is a rear elevation of the support for the bearings of the upper saw shown in section in Fig. 11. Fig. 13 is a plan view of said support. Fig. 14 shows an inverted plan view and side elevation of the rough frame formed by joining together the trapezoids formed by this machine. Fig. 15 is a sectional view through the upper saws and the board on an enlarged scale, showing how the grooves are formed and the ends cut off by the same operation. Fig. 16 is a similar view of the lower saws. Fig. 17 is a plan view of the metallic portions of the guide-table. Fig. 18 is a plan view of the longitudinally-adjustable plate upon which the guide-table is adjusted, a different position of said table from that of Fig. 17 being indicated by the dotted lines. Fig. 19 is a sectional view through the adjustable guide-table and the drill-supports on the line 19 19 of Fig. 17, and Fig. 20 is a rear elevation of the parts shown in Fig. 19.

Referring, first, to Figs. 3, 14, and 15, it will be seen that each of the trapezoids A has its ends formed by the action of the saws C in cutting entirely through the board, while the saws D cut off a portion of the surface adjacent to the end, thus forming the surface E parallel to the main surfaces. The saws F cut still deeper than the saws D, but do not cut

entirely through the board, so that they form the groove G. In all the ends of the trapezoids A it will be seen that the surface E enters into the groove G of the adjacent piece, thus forming a hooked or locked rabbeted joint. The two drill-holes H, formed in each piece are bored simultaneously by the action of the drills J. (Best shown in Figs. 5, 17, and 19.) Of course I do not limit myself to the employment of two drill-holes in each trapezoid, as one or more may be employed.

Referring now especially to Figs. 1 and 4, it will be seen that the general form of the machine, as seen in plan view, is segmental, the upper part of the frame consisting of the two bearing-segments K and L, each of which has the plain surface M, in the outer edge of which is the segmental slot N, which has the bolt or stud O as its center. Mounted upon these segments are the adjustable guide-plates P and Q, supporting the upper and lower sets of saws, respectively. The details of these plates are illustrated in Figs. 8, 9, and 11, where it will be seen that they are provided with the leaves R and S, which are of the ordinary rule-joint construction and are mounted on the stud or bolt O, so that these plates swing about it as a center. These plates are provided with the bolts T, which pass through the slot N and by which they are secured in any desired position. To enable these to be readily adjusted at any one of certain angles which are frequently used, I may make a hole U in each of these plates and through this hole pass a pin V, which passes into one of the series of holes W, formed in the surface M, depending upon the angle to which it is desired to adjust the saws. As will be seen from Fig. 5, the sides of these plates P and Q are formed with the ribs X, to which are bolted the overlapping strips Y, thus forming the grooves Z on the inner edge of each side of the plates. For lightness these plates may have their centers cut away, as clearly shown in the drawings, and to accommodate the saw-driving belts. In the ways formed by the grooves Z are the plates A′, which form the basis of the sliding supports for the bearings of the saws. These plates A′ have the ribs or flanges B′ on their edges, which take into the grooves Z and form the sliding bearing-surfaces. The rectangular base-plate A′ has formed at its rear end the vertical plate C′, which has the flange D′ (best shown in Fig. 8) on its front sides, having formed therein the groove E′, into which take the flanges F′, which are formed on the sides of the journal-box plate G′. This journal-box plate G′ is of a somewhat peculiar shape and consists of the central part H′, the sides of which have the flanges F′, previously mentioned, and the rear end of which has the rearwardly-projecting lug J′, passing through the aperture K′, formed in the plate C′. A screw or bolt L′, passing through the lug M′, integral with or fastened to the upper end of the plate C′, and coöperating with the screw-threaded aperture in the lug J′, serves to adjust the journal-boxes at any height that may be desired. The central plate H′ has rigidly fastened to or formed integral therewith the lower halves N′ of the journal-boxes, and these are strengthened by the brackets or webs O′. As an additional support or adjustment for the lower halves of the journal-boxes, I form the slots P′ in the plate C′, through which pass the bolts Q′, which are secured to the brackets O′ and by which they may be clamped to the plate C′. The upper halves R′ of the journal-boxes are similarly secured by the bolts S′, passing through the slots T′, formed in the plate C′. The journal-boxes carry the shaft U′, upon which is fastened the belt pulley or roller V′, the belt therefor passing up through the aperture W′, formed in the plate A′. The inner end of this shaft carries the saws C, D, and F, which, as will be readily seen from Fig. 15, are of different diameters and widths, C being an ordinary thin circular saw of sufficient diameter to cut through the stuff, whereas D and F are very much thicker and of sufficient diameter to cut out the surface E and the groove G.

As will be best seen from Figs. 5 and 6, the set of saws upon the segment K operates upon the upper side of the board, while the set on the segment L operates on the lower side, the mountings of the lower set being similar to those of the upper set, the differences being only such as are necessitated by the different heights of the bearings. As will be readily seen, it is impossible to channel and cut off both ends of the board at once by moving the board onto the saw, so that it is necessary to move the saws in relation to the board. To provide for this movement, links X′ are pivotally mounted at one end between the lugs Y′, formed on the rear of the plate C′, while the other longitudinally-slotted ends are adjustably connected by the bolts Z′ to the links A^2, which may also be longitudinally slotted and which are pivotally mounted to the cross-piece B^2. This cross-piece B^2 has the lug C^2, to which is pivotally mounted the arm or lever D^2. (Best shown in Fig. 6.) This lever D^2 is mounted by the longitudinal slot E^2 upon the shaft F^2, to be subsequently described, and has its lower end enlarged and formed with the elongated segmental slot G^2. The upper edge of this slot is provided with a series of gear-teeth H^2, while the lower edge is similarly provided with gear-teeth J^2. Through this slot G^2 passes the shaft K^2, which is continuously rotating during the operation of the machine and which has fastened thereon the gear-pinion L^2. Beneath the curved lower end of this lever D^2 is a treadle-lever M^2, pivotally mounted at N^2 at the bottom of the machine and having its forward end O^2 projecting outward in position to be easily reached by the foot of the operator, who stands in front of the machine. The operation of these devices is as follows: When the material

is in position to be sawed, the parts are in the position shown in Fig. 6 and the operator depresses the front end O^2 of the treadle. The rear end is raised, and it raises the lever D^2, the elongated bearing E^2 permitting this movement until the gear-pinion L^2 is in mesh with the teeth J^2. The movement of the pinion carries the lever D^2 in the direction of the arrow, and by the link connections of the supports for the saws they are at the same time slid forward in their bearings, thus operating upon the material. Of course the saws are run continually by means of the belts coöperating with the belt-pulleys V'. When the cut is made, the operator releases the treadle, and this permits the lever D^2 to descend, and when it has reached its lower position the teeth H^2 are in a position to engage the pinion L^2, so that the lever D^2 and the saws are carried back to their normal position, when the board can be advanced ready for another operation.

From an inspection of Figs. 1 and 4 it will be apparent that the saws on the right-hand arbor are set in advance of those on the left-hand arbor, so that the saws on the right-hand arbor will have completed their work before the cutting-off saw on the left-hand arbor severs the integral piece upon which both sets of saws are working from the main piece of material. This arrangement of the saws is essential; otherwise the quadrilateral being severed from the strip before or at the same time the other end was finished would prevent said other end from being properly finished.

While the saws are cutting and channeling the trapezoids the drills J are raised to make the holes H. The mechanism for this action is best shown in Figs. 4 to 7 and 19 and 20. A generally U-shaped piece P^2 has its bottom part elongated, so as to form a plate Q^2, which is bolted to the cross-piece R^2, forming a part of the framework. The sides of the frame P^2 are much narrower than the bottom and have the triangular portion S^2, connecting the narrower portion with the plate Q^2, constituting the elongated bottom portion and operating substantially as a bracket. This triangular portion forms a shoulder at T^2, which shoulder rests upon the horizontal portion of the angle-shaped cross-piece R^2, previously mentioned. A similar U-shaped frame U^2 is secured to the narrow sides of the primary U-shaped frame P^2 to strengthen it without interfering with the mechanism mounted therein. The sides of this frame P^2 have the inwardly-projecting flanges V^2 formed on their upper sides, and these flanges V^2 coöperate with the shoulders W^2, formed by cutting away a portion of the upper edges of the plate X^2. (Shown detached in Fig. 18.) This plate X^2 has a downwardly-projecting lug Y^2, through which the screw-threaded bolt Z^2 passes. This screw-threaded bolt Z^2 is rotatably mounted in the U-shaped frame P^2, so that the position of the plate X^2 may be adjusted to the front or the rear of the machine, as may be desired. This plate X^2 has mounted thereon a plate A^3. (Best shown in plan view in Fig. 4.) This plate is pivotally mounted upon the plate X^2 by means of the bolt B^3, while the bolt C^3, passing through the segmental slot D^3 in the plate A^3, enables this plate to be secured at any desired angle relative to the plate X^2. As this adjustment is ordinarily in one of two or three positions, I provide for positioning these plates rapidly by means of the round hole E^3 in the plate A^3 and the three similar holes F^3 in the plate X^2. A pin G^3 is arranged to be put through a hole in the guide-table and through the hole E^3 and into whichever of the holes F^3 it may be necessary to secure the required adjustment. The plate A^3 has projecting downwardly from its rear end a leg H^3, which has lugs J^3 formed on either side thereof and projecting forwardly therefrom to form one side of the bearing-boxes K^3 for the shafts L^3 of the drills J. The lower part of the leg H^3 is formed with the lugs M^3, similar to J^3, but narrower and forming parts of and supports for the bearing-boxes N^3 for the lower ends of the drill-shafts L^3. These shafts have fastened thereto the belt-pulleys O^3 between the journal-boxes K^3 and N^3. The foot of the leg H^3 has forward and rear projections P^3 and Q^3, as seen in Fig. 19, and the elongated portion formed by these projections is bored through to furnish a bearing for the L-shaped rod R^3, the upturned L portion of which serves as a bearing for the idle belt-pulley S^3. The side plates T^3, projecting downward from and secured to the ends of the projections M^3, form bearings for the eccentric-roller U^3, pivotally mounted therein and furnishing a support for the lower ends of the shafts L^3 of the drills J. Referring now to Fig. 6, it will be seen that this eccentric-shaft U^3 has fastened to its outer end a crank-arm V^3, which is pivotally connected by the link W^3 to the arm D^2. The shaft F^2, previously mentioned, has rigidly secured thereto the belt-wheel X^3, by which it is driven by means of the customary belt Y^3. This shaft has fast thereon the gear-pinion Z^3, which meshes with the gear-wheel A^4, fast on the shaft K^2, previously mentioned, so it will be seen that the rotation of the shaft F^2 drives the shaft K^2 and serves to reciprocate the sliding bearings of the saws. Also mounted on the shaft F^2 are the loose belt-pulleys B^4. A belt-wheel C^4, to which power is applied, has a belt D^4 passing upward over the idle pulleys B^4, around the driving-belt pulleys O^3, and around the idle belt-pulley S^3, as shown in Fig. 7. By means of the bolt or set-screw E^4 the idle pulley S^3 can be adjusted to any position desired to give the desired tension to the belt D^4. The operation of these devices is as follows: It will be seen that through the connections of the drills with the belt-pulleys C^4, to which power is applied, these drills will be running continuously, and whenever the treadle is depressed, thereby

rocking the lever D^2 forward, the link W^3 and the crank-arm V^3 will rock the eccentric-shaft U^3, at the same time raising the drill-shafts the required distance so that they will penetrate into the material and form the holes H of the desired depth.

The guide-table previously referred to is shown in Figs. 1, 5, 6, and 17 to 20. It consists primarily of the long plate F^4, having the upwardly-turned flange G^4 at its rear. This table terminates at its left-hand end in a position to just permit the upper saws to clear it, while a slot H^4 is formed in it to permit the lower saws to cut the material supported thereby. At the point in the flange G^4 where the slot H^4 occurs the flange is formed with a projection J^4 thereon, which forms sufficient material so that some of it may be cut away to form the vertical portion K^4 of the slot H^4 without materially weakening the table. The front end of the forward portion of the table is formed with the upwardly-projecting flange L^4 and the downwardly-projecting flange M^4. This table is secured in position upon the plate A^3 by means of the screws N^4, and it also has the apertures O^4, through which the drill-points project. When the machine is ready to be put into operation, a filling-piece of wood P^4, which is of the shape shown in Fig. 2, is secured upon the trapezoidal portion of the plate F^4, which is formed by the slot H^4. This filling-block is of sufficient thickness to make this portion flush with the rest of the plate F^4, which is slightly higher. In addition to the filling-block P^4 the vertical block Q^4 is used, and this block is of a thickness depending upon the size of the work to be operated on and the distance it is desired to place the holes H from the edge thereof.

To securely hold the material in position while it is being cut by the saws, I fasten or form upon the raised portion J^4 a bearing-stud R^4, upon which is pivotally mounted the hand-lever S^4, (best shown in Fig. 6,) which has fastened on the under side thereof a block T^4, which is in position to clamp firmly the material being operated on when the lever is depressed.

The operation of the machine will be readily apparent from the foregoing description and also the possibility of adjusting it to make any necessary or desired variations in the form of the trapezoidal blocks to be cut out.

While I have shown my invention as embodied in the form which I at present deem best adapted for the purpose in hand, it will be understood that I do not desire to be limited to the exact form shown and described, but only so much as may be necessitated by the state of the art.

What I claim, and desire to secure by Letters Patent of the United States, is—

1. In a machine of the class described, the combination of two cutting-off saws each having separate supports, and means for rotating said saws, with ways arranged at an oblique angle to each other in which the supports may be reciprocated, a work-holding table at one side of said ways upon which the material is held during the movement of the saws, and means for reciprocating the supports while the saws are rotated so that the saw farthest from the work-holding table shall complete its cut before the completion of the cut of the other saw.

2. In a machine of the class described, the combination of two cutting-off saws each having separate supports, and means for rotating said saws, with ways arranged at an oblique angle to each other in which the supports may be reciprocated, a work-holding table at one side of said ways upon which the material is held during the movement of the saws, and means for reciprocating the supports simultaneously during the rotation of the saws, but so that the saw farthest from the work-holding table shall meet the work in advance of the other saw.

3. In a machine of the class described, the combination of two cutting-off saws each having separate supports, and means for rotating said saws, with ways arranged at an oblique angle to each other in which the supports may be reciprocated, said ways being adjustably mounted so as to vary the angles of the saws relative to each other and to the work-holding table, a work-holding table at one side of said ways upon which the material is held during the movement of the saws, and means for reciprocating the supports while the saws are rotated so that the saw farthest from the work-holding table shall complete its cut before the completion of the cut of the other saw.

4. In a machine of the class described, the combination of two cutting-off saws each having separate supports, the support for one saw being located in advance of the other, and means for rotating said saws, with ways arranged at an oblique angle to each other in which the supports may be reciprocated, a work-holding table at one side of said ways adjacent the rearward support and upon which the material is held during the movement of the saws, and means for reciprocating said supports simultaneously while the saws are rotated so that the saw in the forward support shall complete its cut before the completion of the cut of the other saw.

5. In a machine of the class described, the combination of two cutting-off saws each having separate supports, and means for rotating said saws, with ways arranged at an oblique angle to each other in which the supports may be reciprocated, a work-holding table at one side of said ways and adjustable to vary the angle at which the material held thereon is presented to the saws, and means for reciprocating the supports while the saws are rotated so that the cutting-off saw farthest from the work-holding table shall complete its cut before the completion of the cut of the other saw.

6. In a machine of the class described, the combination of two shafts each having separate supports and carrying a plurality of saws comprising a cutting-off saw and one or more grooving-saws, and means for rotating the said saws, with ways arranged at an oblique angle to each other in which said supports may be reciprocated, a work-holding table at one side of said ways upon which the material is held during the movement of the saws, and means for reciprocating the supports while the saws are rotated so that the cutting-off saw of the group farthest from the work-holding table shall complete its cut before the completion of the cut of the other cutting-off saw, the supports for one set of saws being located above the table so as to bring the lower teeth of the cutting-off saw below the top of the table and of the grooving-saws above it, and the supports for the other shaft located beneath the table so as to bring the upper teeth of the cutting-off saw above the table to cut through the material and of the grooving-saws so as to cut into the material.

7. In a machine of the class described, the combination of a plurality of cutting-off saws each having separate supports, and means for rotating said saws, with a plurality of ways corresponding in number to the supports pivotally mounted upon a single pivot and arranged at an oblique angle to each other and in which the supports may be reciprocated, a work-holding table at one side of said ways upon which the material is held during the movement of the saws, and means for reciprocating the supports while the saws are rotated so that the cutting-off saw farthest from the work-holding table shall complete its cut before the completion of the cut of the adjacent saw.

8. In a machine of the class described, the combination of a plurality of cutting-off saws each having separate supports, and means for rotating said saws, with a corresponding plurality of ways pivotally mounted upon a single support and arranged at an oblique angle to each other and in which the supports may be reciprocated, a work-holding table at one side of said ways upon which the material is held during the movement of the saws, and a single means for reciprocating all of said supports, the supports farthest from the table being located in advance of the adjacent supports so that the cutting-off saw farthest from the table shall complete its cut before the completion of the cut of an adjacent saw.

9. In a machine of the class described, the combination of a plurality of cutting-off saws each having separate supports, and means for rotating said saws, with a corresponding plurality of ways pivotally mounted upon a single support and arranged at an oblique angle to each other and in which the supports may be reciprocated, and adjustable to vary the angles of the saws relative to each other and to the table, a work-holding table at one side of said ways upon which the material is held during the movement of the saws, and a single means for reciprocating all of said supports, the supports farthest from the table being located in advance of the adjacent supports so that the cutting-off saw farthest from the table shall complete its cut before the completion of the cut of an adjacent saw.

10. In a machine of the class described, the combination of two cutting-off saws each having separate supports, and means for rotating said saws, with ways arranged at an oblique angle to each other in which the supports may be reciprocated, a work-holding table at one side of said ways upon which the material is held during the movement of the saws, a pair of drills located adjacent to the table, means for driving said drills, means for reciprocating the supports while the saws are rotated so that the cutting-off saw farthest from the work-holding table shall complete its cut before the completion of the cut of the other saw to sever the trapezoid, and means for advancing said drills while they are driven to penetrate the material before the trapezoid is cut off.

11. In a machine of the class described, the combination of two cutting-off saws each having separate supports, and means for rotating said saws, with ways arranged at an oblique angle to each other in which the supports may be reciprocated, a work-holding table at one side of said ways upon which the material is held during the movement of the saws, a pair of drills located adjacent to the table, means for driving said drills, and means for simultaneously advancing said drills and reciprocating said supports so that the cutting-off saw farthest from the work-holding table shall complete its cut and the drills shall have penetrated the material before the completion of the cut of the other saw.

12. In a machine of the class described, the combination of two cutting-off saws each having separate supports, and means for rotating said saws, with ways arranged at an oblique angle to each other in which the supports may be reciprocated during the movement of the saws, a pair of drills located adjacent to the table and adjustable relative thereto, means for driving said drills, and means for simultaneously advancing said drills and reciprocating said supports so that the cutting-off saw farthest from the work-holding table shall complete its cut and the drills shall have penetrated the material before the completion of the cut of the other saw.

13. In a machine of the class described, the combination of the two shafts each having separate supports and carrying a plurality of saws comprising a cutting-off saw and two grooving-saws, the grooving-saw adjacent the cutting-off saw being the smaller, and means for rotating said shafts, with ways arranged at an angle to each other in which said supports may be reciprocated, a work-holding table at one side of said ways upon which the material is held during the movement of the

saws, and means for reciprocating the supports while the saws are rotated so that the saw farthest from the work-holding table shall complete its cut before the completion of the cut of the other cutting-off saw.

14. In a machine of the class described, the combination of a plurality of saws each having separate supports, and means for rotating said saws, with a plurality of ways corresponding in number to the supports and in which said supports may be reciprocated, a work-holding table upon which the material is held during the movement of the saws, and means for reciprocating said supports so that while all the saws cut the same integral piece of material at the same operation, one saw shall meet the work in advance of another.

15. In a woodworking-machine, the combination of two or more saws arranged at different angles and having mechanism for driving them and means for advancing them upon the work, with a drill and means for driving it and for advancing it upon the work, a guide-table for holding the material adjustable to different angles relative to said saws.

16. In a woodworking-machine, the combination of two or more saws arranged at different angles and means for driving them and for advancing them upon the work, with a drill and means for driving it and for advancing it upon the work, means for adjusting the position of the drill relative to the saws, and a guide-table adjustable with said drill.

17. In a woodworking-machine, the combination of the saw-support sliding in ways, with the drill-shaft sliding in its bearings, and the lever D^2 connected to said support and to the drill-shaft, means for raising and lowering said lever, and means for automatically advancing and retracting said lever to reciprocate the saw-support and the drill-shaft.

18. In a machine for sawing off blocks and boring holes therein in a certain relation to the sawed-off edge, the combination with a work-supporting table, of a cutting-off saw, means for rotating it, a support for the saw, a way in which said support can be reciprocated to advance it upon the work, a drill adjacent said way and adapted to be advanced toward and to operate upon the portion of the work being sawed off, means for rotating said drill, and means for simultaneously reciprocating the saw-support and advancing the drill so that the drill shall penetrate the work before the saw has completed the severing of that portion.

19. In a machine for sawing off blocks and boring holes therein in a certain relation to the sawed-off edge, the combination with a work-supporting table, of two cutting-off saws, means for rotating them, two supports for the respective saws, two ways in which said supports can be reciprocated to advance upon the work, a drill between said ways and adapted to be advanced toward and to operate upon the portion of the work being sawed off, means for rotating said drill, and means for simultaneously reciprocating the saw-supports and advancing the drill so that it shall penetrate the work before the saws have completed the severing of the portion being drilled.

20. In a machine for sawing off blocks and boring holes therein in a certain relation to the sawed-off edge, the combination with the work-supporting table, of two cutting-off saws, means for rotating them, supports for the saws, ways in which said supports may be reciprocated adjustably to vary the angles at which the saws shall be advanced upon the work, two drills interposed between said ways, means for driving them, mechanism for adjusting the position of the drills to vary the location of the holes in relation to the cut of the saws upon the material, and means for simultaneously reciprocating the saw-supports and advancing the drills so that the drills shall penetrate the work before the saws have severed the portion being operated upon.

21. In a woodworking-machine, the combination of a plurality of cutting-off saws, a separate support for each saw, a corresponding number of ways, in which the supports may be reciprocated to advance the saw upon the work, means for rotating said saws, a work-supporting table located at one side of said ways, means for adjusting the position of said table relative to said ways to vary the angle at which the saws are presented to the work, and means for reciprocating said supports so that the cut of the saw farthest from the table shall be completed first.

22. In a woodworking-machine, the combination of a plurality of cutting-off saws, separate supports for each saw, a corresponding number of ways adjustable to vary the angles between the saws, means for rotating said saws, a work-supporting table located at one side of said ways, means for adjusting the position of said table relative to the ways to vary the angle at which the saws shall be presented to the work, and means for reciprocating said supports so that the cut of the saw farthest from the table shall be completed first.

23. In a woodworking-machine, the combination of a plurality of cutting-off saws, separate supports for each saw, a corresponding number of ways adjustable to vary the angles between the saws, means for rotating said saws, a work-supporting table located at one side of said ways, means for adjusting the position of said table relative to the ways to vary the angle at which the saws shall be presented to the work, means for reciprocating said supports so that the cut of the saw farthest from the table shall be completed first, and a clamping-bar for holding the material upon said table.

CHARLES E. SANDSTROM.

Witnesses:
LOUISE SERAGE,
ALLAN A. MURRAY.