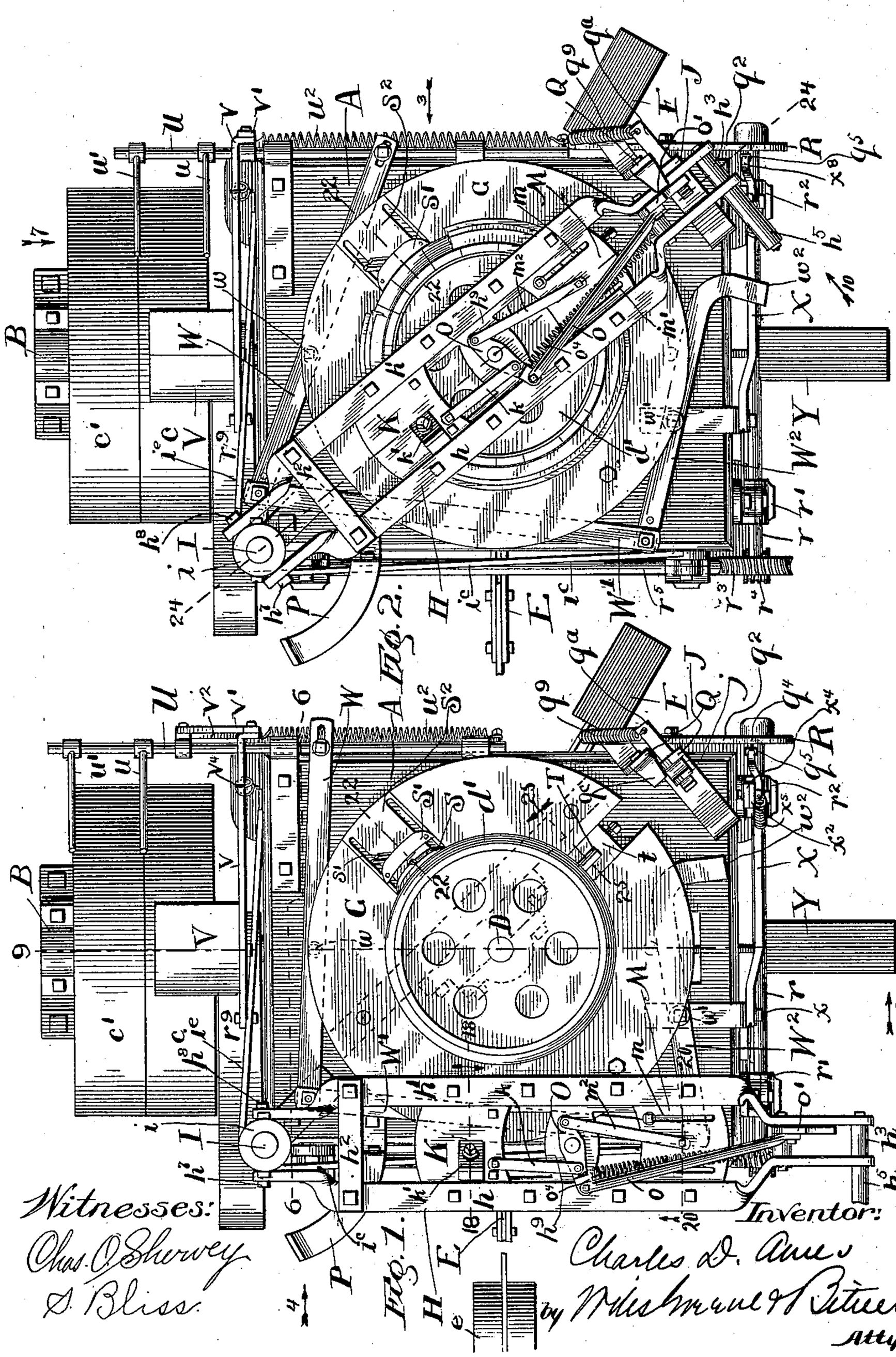
No. 654,822. Patented July 31, 1900.

C. D. AMES.

TUB MAKING MACHINERY.

(Application filed July 31, 1899.)

(No Model.) 9 Sheets—Sheet 1.



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No. 654,822. Patented July 31, 1900.

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TUB MAKING MACHINERY.

(Application filed July 31, 1899.)

(No Model.) 9 Sheets—Sheet 2.

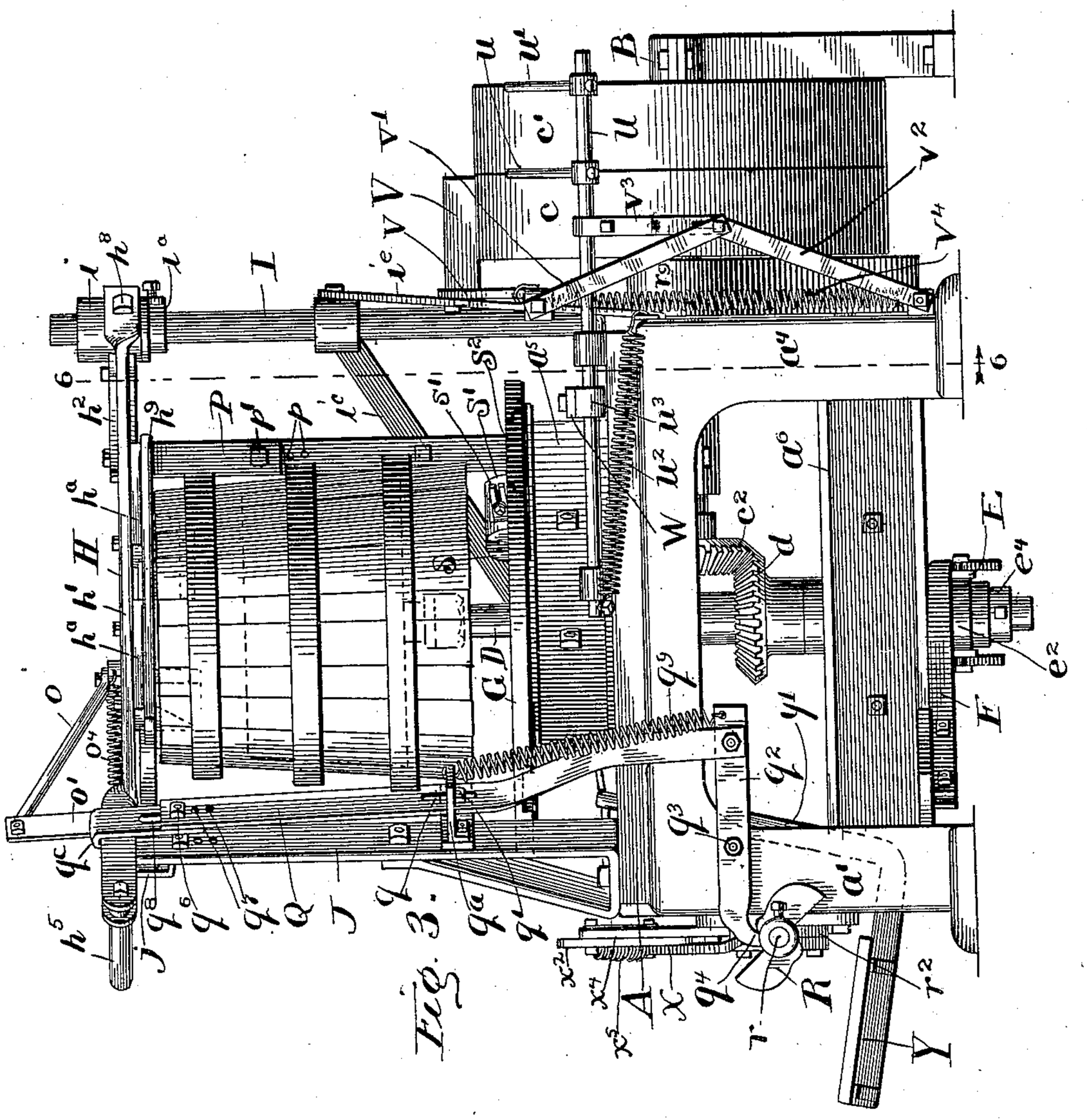

Fig. 3.

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No. 654,822. Patented July 31, 1900.

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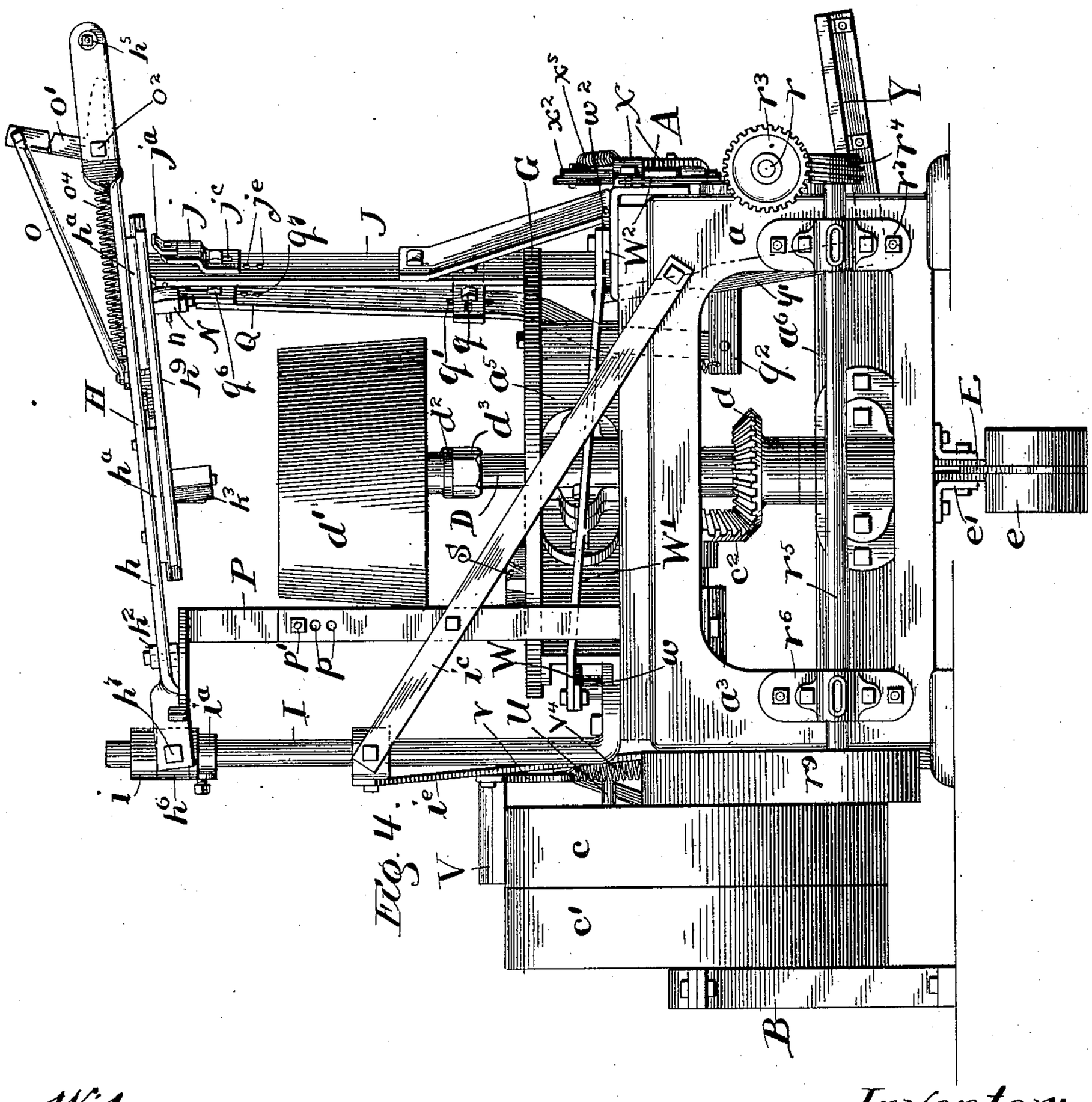
TUB MAKING MACHINERY.

(Application filed July 31, 1899.)

(No Model.) 9 Sheets—Sheet 3.



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No. 654,822.

Patented July 31, 1900.

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TUB MAKING MACHINERY.

(Application filed July 31, 1899.)

(No Model.)

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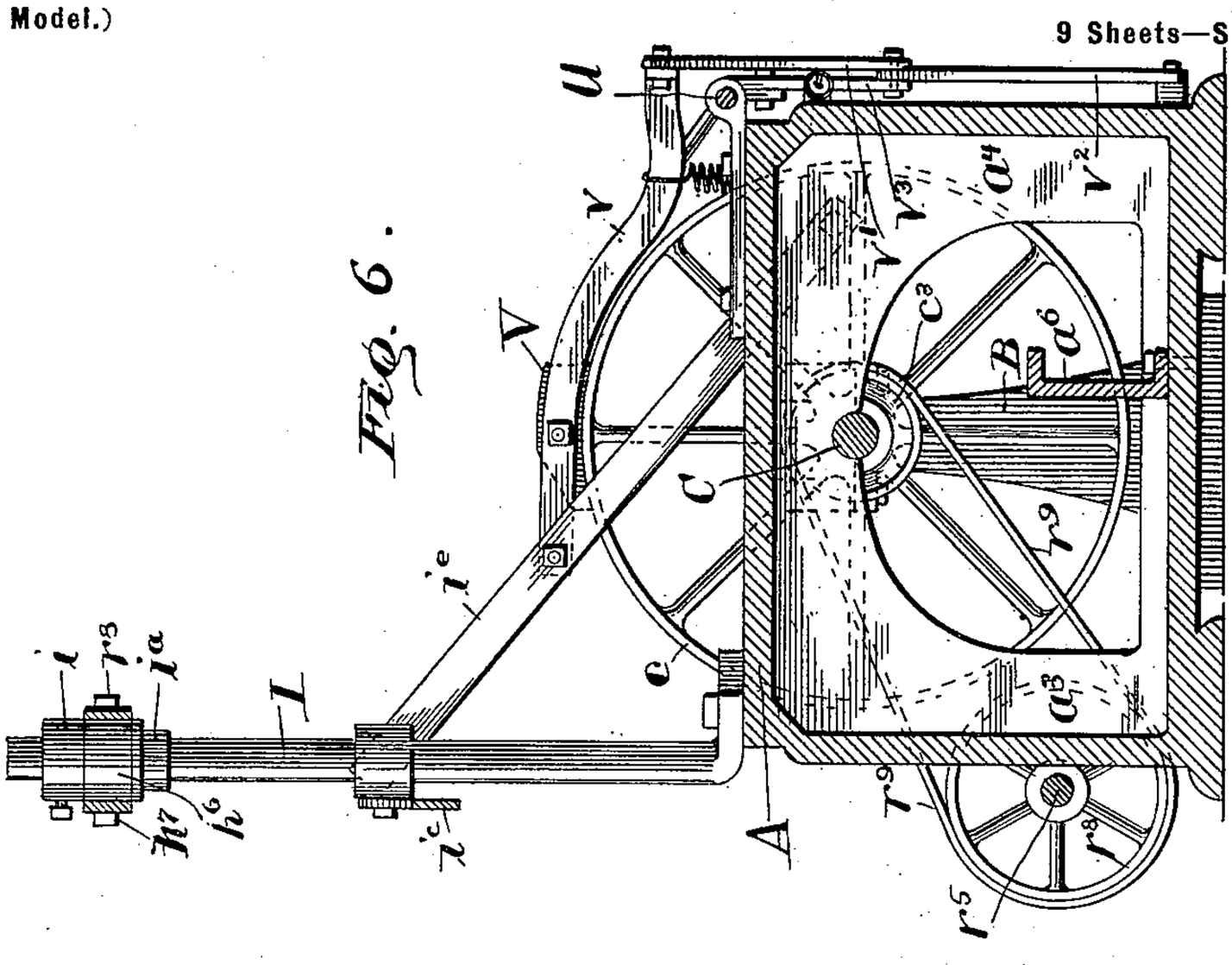

Fig. 6.

Fig. 5.

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No. 654,822. Patented July 31, 1900.

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TUB MAKING MACHINERY.

(Application filed July 31, 1899.)

(No Model.) 9 Sheets—Sheet 5.

Fig. 8.

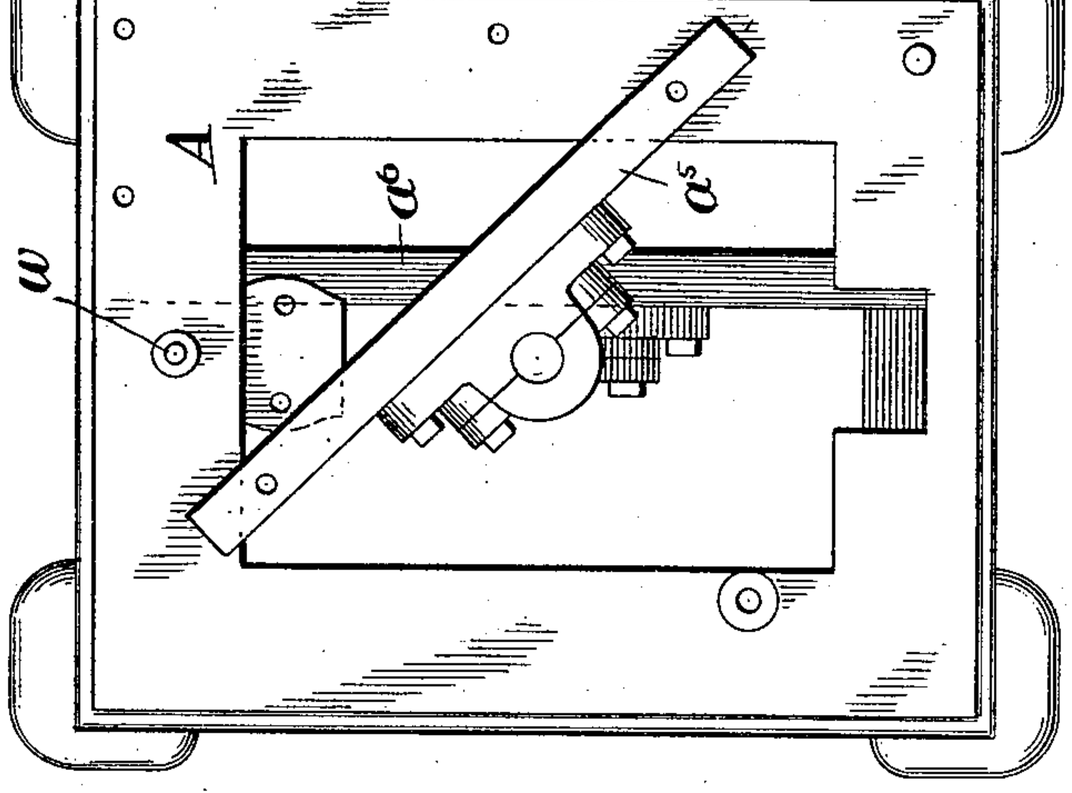
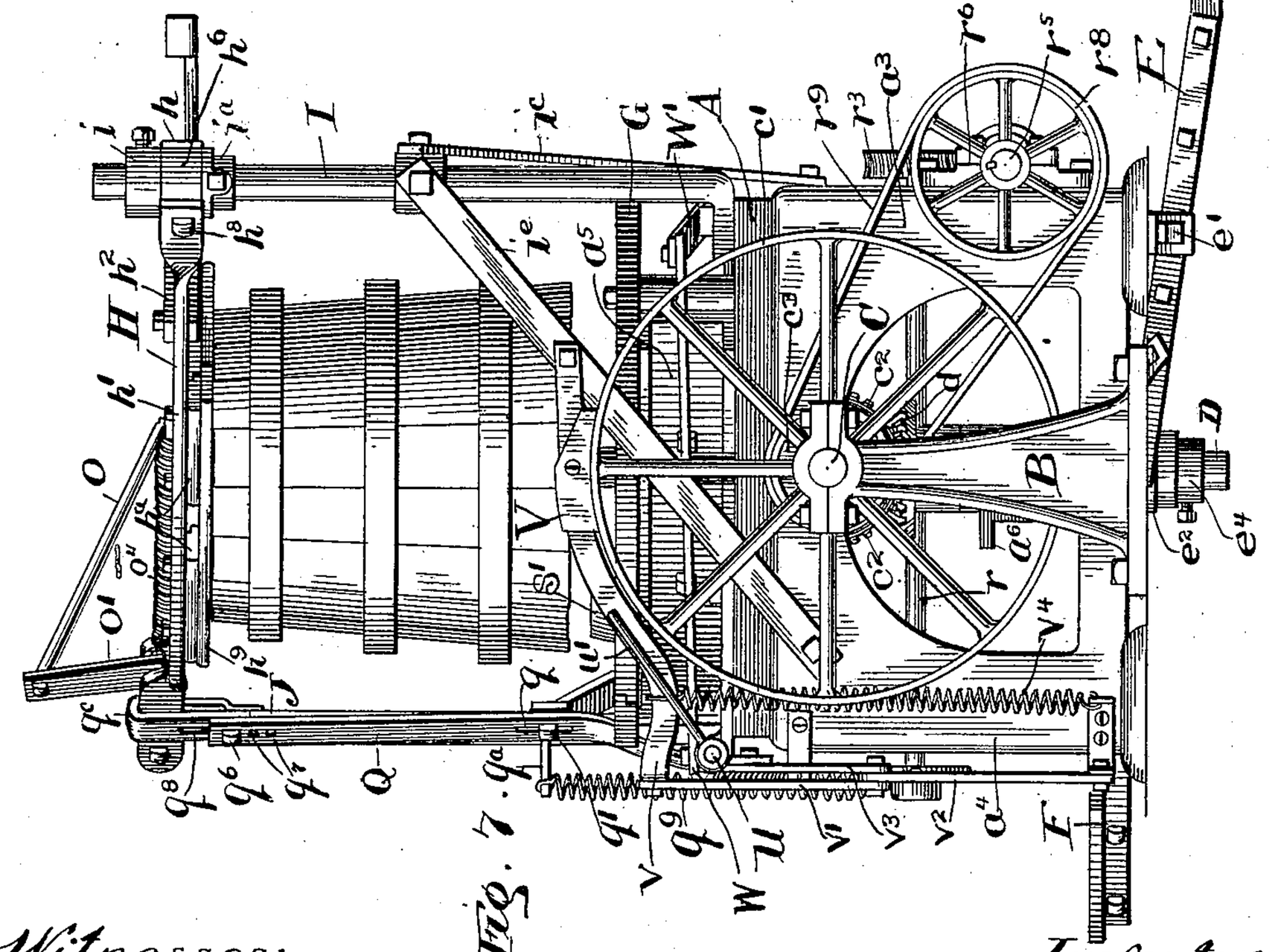


Fig. 7.



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No. 654,822. Patented July 31, 1900.

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TUB MAKING MACHINERY.

(Application filed July 31, 1899.)

(No Model.) 9 Sheets—Sheet 6.

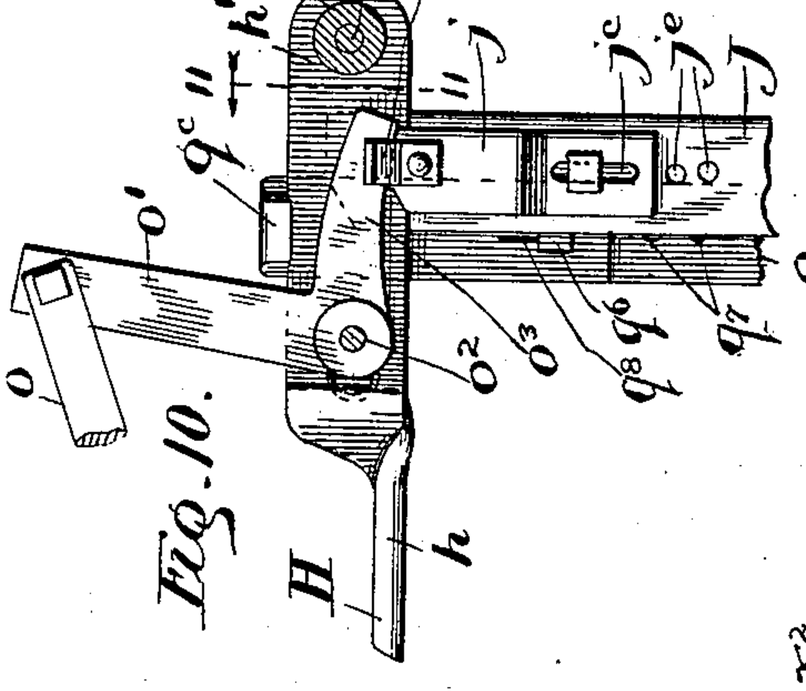

Fig. 10.

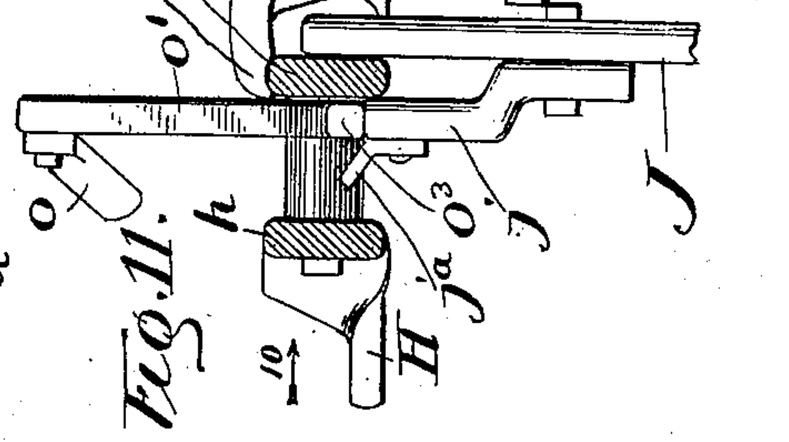

Fig. 11.

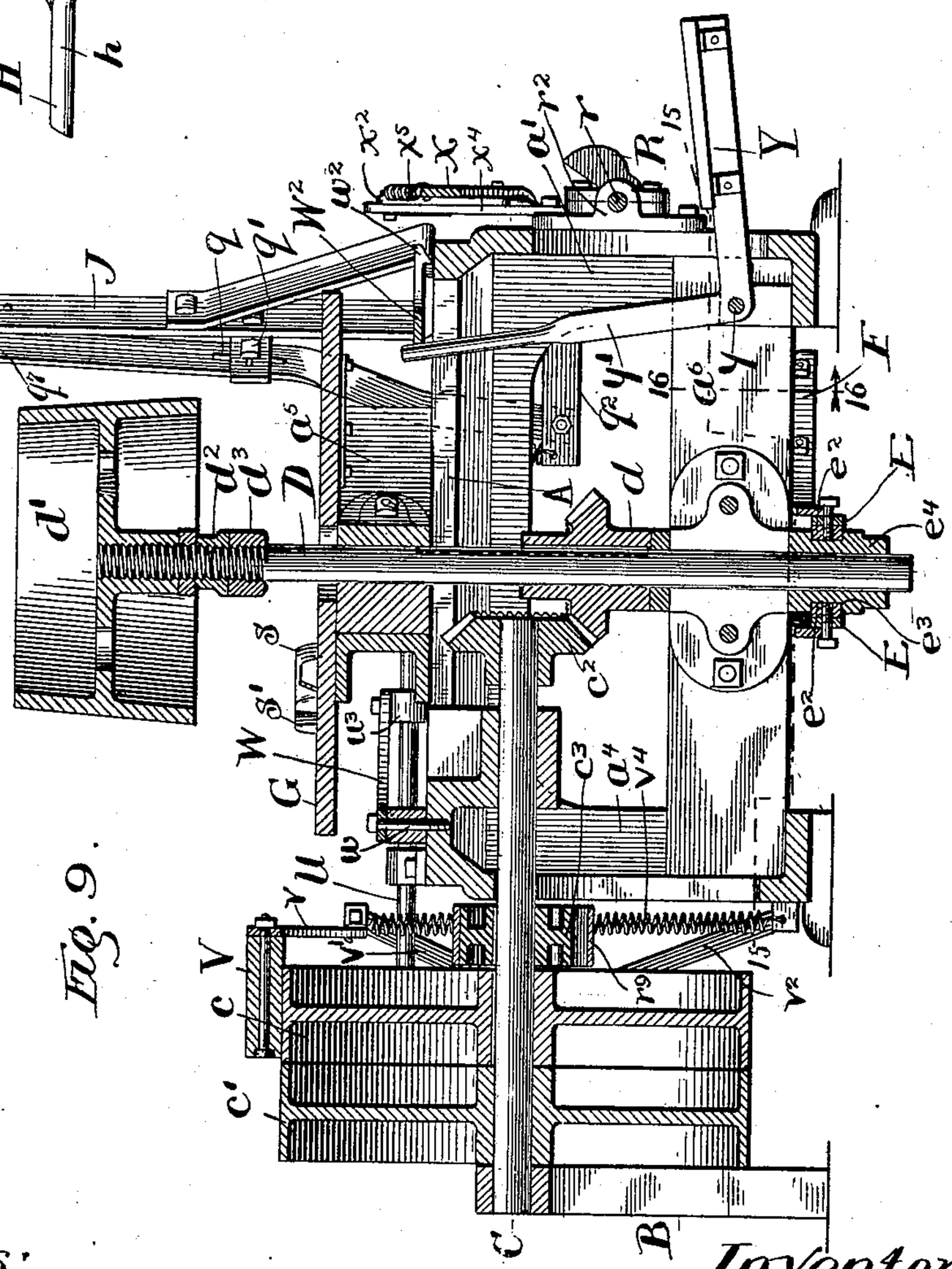

Fig. 9.

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No. 654,822. Patented July 31, 1900.

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TUB MAKING MACHINERY.

(Application filed July 31, 1899.)

(No Model.) 9 Sheets—Sheet 7.

Fig. 15.

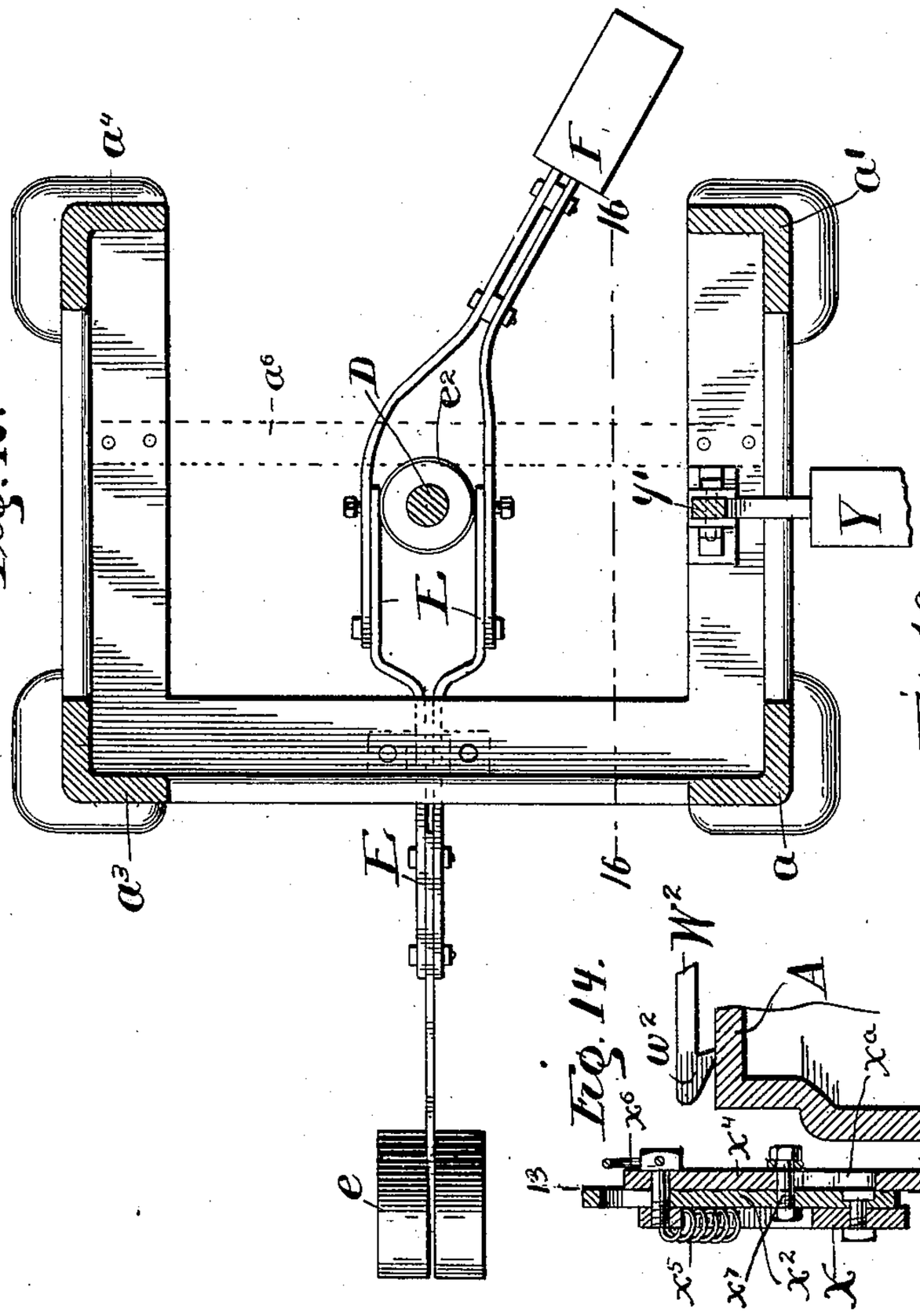


Fig. 16.

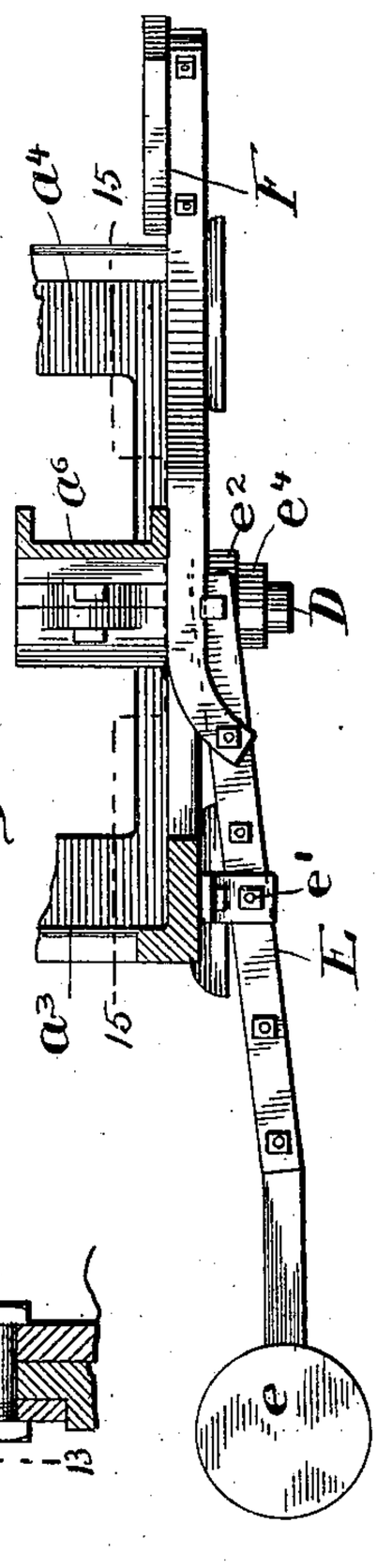


Fig. 14.

Fig. 12.

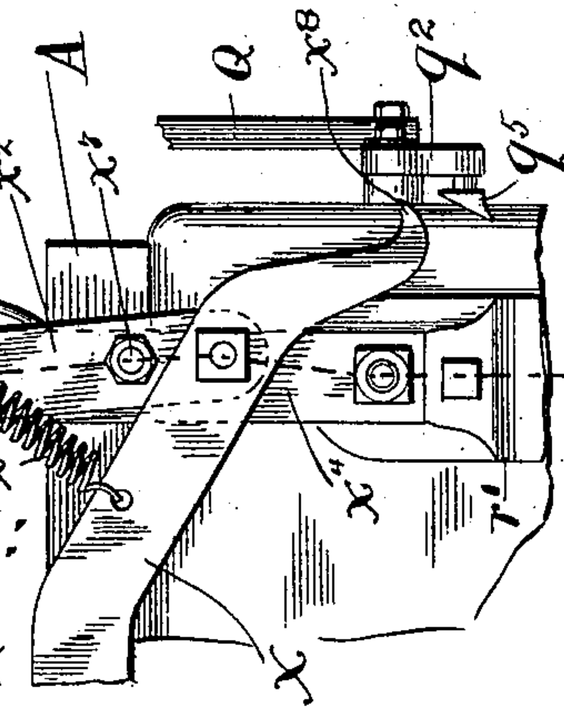
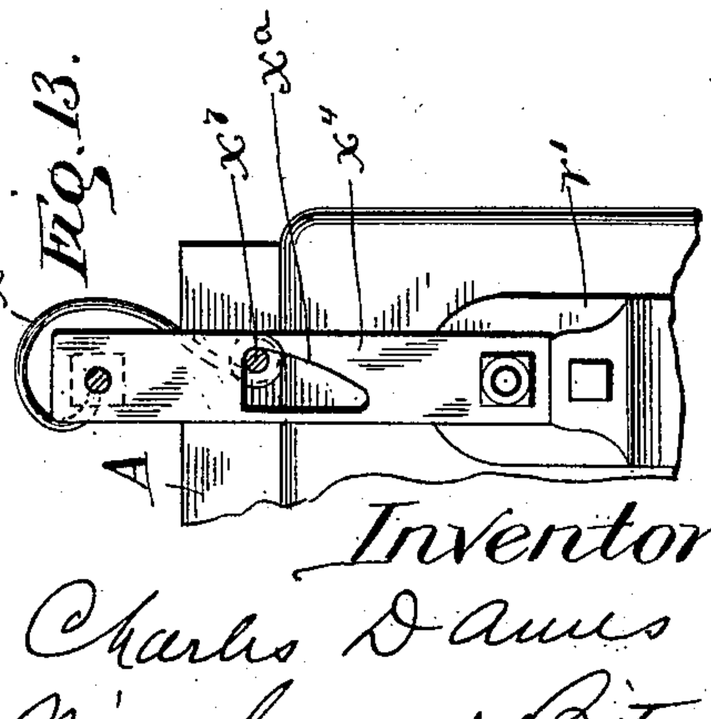


Fig. 13.



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TUB MAKING MACHINERY.

(Application filed July 31, 1899.)

(No Model.) 9 Sheets—Sheet 8.

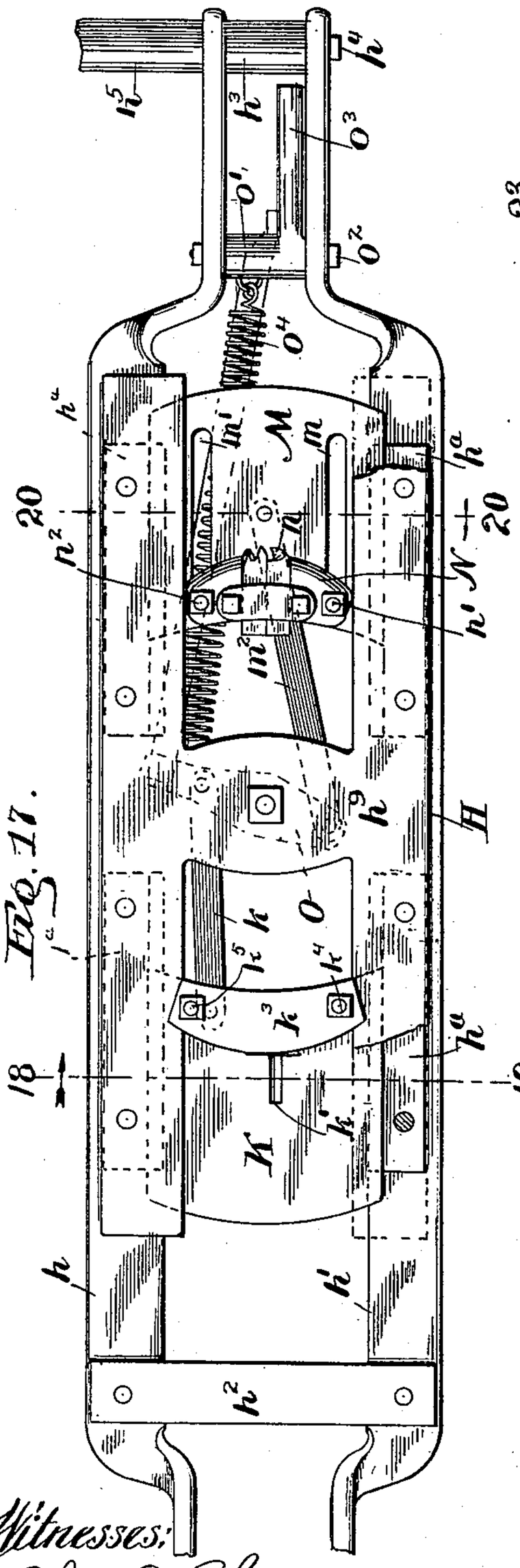

Fig. 17.

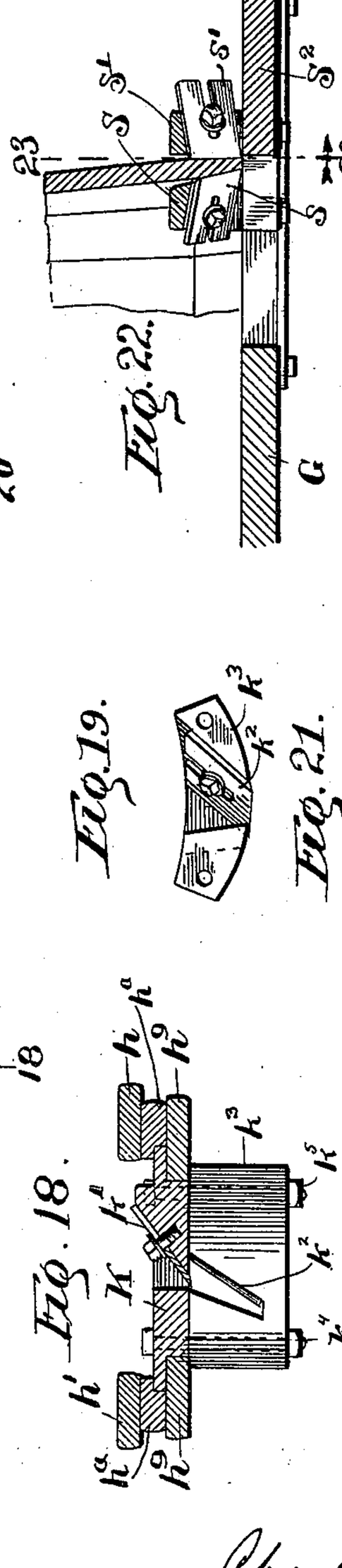

Fig. 22.

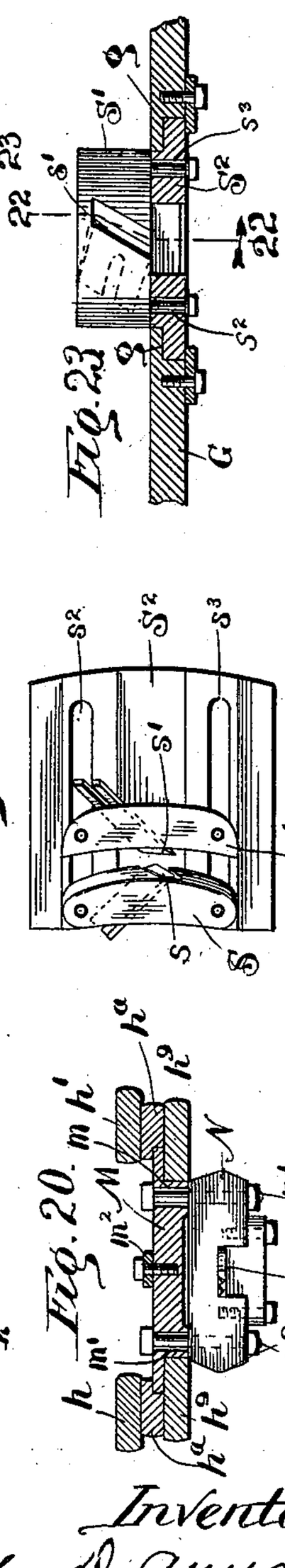

Fig. 23.

Fig. 19.

Fig. 21.

Fig. 18.

Fig. 20.

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TUB MAKING MACHINERY.

(Application filed July 31, 1899.)

(No Model.) 9 Sheets—Sheet 9.

Fig. 24.

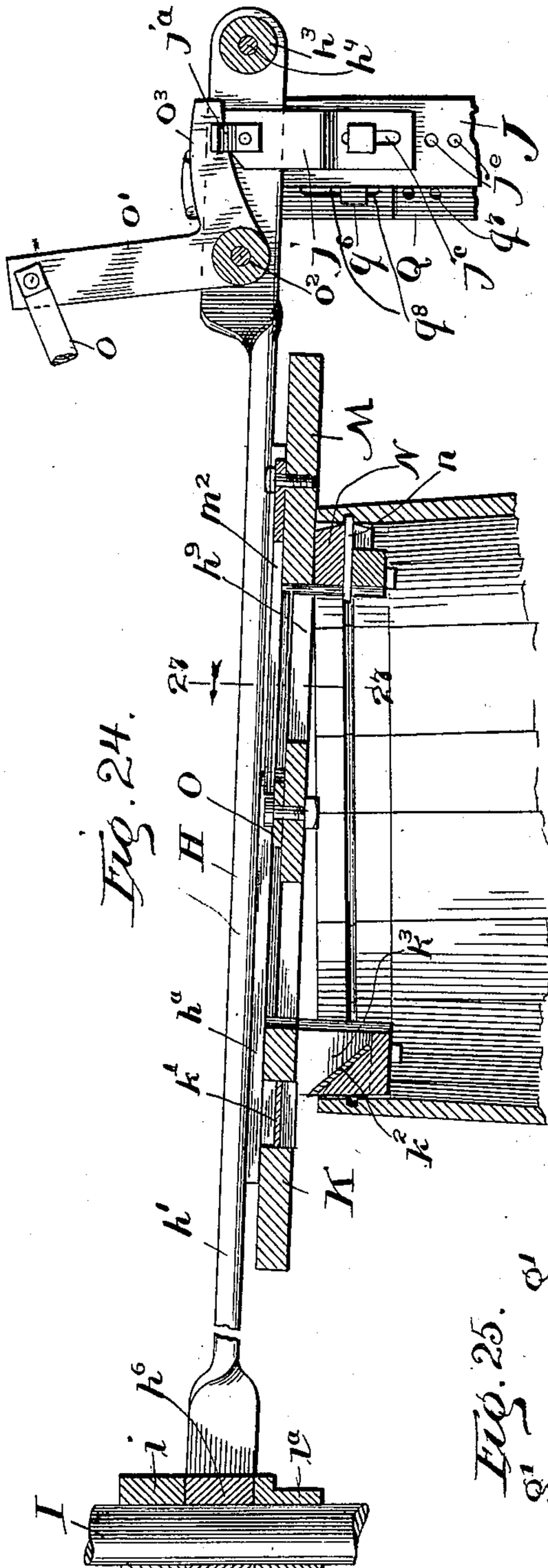


Fig. 28.

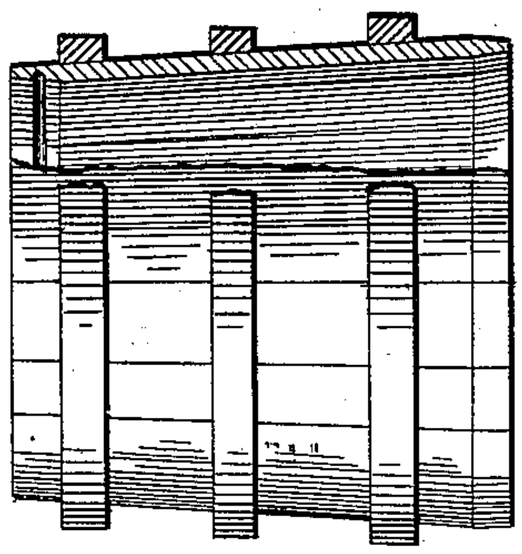


Fig. 27.

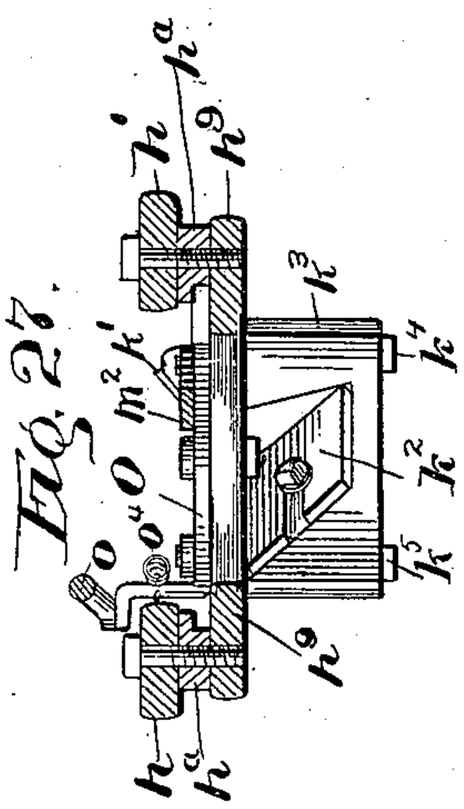


Fig. 25.

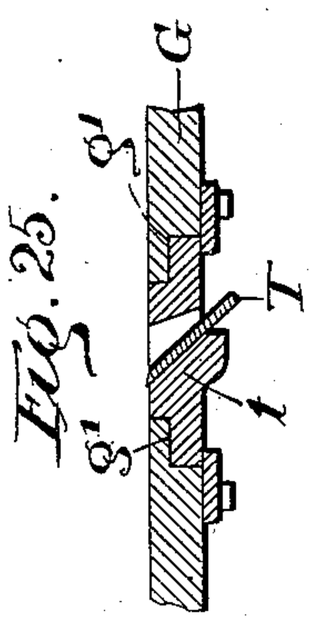
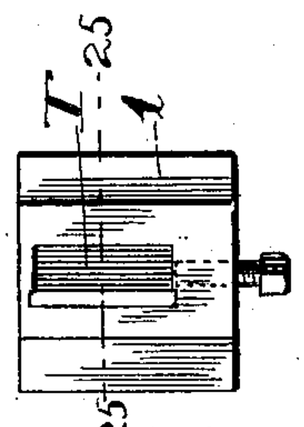


Fig. 26.



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UNITED STATES PATENT OFFICE.

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TUB-MAKING MACHINERY.

SPECIFICATION forming part of Letters Patent No. 654,822, dated July 31, 1900.

Application filed July 31, 1899. Serial No. 725,577. (No model.)

To all whom it may concern:

Be it known that I, CHARLES D. AMES, a citizen of the United States of America, residing at Portland, in the county of Jay and State of Indiana, have invented certain new and useful Improvements in Tub-Making Machinery, of which the following is a specification.

My invention relates to certain improvements in tub-making machinery of the class designed to trim up the ends of the staves after the same have been placed in the truss-hoops, which is called "leveling," prepare the inside of the smaller end of the tub for the croze, which is called "howeling," cut the groove around the inside of the smaller end of the tub, which is called "crozing," and trim up the inner and outer sides of the larger end, which I will call "beveling." The purpose of my invention is to combine in one machine mechanism for performing these operations upon the tub in the most convenient position, the devices composing said mechanism being arranged to work automatically and so timed as to operate to the best advantage.

To such end the invention consists in certain novel characteristics because of which the tub may be handled to the best advantage in putting it in the machine and taking it out of the same, and all of the various operations may be accomplished without effort or attention on the part of the operator except such as is involved in placing the tub in position, starting the machine, and removing the tub therefrom. The preferred mechanism by means of which this is accomplished will be described in this specification and the essential features thereof pointed out in the claims.

The description in the specification will be specific as to the devices illustrated in order to make the same as clear as possible, but it it is not intended to limit the invention to said preferred form or to any particular devices or combinations thereof specifically set forth in said description.

Figure 1 is a plan view of the complete machine with the tool-carrying arm swung out of operative position and resting upon its supporting-standard. Fig. 2 is a plan view of the complete machine with the tool-carrying arm swung into position, a tub being shown upon the chuck. Fig. 3 is a side elevation looking in the direction of the arrow 3 in Fig. 2. Fig. 4 is a side elevation from the opposite side of the machine and showing the tool-carrying arm at rest, the direction of the view being indicated by the arrow 4 in Fig. 1. Fig. 5 is a front elevation of the machine with the tool-carrying arm in the position shown in Fig. 2. Fig. 6 is a vertical cross-section in line 6 6 of Figs. 1 and 3. Fig. 7 is a rear elevation of the complete machine, the direction of the view being indicated by the arrow 7 in Fig. 2. Fig. 8 is a plan view of the main frame and certain of the supporting members. Fig. 9 is a central longitudinal section in line 9 9 of Fig. 1 looking in the direction of the arrow 9. Fig. 10 is a detail side elevation of the end portions of the tool-carrying arm and a certain standard and arm adapted to engage the same, the view being in the direction of the arrows 10 in Figs. 2 and 11. Fig. 11 is a detail cross-section in line 11 11 of Fig. 10. Fig. 12 is a detail front elevation of a tripping mechanism adapted to stop the running of the machine at the end of the cycle of operations. Fig. 13 is a similar front elevation with certain portions cut away in the line 13 13 of Fig. 14. Fig. 14 is a vertical cross-section in line 14 14 of Fig. 12. Fig. 15 is a horizontal section in the line 15 15 of Figs. 9 and 16. Fig. 16 is a section in line 16 16 of Figs. 9 and 15. Fig. 17 is a detail under plan of the tool-carrying arm with certain portions broken away. Fig. 18 is a detail vertical cross-section in line 18 18 of Figs. 1 and 17, showing the leveling-tool and block in section and the howeling-tool and block in front elevation. Fig. 19 is a detail plan view of said howeling-tool and block. Fig. 20 is a detail cross-section in line 20 20 of Figs. 1 and 17, showing the crozing-block and tool in front elevation. Fig. 21 is a detail plan view of the beveling-tools and connecting parts which operate on the larger end of the tub. Fig. 22 is a detail vertical longitudinal section of said beveling-tools and adjacent parts, the line of section being indicated at 22 22 in Figs. 1, 2, and 23. Fig. 23 is a detail vertical cross-section in line 23 23 of Fig. 22. Fig. 24 is a detail vertical longitudinal section through the tool-carrying arm, the line of section being indicated at

line 24 24 in Fig. 2, the arm being shown in its lowest position—that is to say, just before the end of a cycle of operation. Fig. 25 is a detail vertical transverse section of the leveling-tool and adjacent parts adapted to engage the larger end of the tub, the line of section being indicated at 25 25 in Figs. 1 and 26. Fig. 26 is a detail plan of said tool and its carrying-block. Fig. 27 is a detail vertical transverse section in line 27 27 of Fig. 24; and Fig. 28 is a side elevation of a tub showing the same as it appears after it has been operated upon by the machine, a portion of the tub being broken to further illustrate the same.

Referring to the drawings, the particular machine here illustrated consists of a suitable framework, driving-gear supported therein, a rotating and vertically-reciprocating shaft bearing an internal chuck, devices for operating upon the two ends of the tub brought successively into operation by the vertical movement of said tub, and devices for causing said vertical movement and for stopping the rotary movement of the tub when the cycle of operation is complete.

The framework of the machine is made up of a table A, (see Figs. 1, 8, and 9,) supported upon legs a a' a^3 a^4, and the standard B at one side of the table, in which the outer end of the main driving-shaft is journaled. The driving-shaft is lettered C and is provided with tight and loose pulleys c c' outside of the frame. Within the frame it bears a miter-gear c^2, in mesh with a miter d upon a vertical shaft D and journaled in two cross-pieces a^5 a^6, secured to the frame above and below the table, respectively. The miter-gear d is feathered to the vertical shaft and is confined vertically between the miter and the lower bearing. The shaft D is vertically movable in its bearings, said movement being controlled by a weighted lever E, bearing a weight e at its free end and pivoted to the frame and to the vertical shaft. The pivot to the frame is at e', and the opposite end of the weighted lever is pivoted to the shaft by means of a sleeve e^2, (see Figs. 9 and 15,) running in a groove e^3 in a collar e^4, fastened upon the lower end of the vertical shaft. The tendency of the weight is to hold the shaft in its highest position, the lowering of the shaft, which occurs during the operation of the machine, being resisted at all times by the gravity of the weight. A foot-lever F is secured to the inner end of the weighted lever, by the depression of which the operator may overcome the weight and lower the vertical shaft.

Upon the top of the vertical shaft is fixed an inside chuck d', (see Figs. 1, 4, 5, and 9,) which holds the trussed tub while the same is in the machine. This chuck is screwed upon the top of the shaft and is vertically adjustable thereon. Two jam-nuts d^2 d^3 are shown upon the threaded portion of the shaft beneath the chuck to prevent the rotation of the latter upon the shaft.

The cutting or trimming of the tub is effected by rotating the latter in contact with relatively-stationary knives, those for operating upon the larger end, which is the lower end when in the machine, being located upon a stationary disk G, secured in position upon the cross-piece a^5 of the frame. The knives for operating upon the smaller end of the tub, which is at the top of the machine, are located upon a vertically-moving arm H, supported upon standards at diagonally-opposite corners of the bed, so as to be capable of horizontal oscillation upon one of the standards to throw it into or out of operative position and to be vertically-movable upon the other standard to effect the successive operations upon the tub by causing a vertical movement of the latter. The standard I is preferably a round post secured to the frame and braced by the diagonal bars i^c i^e. The rear end of the arm H is pivoted to it between vertically-adjustable collars i i^a. The vertical adjustment of the arm is to adapt it to different lengths of tubs. The standard J is preferably a flat bar secured to the frame and suitably braced therefrom. It is provided at the top with a vertically-adjustable side bracket j, (see Figs. 10, 11, and 24,) bearing a guide j^a, the top of which extends obliquely upward and away from the arm to bring certain devices upon the tool-carrying arm upon the upper end of the bracket j. Said bracket j is secured to the standard J by means of a bolt passing through the slot j^c in the bracket and one of a series of holes j^e in the standard, the slot providing for a close adjustment and the series of holes for an adjustment of greater extent. The frame of the tool-carrying arm H is shown as composed of two side bars h h', (see Figs. 17 and 24,) secured together at the pivoted end by means of a cross-piece h^2 and at the opposite end by means of a strut h^3 and bolt h^4, the bolt also extending through a handle h^5 in line with the strut, by means of which the arm may be conveniently manipulated. The pivoted end of the arm is secured to the standard by means of a collar h^6, held between the collars i i^a, before referred to, the arm being pivoted to said collar h^6 by means of horizontal screws h^7 h^8, (see also Figs. 3 and 4,) giving to said arm both a vertical and a horizontal pivotal motion upon the standard.

Upon the under side of the side bars of the arm is an H-shaped plate h^9, secured to the side bars and spaced apart therefrom by means of interposed bars h^a, rabbeted to form ways for tool-carrying slide-plates K M. The plate K is provided with a leveling-tool k' and a howeling-tool k^2, the latter being supported in a block k^3, fastened to the plate by means of bolts k^4 k^5. The plate M contains two grooves m m', and a block N, bearing a crozing-tool n, is bolted to the plate M by means of bolts n' n^2 passing through the slots. The slide-plates K M are connected by means of links k m^2 (see Figs. 1 and 2) to a lever O, pivoted between its ends to the plate H, the two links being pivoted to the

lever on opposite sides of its pivot and the lever also being pivoted at one end to a link *o*, extending to an angle-lever *o'*, pivoted between the side bars of the arm H at o^2 and extending beyond the pivot in an approximately-horizontal arm o^3, (see Fig. 10,) adapted to rest upon the bracket *j*, above referred to. The oscillation of the angle-lever upon its pivot moves the slide-plates toward or from each other, and a spring o^4, connected to the hub of the angle-lever and to the lever O, tends to draw the two plates toward each other and to withdraw the howeling and crozing-tools carried thereby from the tub. Both of these tools work upon the inside of the tub and are advanced into or withdrawn from the same by the oscillation of the angle-lever *o'*. It should be noticed that the links $k\ m^2$ are not parallel and that as the lever O swings upon its pivot to advance the tools to their work the link *k* approaches a position in line with the pivot of the lever O before the link m^2, the result of which is that during the latter part of the operation of the crozing-tool the advance of the howeling-tool has been substantially checked.

When the tool-carrying arm H is in its working position, it rests upon the lower edge of the tub. To support it when swung out of such position, a rest P (see Figs. 1, 2, 3, 4, and 5) is provided, supported from the frame and from the brace i^c and made in two parts, bolted together by means of a series of holes *p* and a bolt *p'* to give it vertical adjustability. Fig. 1 shows the tool-carrying arm upon the rest, which leaves the chuck free for the putting on or taking off of a tub, and Fig. 2 shows the arm in working position, its weight sustained upon the tub and its free end held against horizontal movement between the standard J and the bracket *j*.

The drawing down of the tool-carrying arm is effected by a vertically-reciprocating rod Q, (see Fig. 3,) guided between its ends by means of a slot *q* and a bolt *q'* in said slot secured to the standard J, the lower end of the rod being pivoted to a lever q^2, pivoted to the frame at q^3 and bearing at its opposite end a nose q^4 and a catch q^5. (See also Figs. 1 and 5.) The rod Q is made up of two parts longitudinally adjustable one upon the other by means of a bolt q^6, a series of holes q^7 in one part and a slot q^8 in the other. The rod is held yieldingly in its upper position by a spring q^9, secured to the lever q^2 and to a bracket q^a upon the standard J. The lever q^2 is oscillated in the opposite direction by means of a double cam R upon a shaft *r*, journaled in boxes $r'\ r^2$, (see Fig. 5,) secured to the frame and bearing upon the opposite side of the frame a worm-gear r^3, rotated by a worm r^4 upon a shaft r^5, (see also Figs. 4, 6, and 7,) journaled in boxes $r^6\ r^7$ and carrying at its opposite end a pulley r^8, geared, by means of a belt r^9, to a pulley c^3 upon the driving-shaft C. The vertically-reciprocating rod Q is provided at the top with a laterally-extending end q^c, adapted to engage the top of the tool-carrying arm H, as seen in Fig. 11, and the operation of the cam R is to draw down the tool-carrying arm, holding the leveling-tool upon the lower end of the tub until its work is completed, then forcing the howeling-tool to its work, and then advancing the crozing-tool and at the same time bringing the larger end of the tub down upon the disk G, where it is operated upon by inside and outside beveling-tools and a leveling-tool supported upon said disk. These beveling-tools are carried by two blocks S S', (see Figs. 1, 21, 22, and 23,) the tools themselves being lettered *s s'*. The blocks are secured to a slide S^2, provided with slots $s^2\ s^3$, by means of bolts passing through the slots and clamping the blocks to the plate. The slide is guided in ways *g* in the disk G, the sliding motion of the plate being radial to the disk, so that the adjustment for different sizes of tubs may be easily made and at the same time the slide and tool may be permitted to move in the ways *g* to follow any irregularities in the tub. The lower leveling-tool T (see Figs. 1, 25, and 26) is supported in a slide *t*, guided in radial ways *g'* in the disk G and is radially adjustable in the same manner as the howeling-tools *s s'*. When the tub is finally brought down so that the lower leveling-tool trims it to exactly the right length, the operation of the machine is automatically stopped by means of the catch q^5. For this purpose the tight and loose pulleys *c c'* are provided with a belt-shifter consisting of two fingers *u u'*, (see Figs. 1 to 7, inclusive,) upon a sliding rod U, guided in the frame and crowded toward the position shown in Fig. 3 by a spring u^2. The pulley *c'* is the loose pulley. The stopping of the tight pulley *c* and the working parts of the machine is effected by means of a brake consisting of a shoe V, secured to a lever *v*, pivoted at one end to the brace i^e, (see Figs. 6 and 7,) and at the other end to a link *v'*, (see Fig. 3,) which together with a link v^2, pivoted to the other end of the link *v'* and at its lower end to the frame, form a toggle operated by a depending arm v^3, secured to the rod U. The shoe V is crowded toward the pulley *c* by a spring v^4 when the parts are in the position shown in Fig. 3. When, however, the rod U is crowded toward the left in said figure, the toggle raises the brake-shoe at the same time that the belt is shifted to the tight pulley.

A collar u^3 is secured to the rod U and has pivoted to it one end of a lever W, (see Figs. 1 and 2,) pivoted between its ends to the frame at *w* and at its opposite end to a link W', extending forward and pivoted at its opposite end to a lever W^2, pivoted between its ends to the frame at *w'* and having a forwardly-bent hooked end w^2, (see Fig. 9,) the depending hook of which extends beyond the front of the bed in one position to engage a vertically-oscillating lever X, (see Fig. 5,) slidingly pivoted to the frame at *x* by means

of a slot x', giving to the lever a longitudinal movement in addition to that of oscillation upon the pivot. Said lever X is pivoted near its opposite end to a vertically sliding and oscillating plate x^2, (see Figs. 12, 13, and 14,) pivoted by means of a slot x^3 to a bar x^4, secured to the frame. A spring x^5 tends to raise the lever X and a spring x^6 (see Fig. 13) tends to crowd it to the right in Figs. 5 and 12. The spring x^6 is secured at one end to the rear of the bar x^4 and at the other end to a bolt x^7, extending through a triangular hole x^a in the bar and fastened to the plate x^2. The lever X extends downward at its free end and is provided with an upturned point x^8, adapted to engage with the catch q^5. This upturned point tends to hook under the catch q^5 as the latter comes down and to slide off of the top of the same as the latter is raised. The pointed end of the lever is guided by means of the triangular hole x^a and the bolt x^7, as clearly seen in Fig. 13. As the lever is forced down by the catch its point is withdrawn from beneath the latter by the oblique side of the hole. As the catch raises, however, it simply slides the lever back as the bolt rides along the upper side of the hole until the point of the lever is cleared.

A foot-lever Y (see Figs. 4 and 9) is pivoted to the frame at y and has an upwardly-extending arm y' resting against the rear side of the lever W^2.

The operation of the machine is as follows: The tub, which has been set up in the ordinary truss-hoops, is inverted and placed upon the chuck d'. The swinging arm H is brought over the tub and crowded down upon the same and toward the right until the top of the arm is caught by the hooked upper end of the rod Q. The operator then presses his foot upon the foot-lever Y until the catch w^2 engages the lever X, which starts the machine and locks all of the parts in operative position. The catch q^5 upon the lever q^2 is moved up and down by the cam R once during the cycle of operation. In its upward movement it forces the lever X out of its way without disturbing the locked portions of the machine; but at the end of the cycle of operation it moves downward, striking the end of the lever and disconnecting the parts which have been locked by the depression of the lever Y. The leveling-knife upon the swinging arm first operates upon the smaller end of the tub to trim the same. The howeling-tool upon the arm bevels off the inside of said smaller end of the tub, as the arm is brought downward by the hooked rod Q, until said rod is lowered sufficiently to throw both the upper leveling and howeling tools out of operation, as is shown in Fig. 24, where the under surface of the arm adjacent to the crozing-tool has crowded the tub downward sufficiently to move it out of range of both the upper leveling and the upper howeling tool. The downward motion of the arm is continued sufficiently for the bell-crank lever o' to strike the bracket j, thereby throwing the crozing-tool outward to the extent necessary to cut the croze in the portion of the tub which has been operated upon by the upper howeling-tool. Said downward movement of the arm also crowds the tub down upon the disk G, subjecting the larger end to the operation of the lower beveling-tools, both inside and out, and also to the leveling-tool upon said disk. The operation of the lower leveling-tool is completed at the instant the highest part of the cam R passes from beneath the nose of the lever q^2. The spring q^9 snaps the nose of the lever downward, engaging the hooked end of the lever X, and lowers said lever sufficiently to release the hook w^2, which locks the driving-gear in operative position. The releasing of the hook permits the spring u^2 to shift the driving-belt, and the shifting of the same releases the brake-shoe, which is brought down on the driving-pulley by the spring v^4. This stops the driving-gear and completes the cycle of operations necessary to finish one tub. The raising of the hooked rod Q by the lever q^2 permits the spring o^4 to swing the lever o about its pivot, thereby withdrawing the crozing-tools from the croze and swinging the bell-crank-lever o' back into its normal position.

Many of the particular elements of the mechanism herein shown and described may be varied almost indefinitely, and for that reason I do not limit myself to the same, as the broad principles of the invention are entirely independent thereof.

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

1. In a machine of the class described, the combination with a frame, a driving-gear, a rotating shaft journaled in the frame and driven by said gear and a longitudinally-movable tub-support upon the shaft, of a leveling-tool supported by the frame, and devices connected with the driving-gear for automatically moving the tub-support to bring the tub within range of the leveling-tool; substantially as described.

2. In a machine of the class described, the combination with a frame, a driving-gear, a rotating shaft journaled in said frame and driven by said gear and a longitudinally-movable tub-support upon said shaft, of a howeling-tool supported by the frame and devices connected with the driving-gear, for automatically moving the tub-support to bring the tub within the range of the howeling-tool; substantially as described.

3. In a machine of the class described, the combination with a frame, a driving-gear, a rotating shaft journaled in said frame and driven by said gear and a tub-support upon said shaft, of a tool-carrying arm supported by the frame, pivotal devices for said arm, permitting oscillation of the same both longitudinally of the rotating shaft and transverse thereof and connecting devices between said

arm and the driving-gear for automatically oscillating the arm longitudinally of the driving-shaft; substantially as described.

4. In a machine of the class described, the combination with a frame, a driving-gear, a rotating shaft journaled in said frame and driven by said gear and a tub-support upon said shaft, of a tool-carrying arm supported upon the frame, pivotal devices between said arm and the frame, permitting the oscillation of the arm longitudinally of the shaft and connecting devices between said arm and the driving-gear for moving the arm longitudinally of the shaft to bring the tool carried by said arm into operation; substantially as described.

5. In a machine of the class described, the combination with a frame, a driving-gear, a rotating shaft journaled in the frame and driven by the gear and a tub-support upon said shaft, of a tool-carrying arm supported from the frame by a pivotal connection permitting oscillation transverse to the rotating shaft to bring the tool into operative position and longitudinal of the rotating shaft to advance the tool to its work, a catch supported from the frame and engaging said arm to hold it in operative position and connecting devices between said catch and the driving-gear for automatically moving the arm to advance the tool to its work; substantially as described.

6. In a machine of the class described, the combination with a frame, a driving-gear, a rotating shaft journaled in the frame and driven by the gear and a tub-support upon said shaft, of an oscillating tool-carrying arm supported from the frame and capable of swinging from an operative position to one out of the way of the tub, a catch supported from the frame and adapted to hold the arm in operative position, a tool, a tool-carrier movably supported upon the arm and connecting devices between said tool-carrier and the driving-gear for automatically advancing the tool to its work; substantially as described.

7. In a machine of the class described, the combination with a frame, a driving-gear, a rotating shaft journaled in the frame and driven by the gear and a tub-support upon the shaft, of an oscillating tool-carrying arm, capable of swinging from an operative position to one out of the way of the tub, a catch supported from the frame and adapted to hold the arm in an operative position, a tool, a tool-carrier movably supported upon the arm and connecting devices between said tool-carrier and the driving-gear, for automatically withdrawing the tool from its work; substantially as described.

8. In a machine of the class described, the combination with a frame, a driving-gear, a rotating shaft journaled in the frame and driven by the gear and a tub-support upon the shaft, of an oscillating tool-carrying arm, capable of swinging from an operative position to one out of the way of the tub, a catch supported from the frame and adapted to hold the arm in an operative position, a tool, a tool-carrier movably supported upon the arm, connecting devices between said carrier and the driving-gear for automatically advancing the tool to its work and connecting devices between the carrier and the driving-gear for automatically withdrawing the tool from its work, substantially as described.

9. In a machine of the class described, the combination with a frame, a driving-gear and a longitudinally-movable tub-support, of a tool, a carrier therefor supported from the frame and movable toward and from the tub, means for moving the tool toward the tub to advance it to its work and means for moving the tub away from the tool to check the operation of the latter; substantially as described.

10. In a machine of the class described, the combination with a frame and driving-gear, of a longitudinally-movable tub-support guided in said frame, a suitably-supported tool brought into operation upon one end of the tub by the longitudinal movement of the latter, a second tool, a support therefor movable longitudinally of the tub, means for moving said second tool toward the tub to advance it to its work and means for moving the tub longitudinally to withdraw it from the second tool and advance it toward the first; substantially as described.

11. In a machine of the class described, the combination with a frame, a driving-gear and a rotating shaft journaled in the frame and driven by the gear, of a longitudinally-movable tub-support upon the shaft, a stationary tool supported adjacent to one end of the tub-support and adapted to be brought into operation upon the corresponding end of the tub by the longitudinal movement of the latter toward the tool and a swinging arm adapted to extend across the other end of the tub, provided with a tool arranged to operate upon one side of the tub, said arm being capable of oscillation longitudinally of the tub-support to first bring said tool into operation upon one side of the tub and then bring the arm against the opposite side of the tub to crowd the latter toward the stationary tool; substantially as described.

12. In a machine of the class described, the combination with a frame, a driving-gear and a rotating shaft journaled in the frame and driven by the gear, of a longitudinally-movable tub-support upon the shaft and a swinging arm adapted to extend across the end of the tub, provided with a tool arranged to operate upon one side of the tub, said arm being capable of oscillation longitudinally of the tub-support to first bring said tool into operation upon one side of the tub and then bring the arm against the opposite side of the tub to crowd the latter away from said tool; substantially as described.

13. In a machine of the class described, the combination with a frame, a driving-gear and a tub-support, of two sets of tools operating

respectively upon the opposite ends of the tub, supporting devices for said tools and connecting devices between the same and the driving-gear for automatically throwing one set of tools into operation and thereafter throwing the other set into operation; substantially as described.

14. In a machine of the class described, the combination with a frame and driving-gear, a swinging arm and a rotating tub-support, of a set of tub-working tools mounted upon the arm and devices connecting said arm and the driving-gear for automatically advancing said tools to their work by the swinging of the arm toward the tub; substantially as described.

15. In a machine of the class described, the combination with a frame, a driving-gear, a rotating and longitudinally-moving tub-support and an oscillating arm swinging longitudinally of the tub-support, of a set of tub-working tools mounted upon the arm and a second set of relatively-stationary tools mounted upon the frame of the machine and means for bringing said tools successively into operation by the swinging of the arm longitudinally of the tub and the longitudinal movement of said tub with its support; substantially as described.

16. In a machine of the class described, the combination with a frame, a driving-gear, a tub-support and a series of tub-working tools, of means for performing the work of said tools through the driving-gear, mechanism for advancing said tools to their work, mechanism for stopping the motion of the machine, a governing device connected with and driven by the driving-gear and connecting devices between said governing device and the stopping and tool-advancing mechanism for automatically advancing the tools to their work and for automatically stopping the machine when said work is completed; substantially as described.

17. In a machine of the class described, the combination with a frame, a driving-gear and a rotating tub-support, of a swinging arm, tub-working tools mounted upon the arm and movable with respect thereto, means for swinging the arm to move said tools in one direction and devices actuated by the swinging of the arm for moving said tools with respect to the latter; substantially as described.

18. In a machine of the class described, the combination with a frame, a driving-gear and a rotating tub-support journaled in the frame and reciprocating longitudinally therein, of a pair of beveling-tools operating respectively upon the outside and inside of the tub and a supporting-block therefor loosely mounted in a horizontal slide, radial to the axis of the tub-support; substantially as described.

19. In a machine of the class described, the combination with the swinging arm, H, having the slides, K, M, guided therein, of the oscillating lever, O, pivoted between its ends to the arm and links, k, m^2, oblique with respect to each other, both pivoted at one end to the lever, O, upon opposite sides of its pivot and each pivoted at its other end to its respective slide; substantially as described.

20. In a machine of the class described, the combination with a frame, a leveling-tool and a driving-gear, producing relative rotation of tub and tool, of a longitudinally-movable tub-support and connecting devices between said tub-support and driving-gear for automatically moving the tub into engagement with the leveling-tool; substantially as described.

21. In a machine of the class described, the combination with a frame, a leveling-tool and a driving-gear, causing relative rotation of tub and tool, of a longitudinally-movable tub-support and connecting devices between said tub-support and the driving-gear for automatically moving said tub out of range of the leveling-tool; substantially as described.

22. In a machine of the class described, the combination with a frame, a leveling-tool and a driving-gear, causing relative rotation of tub and tool, of a longitudinally-movable tub-support, connecting devices between said tub-support and the driving-gear, for automatically advancing the tub into engagement with the leveling-tool, and devices for automatically moving the tub out of the range of said tool; substantially as described.

23. In a machine of the class described, the combination with a frame, a beveling-tool and a driving-gear, causing relative rotation of tub and tool, of a longitudinally-movable tub-support and connecting devices between said tub-support and the driving-gear for automatically moving the tub into engagement with the beveling-tool; substantially as described.

24. In a machine of the class described, the combination with a frame, a beveling-tool and a driving-gear, causing relative rotation of tub and tool, of a longitudinally-movable tub-support and connecting devices between the tub-support and said driving-gear for automatically moving the tub from the range of the beveling-tool; substantially as described.

25. In a machine of the class described, the combination with a frame, a beveling-tool and a driving-gear, causing relative rotation of tub and tool, of a longitudinally-movable tub-support, connecting devices between said tub-support and the driving-gear for automatically advancing the tub into engagement with the beveling-tool and devices for automatically removing the tub from the range thereof; substantially as described.

26. In a machine of the class described, the combination with a frame and a rotatable tub-support, of a leveling-tool adapted to operate upon one end of the tub, an arm carrying said tool, a suitably-supported leveling-tool adapted to operate upon the other end of the tub, driving-gear, a cam rotated by said driving-gear, a rod reciprocated by said cam and removably connected to said arm, said rod being adapted to bring the first-named tool into

engagement with the tub during the first part of its movement in one direction and to bring the tub against the second-named tool during the latter part of said movement; substantially as described.

27. In a machine of the class described, the combination with a frame, and a rotatable tub-support, of a howeling-tool adapted to operate upon one end of the tub, an arm carrying said howeling-tool, a suitably-supported beveling-tool adapted to operate upon the other end of the tub, driving-gear, a cam rotated by said gear, a rod, reciprocated by said cam and removably connected to said arm, said rod being adapted to bring the howeling-tool into engagement with the tub during the first part of its movement in one direction and to bring the tub against the beveling-tool during the latter part of its movement; substantially as described.

28. In a machine of the class described, the combination with a frame, driving-gear and tub-support, of suitably-supported howeling and crozing tools adapted to operate upon the same end of the tub, an oscillating lever, links pivoted to said lever, upon opposite sides of its pivotal point and to the howeling and crozing tool supports, the pivot of the link upon the howeling-tool being to one side of a line passing through the pivotal point of the oscillating lever and the pivot upon the crozing-tool, whereby the pivot of said link with the oscillating lever will pass the dead-center before the corresponding pivot on the other link; substantially as described.

29. In a machine of the class described, the combination with the swinging arm, H, having the slides, K, M, guided therein, of the oscillating lever, O, pivoted between its ends, to the arm, and links, k, m^2, pivoted upon the oscillating lever, upon opposite sides of its pivot and each pivoted at its other end, to its respective slide, the pivot of one of said links upon its slide being out of a line, passing through the pivot of the lever and through the pivot of the other link upon its slide, whereby the pivot of one of the links upon the oscillating lever will pass the dead-center before the other; substantially as described.

30. In a machine of the class described, the combination with a frame, a driving-gear and a tub-support, of a suitably-supported leveling-tool adapted to operate upon one end of the tub, a suitably-supported leveling-tool adapted to operate upon the other end of the tub and connecting devices between said leveling-tools and the driving-gear for automatically bringing the first tool into operation upon the tub, for automatically throwing it out of operation and for automatically bringing the second leveling-tool into operation after the operation of the first tool is completed; substantially as described.

31. In a machine of the class described, the combination with a frame, a driving-gear and a tub-support, of a howeling-tool adapted to operate upon one end of the tub, a beveling-tool adapted to operate upon the other end of the tub, supporting devices for both of said tools, connecting devices between said tools and the driving-gear for automatically bringing the howeling-tool into operation and throwing it out of operation and for automatically bringing the beveling-tool into operation after the operation of the howeling-tool is completed; substantially as described.

In witness whereof I have hereunto set my hand, at Portland, in the county of Jay and State of Indiana, this 19th day of July, A. D. 1899.

CHARLES D. AMES.

Witnesses:
WM. P. JONES,
F. W. MINCKS.