(No Model.) 6 Sheets—Sheet 1.

M. E. BRIGHAM.

MACHINE FOR FORMING WOODEN TUBES.

No. 497,299. Patented May 16, 1893.

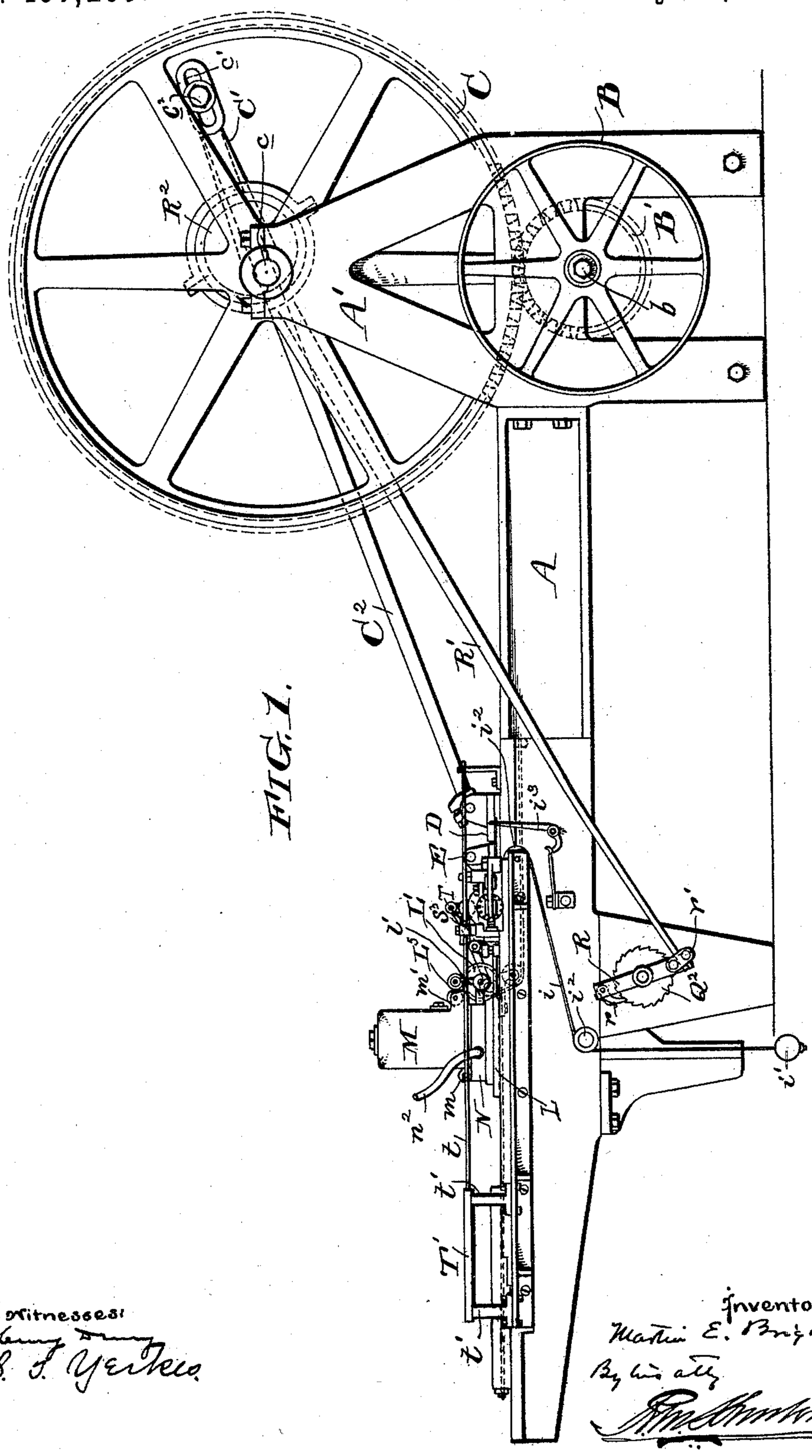

FIG. 1.

Witnesses:
Henry Orrell
S. F. Yerkes.

Inventor:
Martin E. Brigham
By his atty
[illegible]

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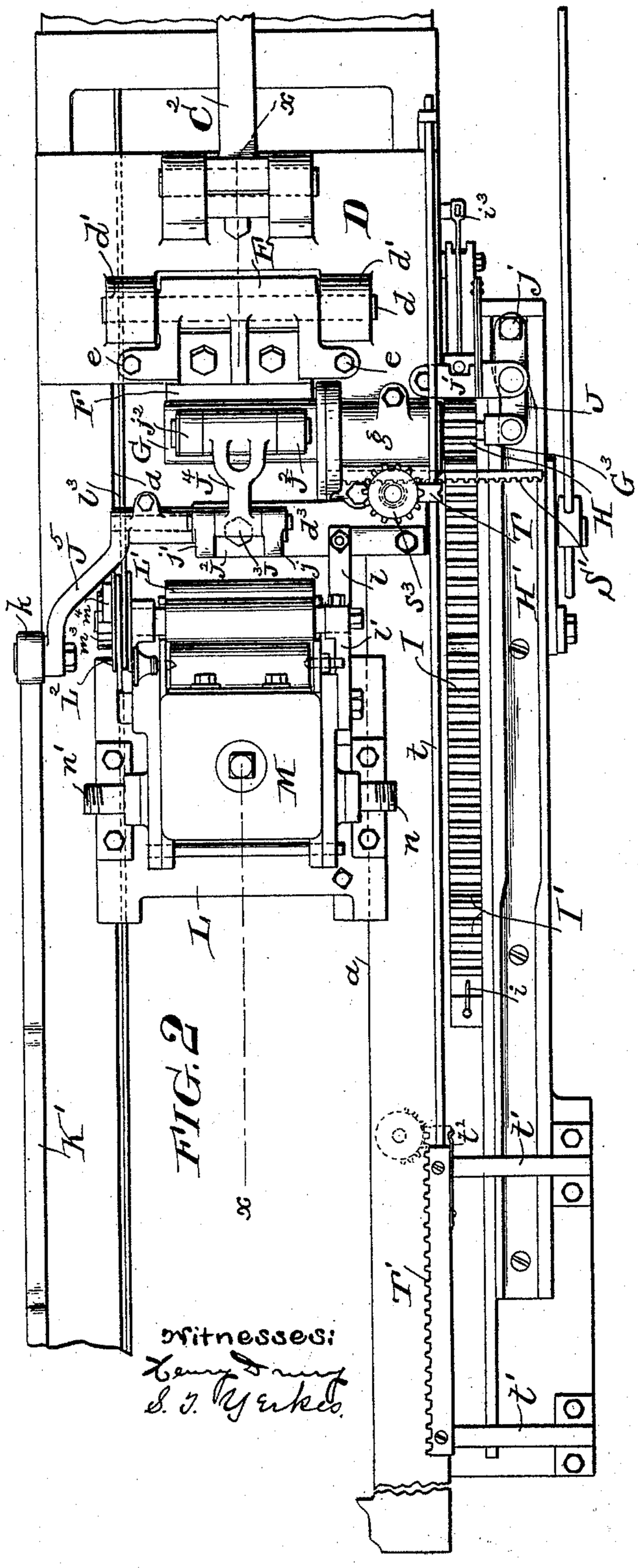

FIG. 2

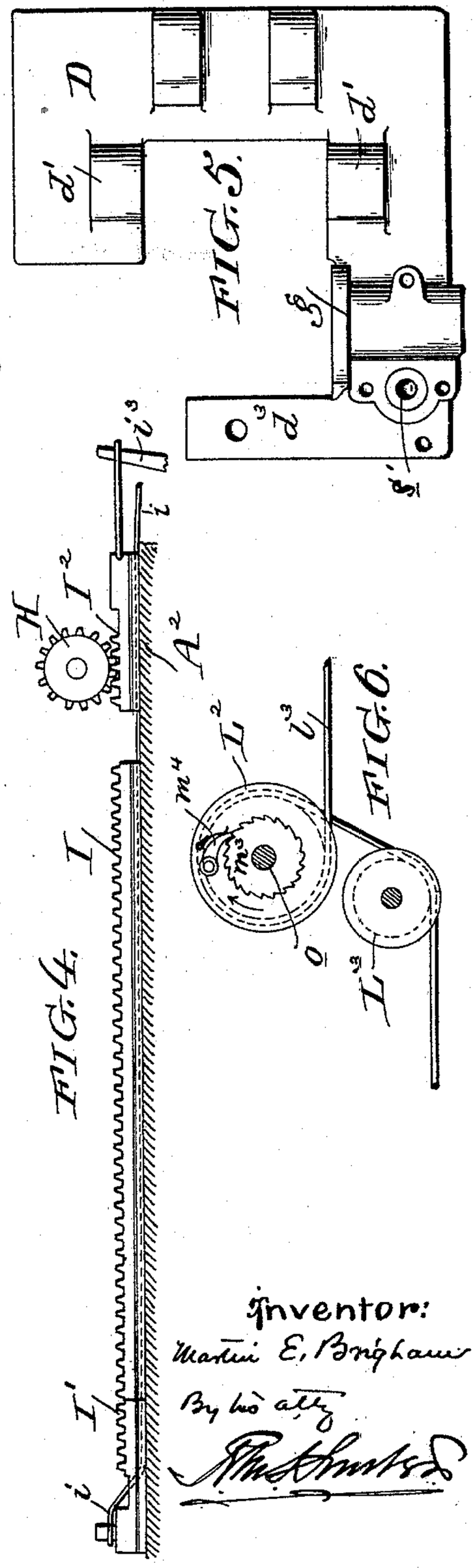

FIG. 3.

FIG. 6.

FIG. 4.

Witnesses:
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(No Model.)

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M. E. BRIGHAM.

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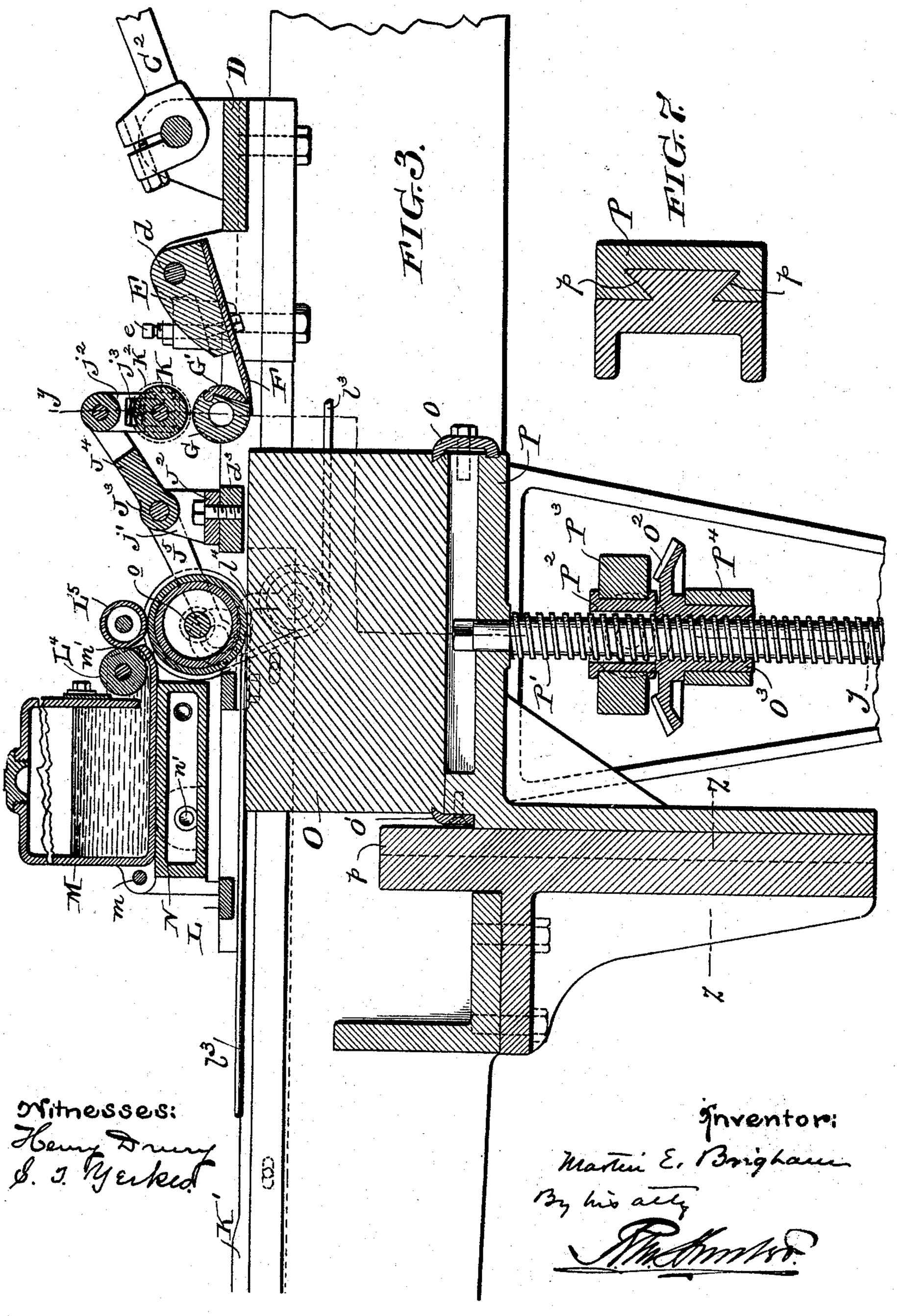

FIG. 3.

FIG. 2.

Witnesses:
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(No Model.) 6 Sheets—Sheet 4.

M. E. BRIGHAM.

MACHINE FOR FORMING WOODEN TUBES.

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FIG. 8.

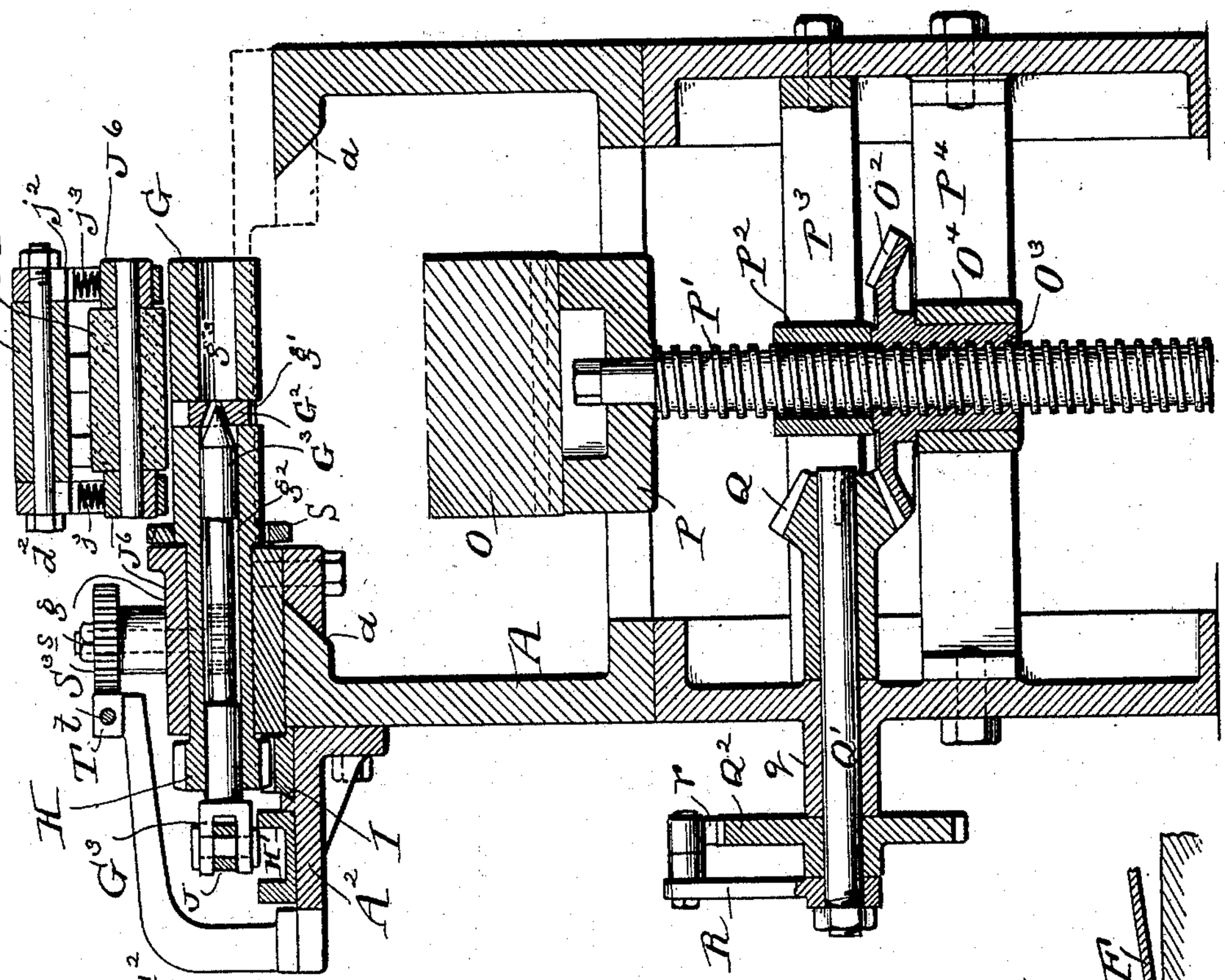


FIG. 10.

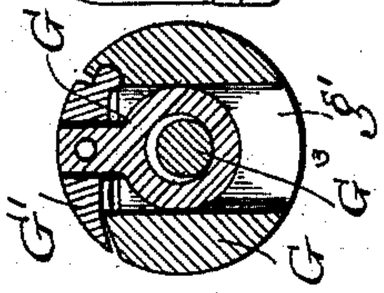


FIG. 9.

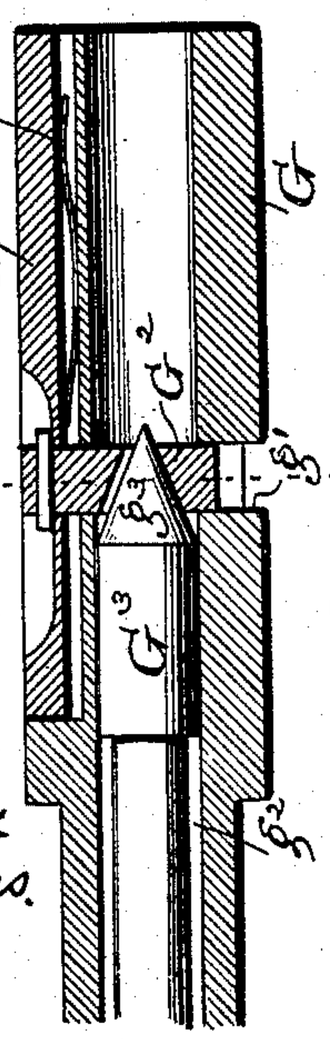


FIG. 11.

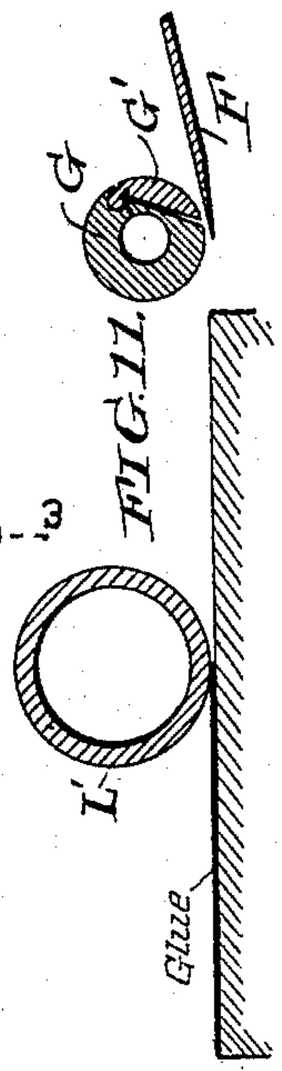


FIG. 12.

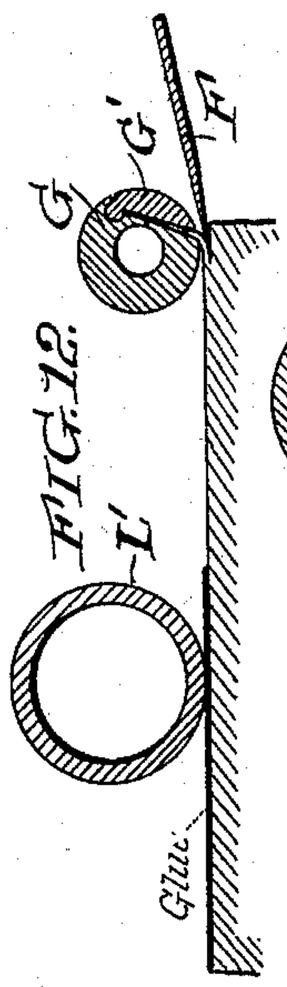


FIG. 13.

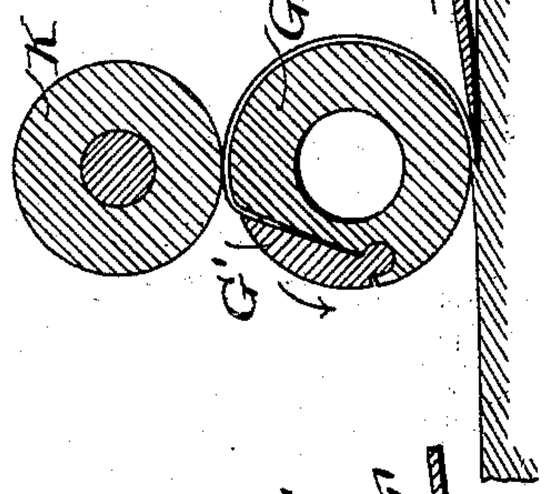
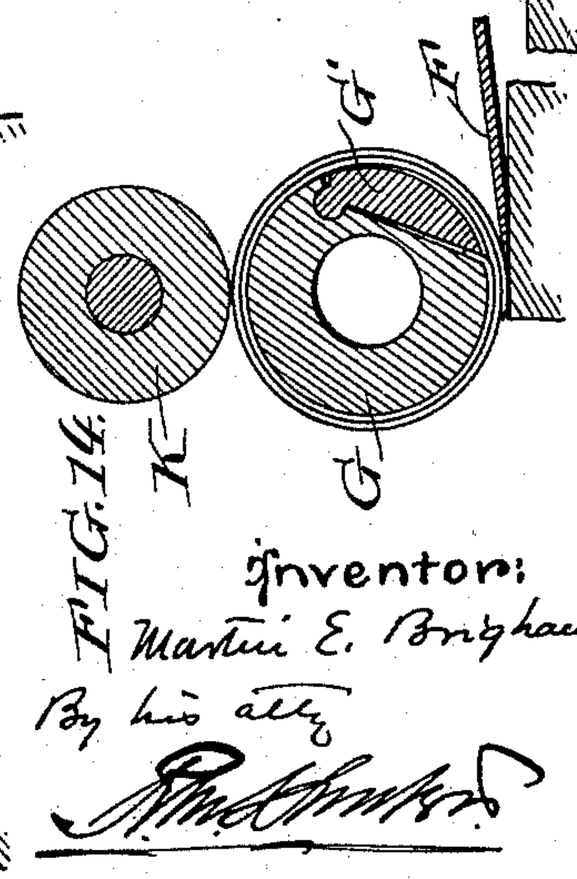


FIG. 14.



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(No Model.) 6 Sheets—Sheet 5.

M. E. BRIGHAM.

MACHINE FOR FORMING WOODEN TUBES.

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FIG. 15.

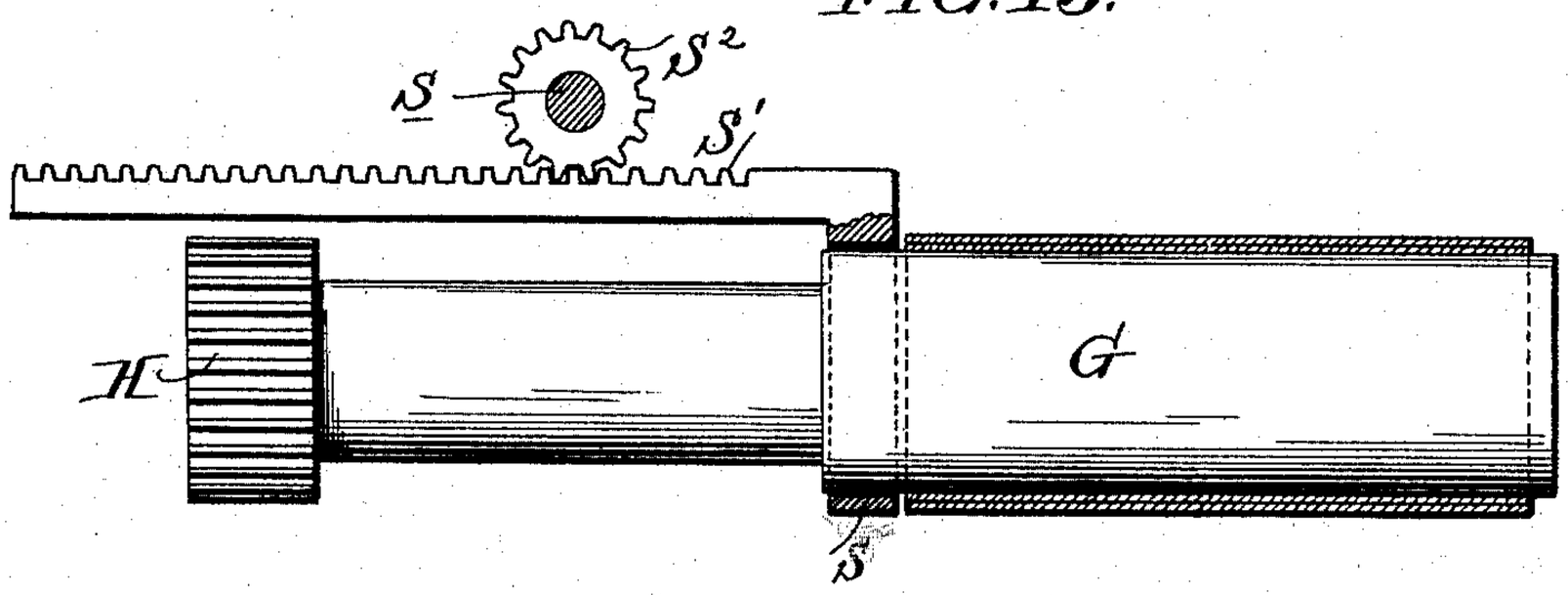


FIG. 16.

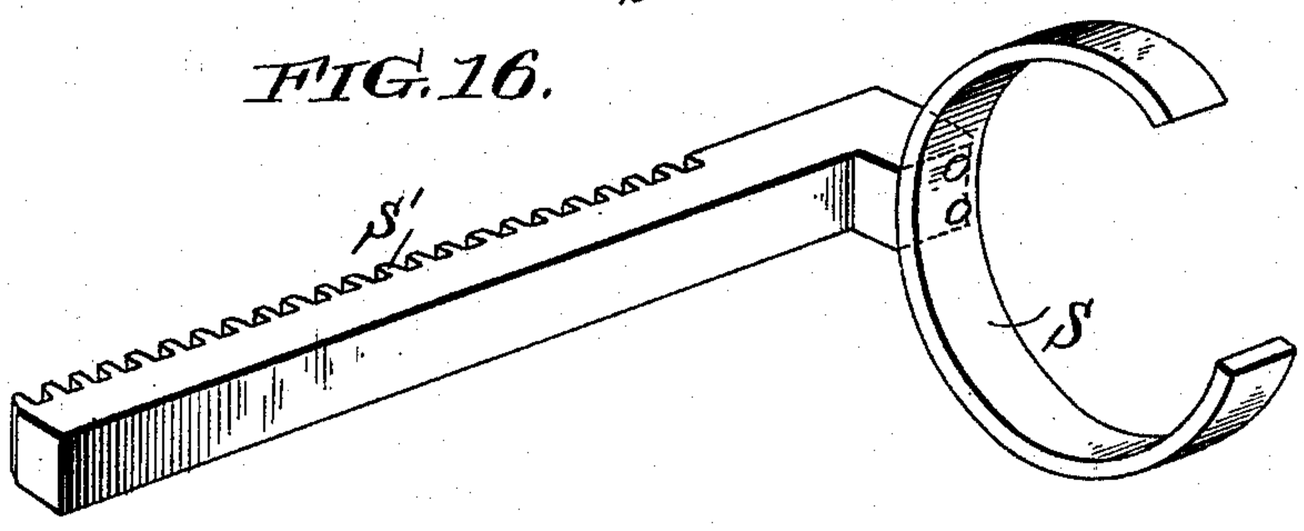


FIG. 17.

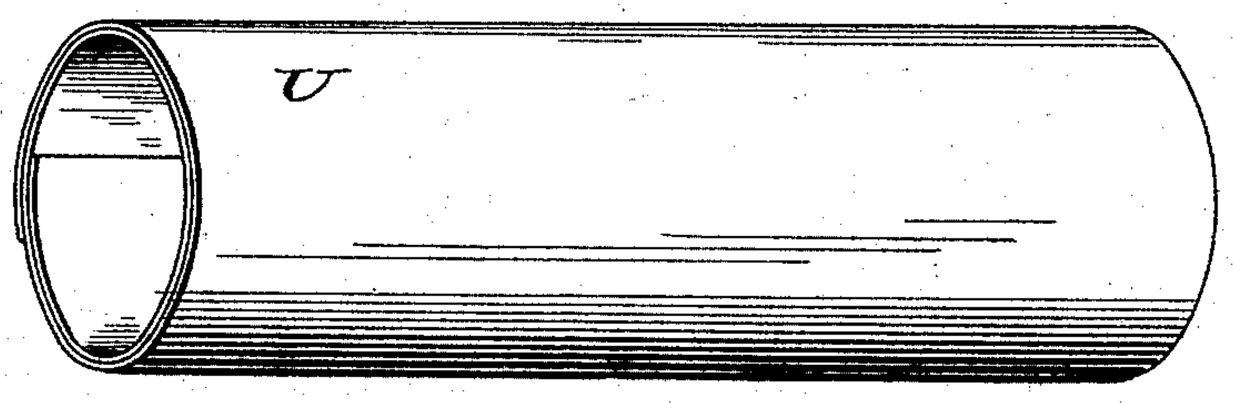
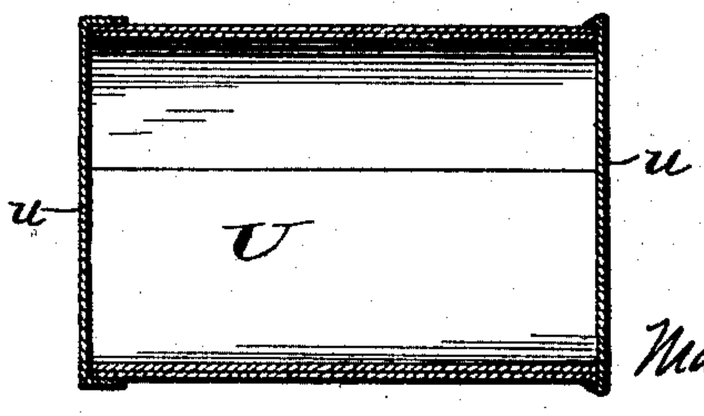


FIG. 18.



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W. W. Thompson

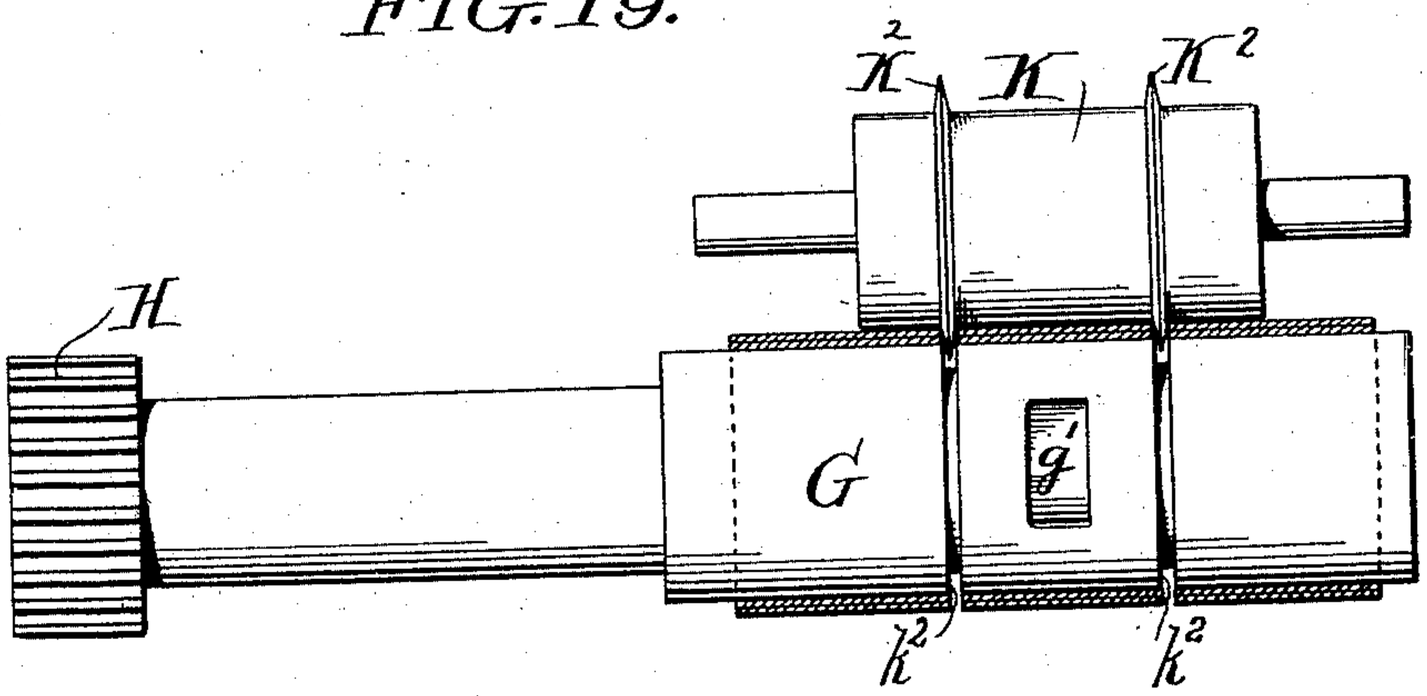
(No Model.) 6 Sheets—Sheet 6.

M. E. BRIGHAM.

MACHINE FOR FORMING WOODEN TUBES.

No. 497,299. Patented May 16, 1893.

FIG. 19.



WITNESSES:
Henry Orth
C. A. Dittrich.

INVENTOR:
Martin E. Brigham
By his atty,
[signature]

UNITED STATES PATENT OFFICE.

MARTIN E. BRIGHAM, OF PHILADELPHIA, PENNSYLVANIA.

MACHINE FOR FORMING WOODEN TUBES.

SPECIFICATION forming part of Letters Patent No. 497,299, dated May 16, 1893.

Application filed May 9, 1892. Serial No. 432,401. (No model.)

To all whom it may concern:

Be it known that I, MARTIN E. BRIGHAM, a citizen of the United States, and a resident of the city and county of Philadelphia and State of Pennsylvania, have invented an Improvement in Machines for Forming Wooden Tubes, of which the following is a specification.

My invention relates to machines for forming wooden tubes, and consists of certain improvements which are fully set forth in the following specification and are shown in the accompanying drawings which form a part thereof.

The object of my invention is to produce a machine for forming wooden tubes such as may be used for boxes, casings, &c.

My invention is designed to form such tubes from a solid block of wood, by a continuous operation, cutting the shaving, rolling it, fastening the edges and delivering the finished tube from the machine.

The machine is designed to operate continuously and with rapidity, forming successive tubes until the block of wood is used up.

In carrying out my invention, I employ a reciprocating cutter adapted to cut a shaving from the wooden block, and a forming cylinder designed to take the cut shaving and roll it into the required form.

My invention also includes devices for supplying glue to the shaving so that the lapped portions of the rolled tube are secured together, and also devices for pressing the lapped parts in contact so that the glue will take effect.

My invention also relates to certain devices for containing the glue and maintaining it in a liquid condition.

My invention also relates to devices for stripping the formed tube from the forming cylinder, and to mechanism for feeding the block of wood so that its surface may be maintained in proper position for the cutter to cut the shaving.

While I prefer to unite the lapped portions of the rolled tube by glue, they may be fastened in other ways, as by stapling in any of the well known methods.

In the drawings:—Figure 1 is a side elevation of my improved tube forming machine. Fig. 2 is a plan view of a portion of the same. Fig. 3 is a longitudinal vertical sectional view of a portion of the machine on the line *x*—*x* of Fig. 2 on an enlarged scale. Fig. 4 is a side elevation of the rack and pinion devices for operating the tube forming cylinder. Fig. 5 is a plan view of the slide frame. Fig. 6 is a detail view of the devices for rotating the glue supplying roller. Fig. 7 is an enlarged horizontal sectional view on the line *z*—*z* of Fig. 3 showing the guides for the block carrying frame. Fig. 8 is a transverse vertical sectional view of the machine on the line *y*—*y* of Fig. 3. Fig. 9 is an enlarged longitudinal sectional view of the tube forming cylinder and the devices for operating the gripping jaw thereof. Fig. 10 is a transverse vertical sectional view of the same on the line *w*—*w* of Fig. 9. Figs. 11, 12, 13 and 14 are illustrative views showing successive steps in the formation of the tube. Fig. 15 is a side elevation, with part in section, of the tube forming cylinder and stripping devices. Fig. 16 is a perspective view of the tube stripper. Fig. 17 is a perspective view of the tube. Fig. 18 is a longitudinal sectional view of a tubular box such as may be formed from the tube, and Fig. 19 is a side elevation of the tube forming and pressure cylinders showing the same provided with devices for cutting the formed tubes into short sections. Figs. 15, 16, 17, 18 and 19 are all on an enlarged scale.

A is the main frame of the machine.

B is the driving pulley having its shaft *b* journaled in the frame A.

B′ is a gear wheel carried by the shaft *b* engaging the teeth of the large gear wheel C which is carried by a shaft *c* journaled in uprights A′ of the frame.

C′ is a crank arm carried by the shaft *c* to which is connected the pitman rod C^2 through the slot *c*′ and pin c^2.

D is a sliding carriage or frame sliding in suitable guides *a* and hinged to the end of the rod C^2.

E is a frame hinged on a shaft *d* journaled in bearings *d*′ *d*′ on the frame or carriage D.

F is a cutter bolted or otherwise secured to the frame E, preferably at an inclination as shown in Fig. 3.

e are adjusting screws carried by the frame

E and bearing on the slide D for raising or lowering the frame E and thus adjusting the angle of inclination of the cutter F.

G is the tube forming cylinder journaled in a bearing *g*, in the side of the sliding carriage D and located transversely in front of and immediately above the cutting edge of the cutter F.

G′ is a movable or hinged section of the cylinder G forming a nipping or gripping jaw. A portion of the cylinder G is cut away to receive the section or jaw G′ and this jaw is shaped to form a continuous circular periphery with the surface of the cylinder.

G^2 (Figs. 8, 9, and 10), is a link or ring attached to the hinged section or jaw G′ and extending within an aperture or hole *g′* in the roller.

G^3 is a plunger extending through a longitudinal bore g^2 in the roller G and preferably having a tapered or cam end g^3 adapted to be projected through the ring or link G^2 to draw the link inward so as to clamp the jaw or section G′ upon the body portion of the cylinder G.

g^4 (Fig. 9) is a spring for normally opening the jaw section G′.

H is a pinion on the outer end of the cylinder G.

I is a toothed rack on the side of the frame A (shown in Fig. 8 upon the bracket A^2) in which the teeth of the pinion H work to impart a rotation to the cylinder G when it is reciprocated with the slide D.

The rack I consists of a central stationary portion, and movable or sliding end sections or parts I′, I^2 (Figs. 2 and 4) adapted to be moved to and from the stationary portions. With this construction the pinion H is rotated only while it passes over the stationary portion of the rack, and is not rotated when it passes upon either of the end sections I′ or I^2, which being free to reciprocate are moved with the reciprocation of the rotary cylinder G and its pinion H and therefore do not rotate them. The rotation of the cylinder G is therefore intermittent, being interrupted at the commencement and end of each reciprocation of the frame D. The movable end sections I′ and I^2 of the rack I may be held normally against the ends of the stationary portion of the rack by springs or in any convenient manner. In the drawings I have shown the end section I′ connected with a cord *i* provided with a weight *i′* and passing over suitable guides i^2 i^2 (see Fig. 1); and the section I^2 connected with a spring operated lever i^3.

J is a lever hinged to the projecting end of the plunger G^3 and pivoted at its middle to a support or plate J′ carried fixedly upon the reciprocating slide or frame D. Upon the free end of the lever J is a pin or projection *j* which works in a cam groove H′ on the bracket A^2. This cam groove H′ is so arranged (see Fig. 2) that it will rock the lever J during a portion of its reciprocation and throw the plunger G^3 forward so as to operate the link G^2 and clamp the jaw section G′ against the action of the spring g^4, and having so rocked the lever J will maintain it in that position during a portion of the reciprocation and will then rock it back again so as to draw back the plunger and allow the spring g^4 to open the jaw section G′. The cam portion of the groove H′ by which the clamping of the jaw G′ is effected corresponds with the stationary portion of the rack I, so that the jaw G′ is clamped during that portion of the reciprocation of the cylinder G in which the roller is rotated.

J^2 (Figs. 2 and 3) is a frame carried by the arm d^3 of the sliding frame D and provided with bearings *j*, *j′*, in which is journaled a rock shaft J^3 carrying arms J^4 and J^5. The arm J^4 extends over the cylinder G and carries depending arms j^2, j^2, in which are located sliding journal boxes J^6, J^6 acted on by springs j^3, j^3 (see Fig. 8).

K is a pressure roller journaled in the boxes J^6, J^6, and located immediately above the cylinder G. The roller K is adapted to be brought in contact with the cylinder G, as will be more fully described hereinafter.

If desired the pressure roller K may be provided with one or more slitting disks or cutters K^2 (shown in dotted lines in Fig. 3) to cut the tube formed by the shaving rolled on the cylinder G into desired short lengths. The cylinder G may be provided with annular grooves k^2 to receive the cutters K^2. This construction for cutting the formed tube into sections is particularly illustrated in Fig. 19. The particular construction which I have employed for supporting this pressure roller K is designed for holding it upon the cylinder G with a yielding pressure, but is not to be taken as essential to the invention. It is merely a preferable construction.

K′ is a cam on the side of the frame A in the path of the free end of the arm J^5 when the same is reciprocated to elevate the arm J^5 and thus rock the shaft J^3 and depress the arm J^4 so as to press the roller K toward the cylinder G during a portion of the reciprocation. The end of the arm J^5 may be provided with an anti-friction roller *k*.

L (Figs. 2 and 3) is a sliding frame located in front of the frame D and preferably connected therewith through a connection *l*. The frame L is adapted to guides on the frame A and slides therein with the frame D.

M is a glue pot carried by the frame L. For the purpose of keeping the glue in the glue pot M in the proper liquid state, I prefer to employ a heating chest or chamber N upon the sliding frame L and located under the pot M. The pot M may be hinged as at *m* to the chamber N or the frame L, and may have its bottom resting upon the top of the heating chest. Heat may be supplied to the chest N in any convenient manner, but I prefer to circulate steam through the chamber by inlet and outlet pipes *n*, *n′*, which may be con-

nected with the fixed steam pipes through flexible tubes n^2 (see Fig. 1).

m' is the outlet lip of the glue pot leading from the lower portion thereof.

L′ is a glue supplying roller having its shaft O journaled in suitable brackets l' (see Fig. 2) of the frame L adjacent to the outlet lip m' of the glue pot M. This roller L′ is rotated preferably by a sheave L^2 carried by its shaft and a friction cord l^3 passing about the sheave L^2 and having its ends attached to stationary portions of the frame (see Fig. 6.)

L^3 is an idler guide roller over which the cord l^3 is passed for the purpose of guiding it below the upper part of the frame A at the forward end of the machine. This idler L^3 is carried by an arm l^4 upon the frame L and thus moves with the frame (see dotted lines in Fig. 3). It is apparent that when the frame L reciprocates the roller L′ reciprocating with it will be rotated by the friction of the cord l^3 upon the sheave L^2. As it is desirable, however, that this roller L′ shall rotate for the purpose of supplying glue only during its reciprocation in one direction, I prefer to employ a ratchet wheel m^3 and pawl m^4, on the end of the roller shaft to prevent the rotation of the roller when it is reciprocated backward, *i. e.* toward the right in Fig. 3, while permitting it to rotate when reciprocated in the other direction.

L^4, L^5 are feeding rollers journaled adjacent to the outlet lip m' for feeding the glue to the roller L′.

O is the block of wood from which the boxes or tubes are to be formed.

P is a movable support or carriage sliding in guides p (preferably dovetailed as shown in Fig. 7) in the lower part of the frame A.

O′ are clamps for securing the block O upon the top of the carriage P.

The carriage P is so located with reference to the other portions of the machine described when the same are at rest that the block O carried thereby is located below the glue supplying roller L′ and approximately on a level with the cutter F and roller G, but slightly above the line of movement of the edge of the cutter F, so that the cutter will cut a shaving from the upper surface of the block when it is reciprocated.

The carriage P is fed upward to keep the upper surface of the block O in position to be operated upon by the cutter F, and any convenient mechanism may be employed for this purpose. In order, however, to obtain a uniform, positive feed, properly timed with reference to the operation of the other parts of the machine I prefer to employ the mechanism shown in Figs. 1, 3 and 8. Referring, now, to this mechanism, P′ is a feeding screw carried by the frame P and extending below the same.

P^2 is a sleeve, carried by a cross piece P^3 bolted to the frame A, through which the screw P′ moves.

O^2 is a bevel gear carried by an internally screw threaded sleeve O^3 upon the screw P′ journaled in a bearing O^4 carried by the cross piece P^4.

Q is a bevel gear engaging with the bevel gear O^2.

Q′ is a shaft journaled in suitable bearings q in the frame A, and carrying the bevel gear Q.

Q^2 is a ratchet wheel carried fast upon the outer end of the shaft Q′.

R is a rocking lever loosely journaled upon the extremity of the shaft Q′ carrying a spring pressed pawl r adapted to engage the teeth of the ratchet Q^2.

R′ is a pitman connected with the lever R through a link r' and operated by an eccentric R^2 carried by the shaft c (see Fig. 1). By this means the lever R is rocked back and forth and through the pawl r and ratchet wheel Q^2 the bevel gears Q and O^2 are driven intermittently thus feeding the screw P′ and the frame P with the block O upward by a regular intermittent motion; and as this operation is controlled by the eccentric R^2 on the same shaft c by which the other parts of the machine are driven, it is apparent that the feeding of the block O may be properly timed.

I shall now refer to the devices for removing the wooden tube from the cylinder G, referring more particularly to Figs. 2 and 8.

S is a stripping collar or band upon the cylinder G adapted to be moved thereon and normally located adjacent to the journal g.

S′ is a rack bar carrying the collar or band S and engaging the teeth of a pinion S^2 upon a vertical shaft s journaled in a bearing s' carried by the frame D.

S^3 is a pinion upon the upper portion of the shaft s.

T is a notched slide block guided by the horizontal guide rod t on the frame A. This slide block is adapted to engage a tooth of the pinion S^3 and hold it normally against rotation.

T′ is a rack bar carried by arms t', t' at the outer end of the machine in line with the guide rod t, with which the teeth of the pinion S^3 come into engagement when the reciprocation of the slide D has carried the pinion S^3 to the rear of the machine. The block T slides upon the guide rod t when the pinion S^3 reciprocates and thus locks the pinion against accidental rotation until the rack bar T′ is reached, when the further movement of the block T is arrested and the pinion S^3 moves on in engagement with the teeth of the rack bar T′ and is rotated. This rotation of the pinion S^3 rotates the shaft s and pinion S^2 and feeds the rack bar S′ forward so as to move the collar or band S on the cylinder G and thereby push off the finished tube. When the frame D is reciprocated back, the pinion S^3 is rotated in the opposite direction and thus draws back the collar or band S. When the pinion S^3 reaches the end of the rack bar T′ on its backward reciprocation, the notched

block T engages again with its teeth and locks it against further rotation, moving back with the pinion upon the guide t until it reaches again its first position.

To hold the block T at the end of the rack bar T′ when the pinion S^3 leaves the block and passes upon the rack bar, I prefer to employ a spring catch t^2 at the forward end ef the rack bar adapted to snap into a notch of the block T and thus hold it, though not with sufficient tension to prevent the block being readily moved forward again when it engages the teeth of the pinion.

Having described the construction of my machine, and the arrangement of the parts thereof, I shall now describe the operation of the machine as an entirety in the formation of wooden tubes.

The wooden block O carried by the frame P has its upper surface slightly above the line of movement of the cutter F, which is in a position in front of the block, or to the right in Figs. 1, 2 and 3. The glue supplying roller is now in a position at about the middle of the surface of the block O and the plunger G^3 is withdrawn, or in its extreme outward position, so as to release the ring G^2 and permit the jaw section G′ of the cylinder G to be forced open by the spring g^4. The edge of the jaw G′ is normally located immediately above the edge of the knife or cutter F as shown in Fig. 3, and the gear wheel H by which the cylinder G is rotated is engaged with the movable end section I^2 of the track I as is shown in Fig. 4. When the frame D is moved forward by the pitman G^2, the cutter F is brought in contact with the block O and commences to cut a thin shaving from the surface thereof, and the edge of this shaving passes under the jaw G′ of the cylinder G, which has moved forward simultaneously with the movement of the cutter F. At this moment the lever J of the plunger G^3 is rocked by the cam groove H′ and throws forward the plunger causing it to draw the link G^2 in and clamp the jaw G′ upon the edge of the shaving, and the gear wheel H passing upon the stationary portion of the rack I rotates the roller G as the frame D continues to move toward the left, and wraps the shaving in the form of a tube upon the surface of the roller. While the knife F and the cylinder G are thus moving forward cutting the shaving and rolling it up as fast as it is cut, the glue supplying roller L′ is moved over the half of the block O and being rotated by the friction of the cord l^3, spreads the glue over one half of the surface of the wood as indicated by the heavy black line in Figs. 11, and 12, so that when the shaving is rolled upon itself on the cylinder G the inner glued surface is brought in contact with the outer unglued surface and the adjacent surfaces are thus glued together. As the glue is spread only on one half of the surface of the block, that portion of the rolled shaving which comes immediately adjacent to the surface of the cylinder G and constitutes the inside of the finished tube is not touched by the glue. While the shaving is thus rolled upon the tube forming cylinder the pressure roller K, through the cam K′ and arm J^5 is pressed upon the rolled shaving so as to press the adjacent surfaces together. When the entire shaving has thus been wound upon the roller G, further rotation of the roller is arrested by the gear wheel H passing from the stationary portion of the rack I to the movable end section I′ thereof, which, as has been heretofore stated, slides with the gear wheel H; at the same time the lever J is rocked by the cam groove H′ so as to draw back the plunger G^3 and open the jaw G′, and when the pinion S^3 reaches the rack bar T′, the collar S is pushed forward, as has been heretofore described, pushing the glued tube from the cylinder G. Previous to the commencement of this last operation, the arm J^5 has passed from the cam K′ so as to raise the pressure roller K and permit the tube to be easily pushed off. The frame D and the parts carried by it return to their former positions when the pitman C^2 moves back. During the backward reciprocation, the glue feeding roller is held against rotation by the ratchet and pawl m^4, m^5 as has been heretofore described. Meanwhile the block has been fed up in the manner described so as to bring its surface into operative position to be again acted upon by the cutter F, when it is again moved forward.

In Fig. 17 is shown the finished glued tube U. This tube may be made exactly of the desired length for the purpose required, or it may be made of greater length and subsequently cut. The ends of the tube may be provided with caps $u\,u$, to make tops and bottoms for a tubular box as is shown in Fig. 18.

While I prefer the minor details of construction shown, it is apparent that they may be modified in many ways without departing from the invention.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a machine for forming wooden tubes, the combination with a support for a solid block of wood, of a reciprocating cutter to cut a shaving from the block and a rotary forming cylinder arranged to automatically receive the cut shaving from the cutter and form it into the tube.

2. In a machine for forming wooden tubes, the combination of feeding devices for feeding a block of wood, a cutter to cut a shaving therefrom, mechanism for rolling said cut shaving into a tube arranged to automatically receive the cut shaving from the cutter and power devices to operate said feeding, cutting and rolling devices synchronously.

3. In a machine for forming wooden tubes, the combination of feeding devices for feeding a block of wood, a cutter to cut a shaving therefrom, mechanism for rolling said cut shaving into a tube, arranged to automatically

receive the cut shaving from the cutter, and a stripper to remove the formed tube from the tube forming mechanism.

4. In a machine for forming wooden tubes, the combination of feeding devices for feeding a block of wood, a cutter to cut a shaving therefrom, mechanism for rolling said cut shaving into a tube, arranged to automatically receive the cut shaving from the cutter and devices for fastening the lapped portions of the rolled shaving.

5. In a machine for forming wooden tubes, the combination of a support for a solid block of wood, means to supply glue to the surface of the block, a cutter to cut a shaving from the block of wood and a rotary forming cylinder arranged to automatically receive the cut shaving from the cutter and to form it into a tube.

6. In a machine for forming wooden tubes, the combination of a support for a solid block of wood, a reciprocating cutter to cut a shaving therefrom, and a reciprocating tube forming cylinder intermittently rotated to roll the cut shaving into a tube.

7. In a machine for forming wooden tubes, the combination of a reciprocating and rotary tube forming cylinder having a gripping jaw, and a reciprocating cutter to cut a shaving from a block of wood.

8. In a machine for forming wooden tubes, the combination of a reciprocating and rotary tube forming cylinder having a gripping jaw, means to clamp the gripping jaw intermittently and a cutter to cut a shaving from a block of wood.

9. In a machine for forming wooden tubes, the combination with the sliding frame D of a cutter for cutting a shaving from a block of wood, and a rotary forming cylinder, each carried by the sliding frame.

10. In a machine for forming wooden tubes, the combination with the slide D, of a rotary tube forming cylinder carried thereby, of the adjustable frame E carried by the slide D, and the cutter F carried by the frame E.

11. In a machine for forming wooden tubes, the combination of a support for a block of wood, a cutter for cutting a shaving therefrom, devices to form said cut shaving into a tube, and a reciprocating and rotary glue supplying roller to supply glue to the surface of the wooden block.

12. In a machine for forming wooden tubes, the combination of a support for a block of wood, a cutter for cutting a shaving therefrom, devices to form said cut shaving into a tube, a reciprocating glue pot, and intermediate glue supplying devices reciprocating with the glue pot for supplying glue to the surface of the wooden block.

13. In a machine for forming wooden tubes, the combination of a support for a block of wood, a cutter for cutting a shaving therefrom, devices to form said cut shaving into a tube, a reciprocating glue pot, having a heating chamber, and intermediate glue supplying devices reciprocating with the glue pot for supplying glue to the surface of the wooden block.

14. In a machine for forming wooden tubes, the combination of a support for a block of wood, a cutter to cut a shaving therefrom, devices to form the cut shaving into a tube, a reciprocating glue supplying roller to supply glue to the surface of the block, and a friction band for rotating said roller when it is reciprocated.

15. In a machine for forming wooden tubes, the combination of a support for a block of wood, a cutter to cut a shaving therefrom, devices to form the cut shaving into a tube, a reciprocating glue supplying roller to supply glue to the surface of the block, a friction band for rotating said roller when it is reciprocated in one direction, and a ratchet and pawl device to prevent rotation in the opposite direction.

16. In a machine for forming wooden tubes, the combination with a cutter and a forming cylinder, of power devices for reciprocating said cutter and cylinder, a support for a block of wood, feeding devices for feeding said block of wood intermittently, and connections between the feeding devices for the block of wood and the power devices for reciprocating the cutter and forming cylinder whereby said mechanisms are operated synchronously.

17. In a machine for forming wooden tubes, the combination with a reciprocating cutter and devices for forming a shaving into a tube operating synchronously with the cutter and arranged to receive the cut shaving from the cutter and form it into the tube, of a support for a block of wood, a feeding screw for feeding said support, and power devices to operate said feeding screw intermittently.

18. In a machine for forming wooden tubes, the combination of a rolling tube forming cylinder, a pressure roller adjacent to said tube forming cylinder, and cam operated devices for moving said pressure roller to and from the tube forming cylinder.

19. In a machine for forming wooden tubes, the combination of a rolling tube forming cylinder, the rock shaft J^3, arms J^4, J^5 carried thereby, the pressure roller K carried by the arm J^4 and located adjacent to the tube forming cylinder and the cam K′ for operating the arm J^5.

20. In a machine for forming wooden tubes, the combination with a cutter for cutting a shaving and a rotary and reciprocating forming cylinder for forming the shaving into a tube, of a stripper carried by the forming cylinder, and means to reciprocate said stripper intermittently upon the forming cylinder.

21. The combination with the rotary and reciprocating tube forming cylinder G, of the stripper S and its rack bar S′, pinion S^2 engaging the rack bar S′ and carried with the reciprocating cylinder G and rack bar T′ arranged in the path of the pinion S^2.

22. The combination with the rotary and

reciprocating tube forming cylinder G, of the stripper S and its rack bar S′, pinion S^2, locking slide block T, guide rod *t*, and rack bar T′.

23. The combination with the rolling tube forming cylinder G having the gripping jaw G′, of the gear wheel H carried by the cylinder and the rack I, having the movable sections I′, I^2.

24. In a machine for making wooden tubes, the combination with a cutter to cut a shaving from a solid block of wood, of a rotary cylinder to roll the cut shaving into a tube operating synchronously with said cutter and arranged to automatically receive the cut shaving from the cutter and cutters to cut the tube into appropriate lengths.

In testimony of which invention I have hereunto set my hand.

MARTIN E. BRIGHAM.

Witnesses:

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S. T. YERKES.