No. 701,625. Patented June 3, 1902.

C. E. SANDSTROM.

MACHINE FOR FORMING ELLIPTICAL FRAMES.

(Application filed Aug. 9, 1900. Renewed Apr. 2, 1902.)

(No Model.) 8 Sheets—Sheet 1.

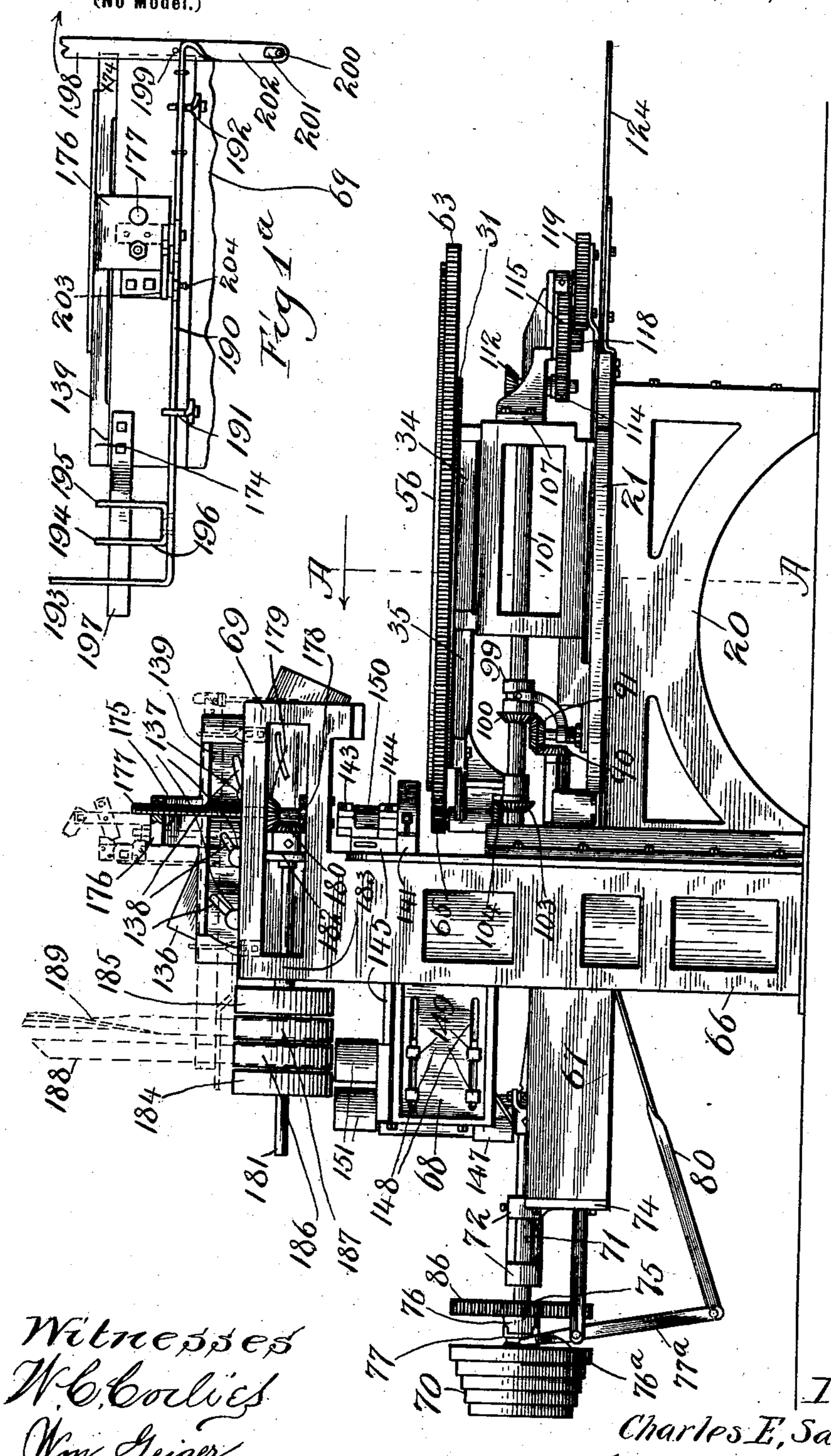

Fig 1a

Fig 1

Witnesses
W. C. Curtis
Wm. Geiger

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Attys

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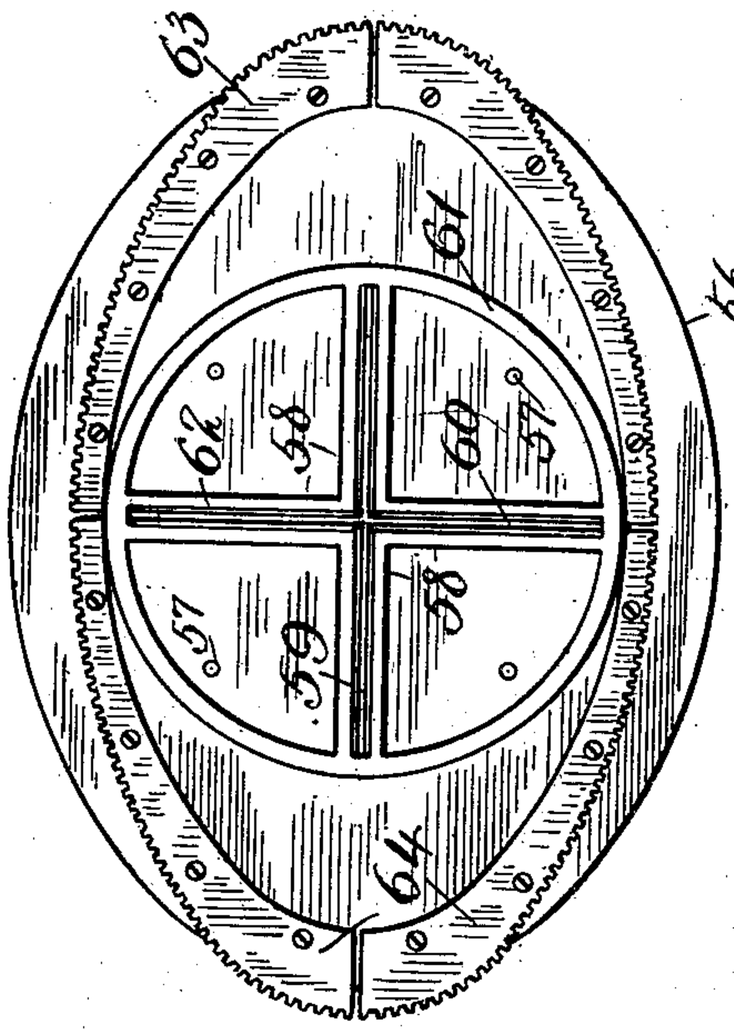

Fig. 3.

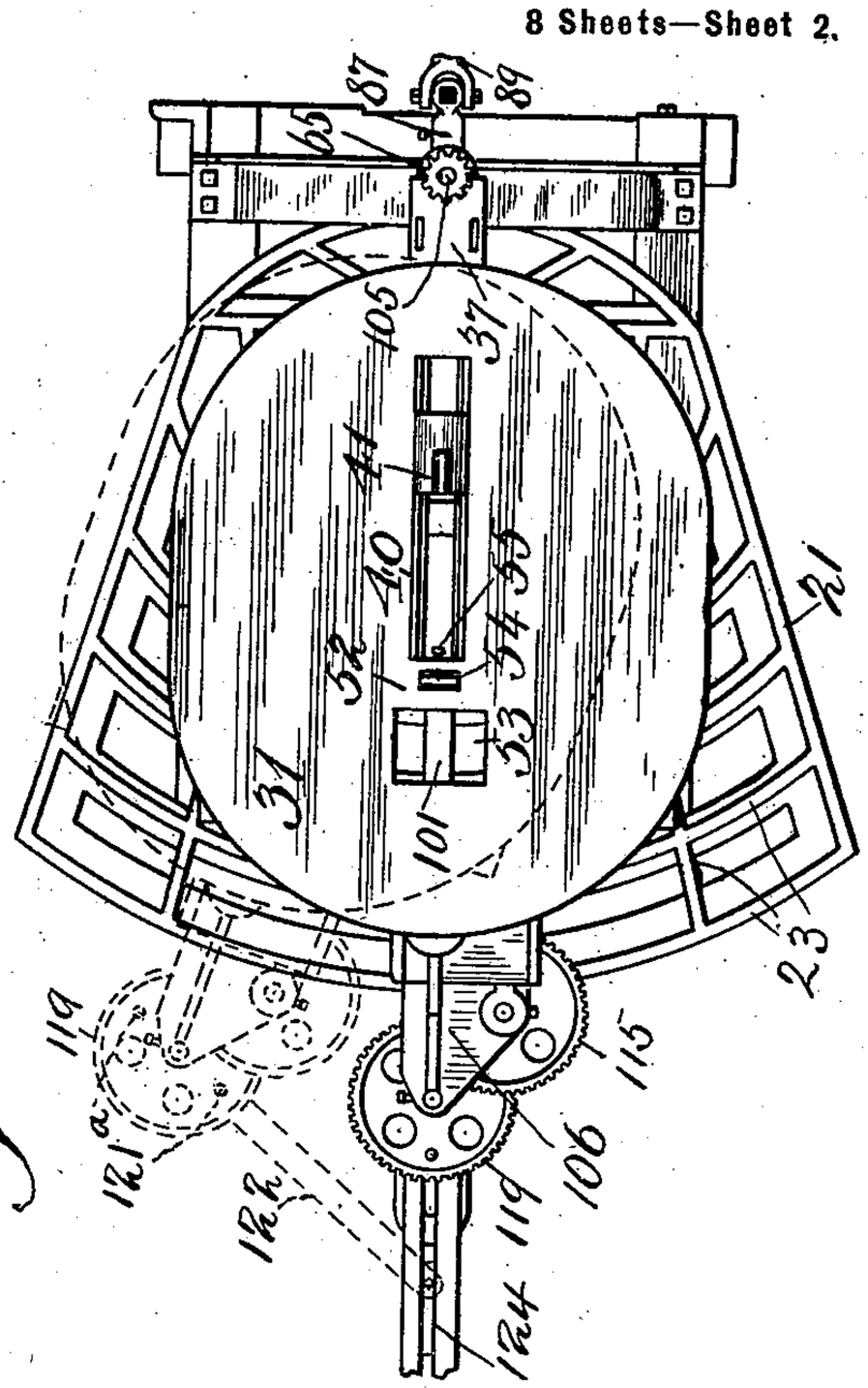

Fig 4.

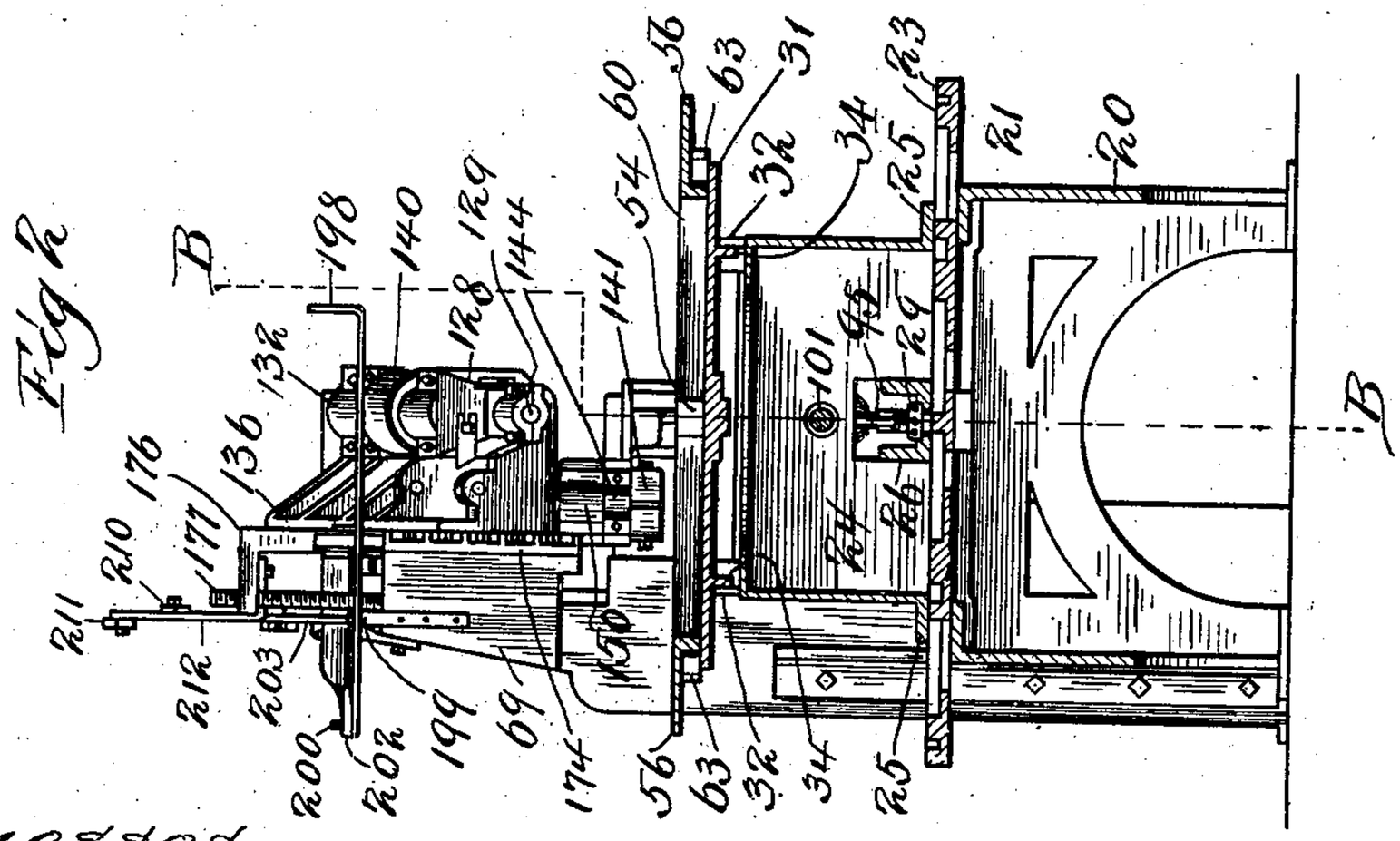

Fig 5.

Witnesses
W. C. Cories
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(Application filed Aug. 9, 1900. Renewed Apr. 2, 1902.)

(No Model.) 8 Sheets—Sheet 3.

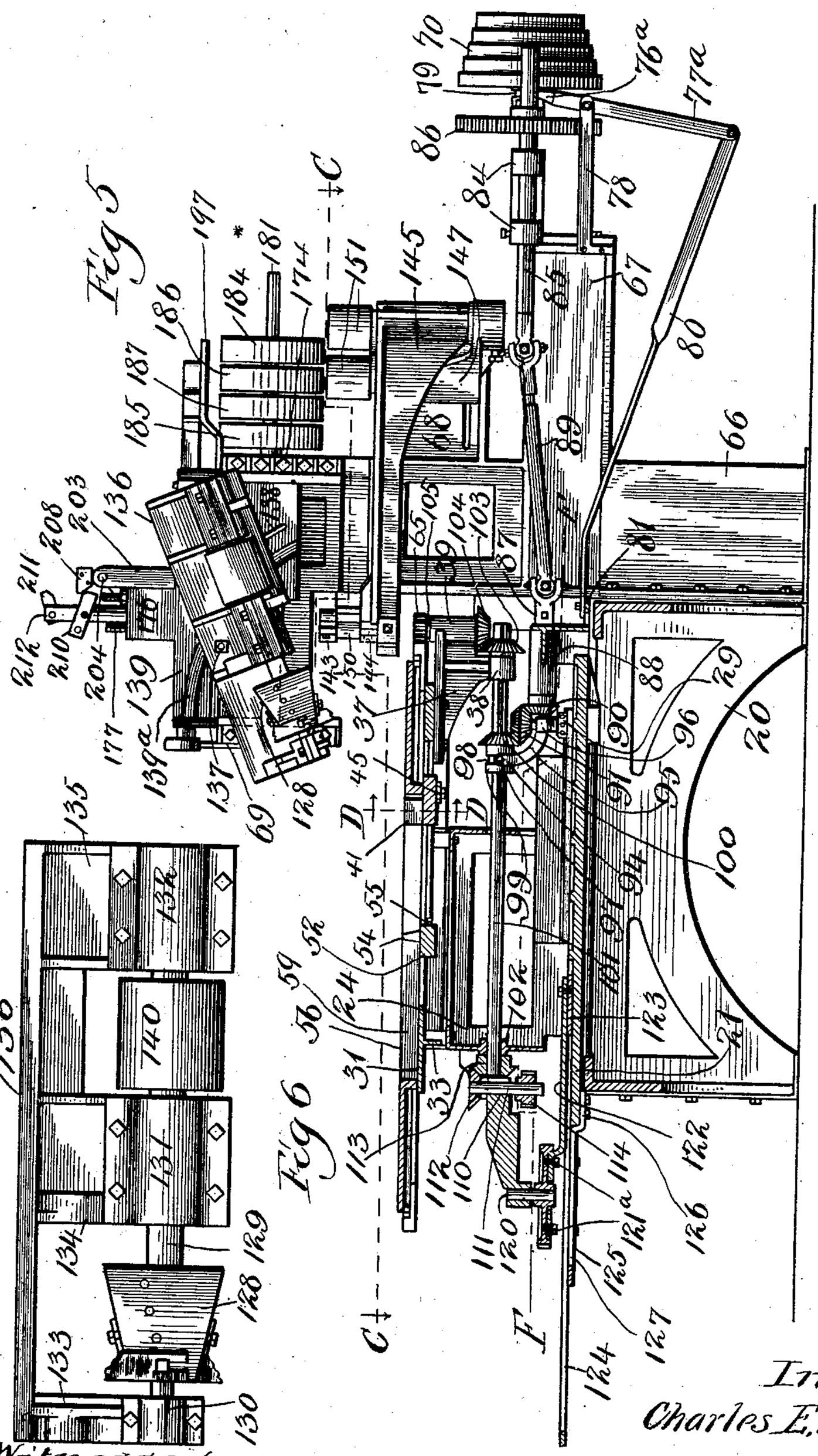

Fig 5

Fig 6

Witnesses
W. C. Eccles
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(No Model.) 8 Sheets—Sheet 4.

Fig 7a

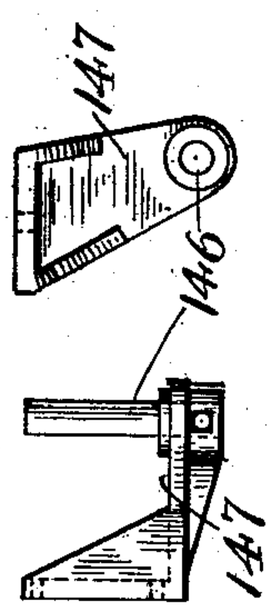

Fig 7.

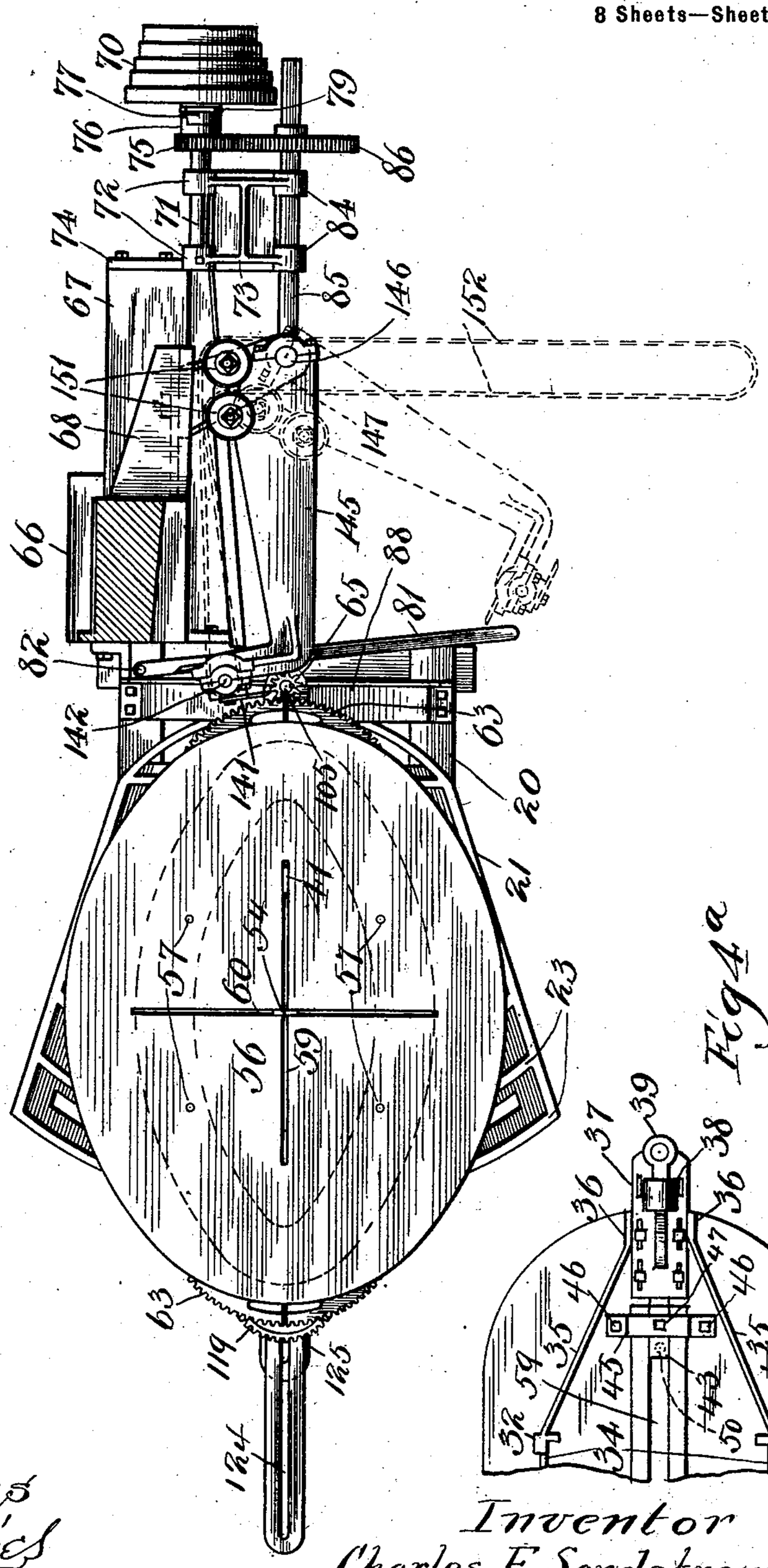

Fig 4a

Witnesses
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(No Model.) 8 Sheets—Sheet 5.

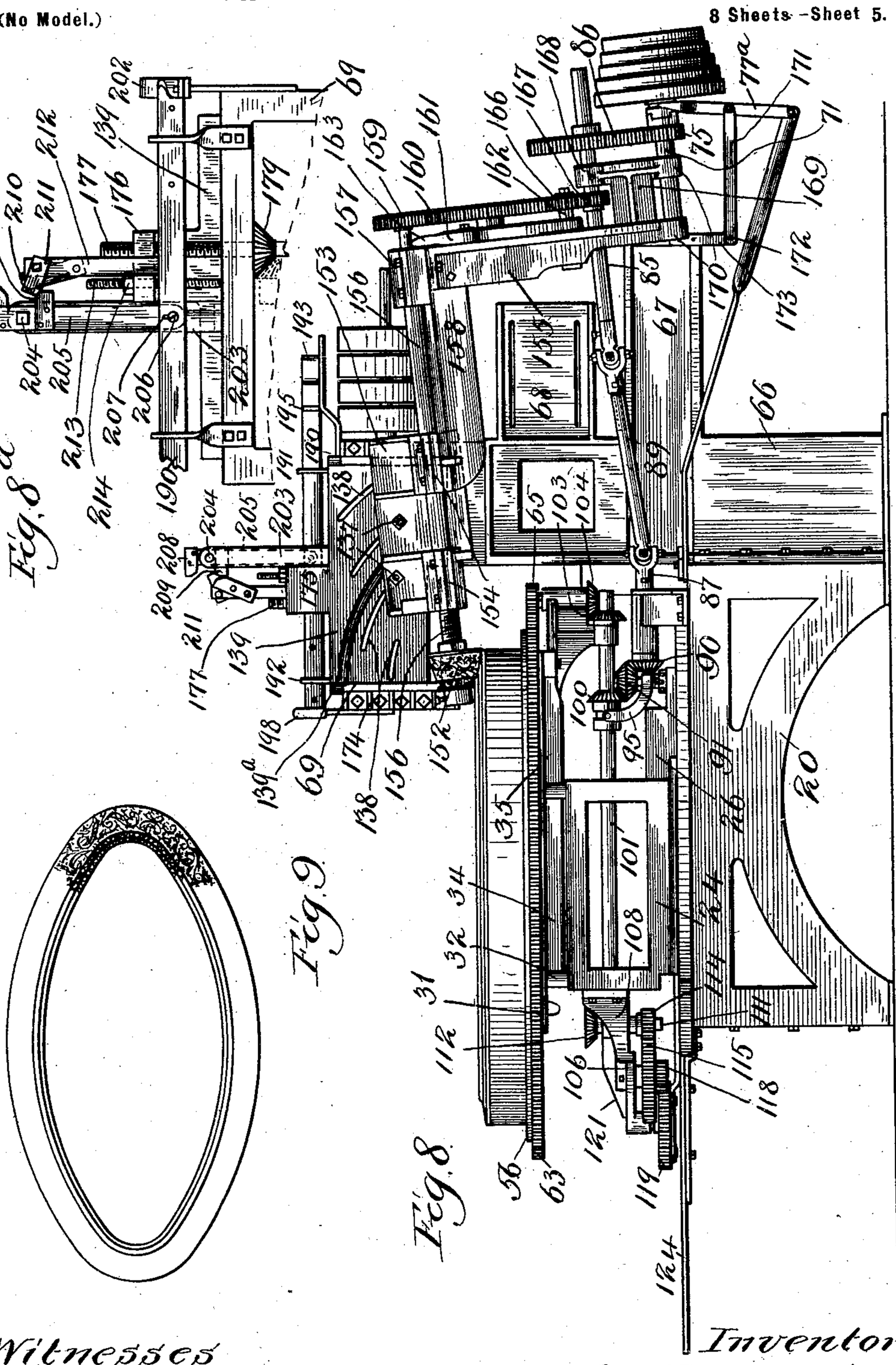

Fig. 8a

Fig. 9

Fig. 8

Witnesses,
W. C. Coales
Wm. Geiger

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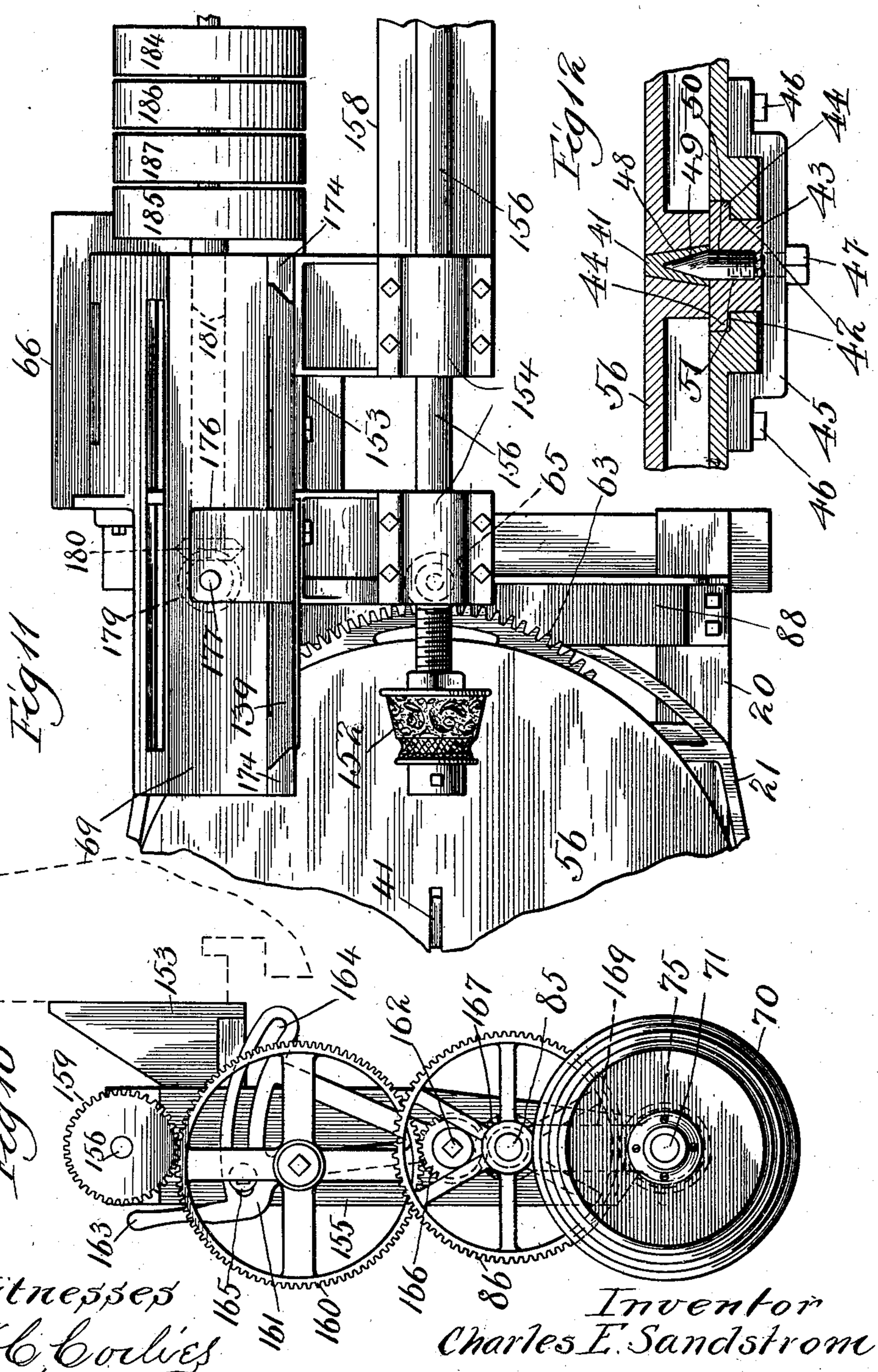
(Application filed Aug. 9, 1900. Renewed Apr. 2, 1902.)

(No Model.) 8 Sheets—Sheet 6.



No. 701,625. Patented June 3, 1902.

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MACHINE FOR FORMING ELLIPTICAL FRAMES.

(Application filed Aug. 9, 1900. Renewed Apr. 2, 1902.)

(No Model.) 8 Sheets—Sheet 7.

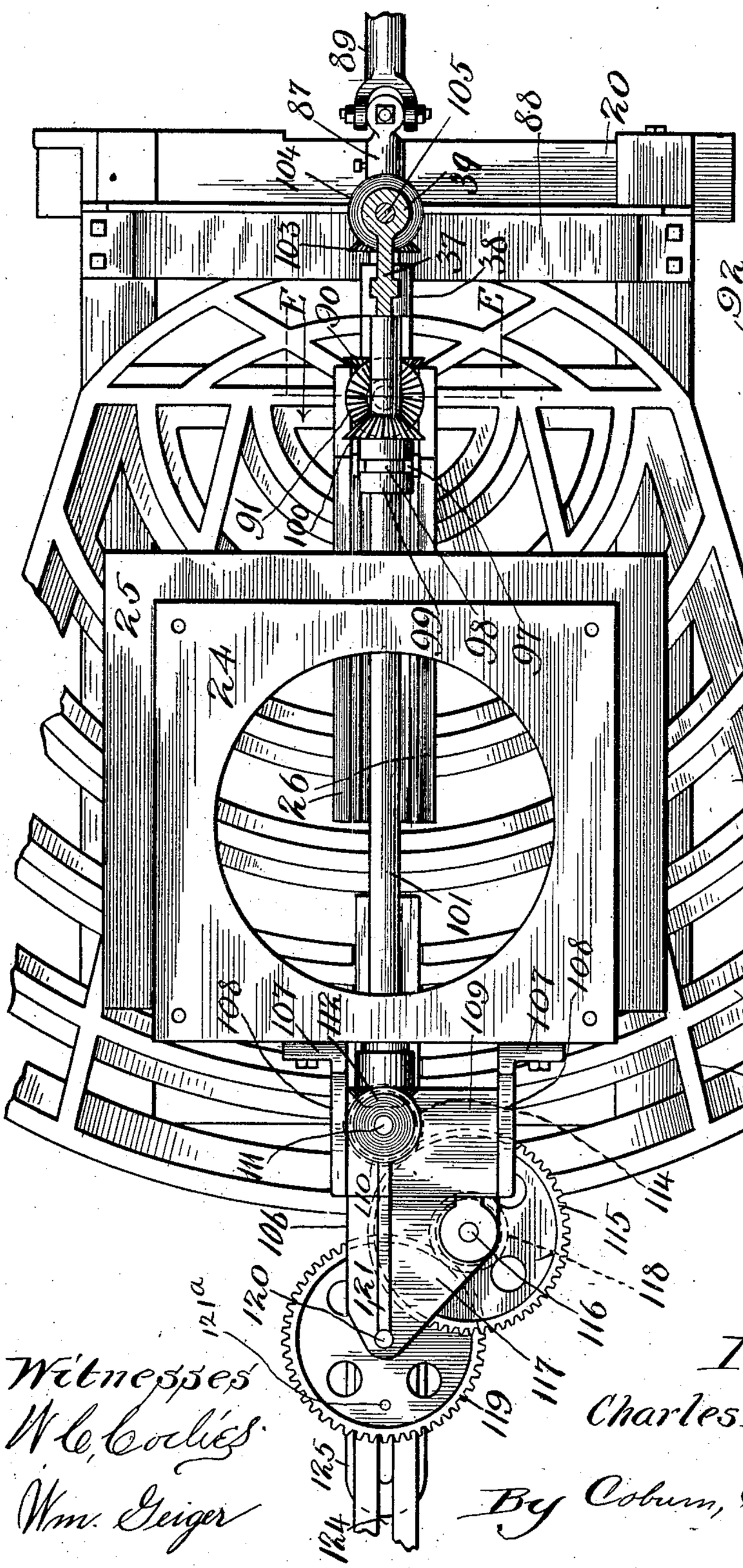

Fig 13.

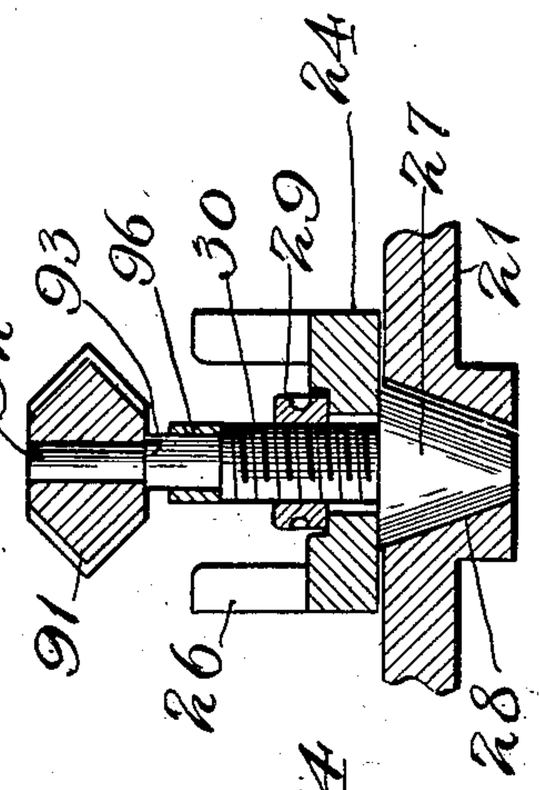

Fig 14.

Witnesses
W. C. Coles.
Wm. Geiger

Inventor
Charles E. Sandstrom

By Coburn, Gibbon & McElroy
Attys

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MACHINE FOR FORMING ELLIPTICAL FRAMES.

(Application filed Aug. 9, 1900. Renewed Apr. 2, 1902.)

(No Model.) 8 Sheets—Sheet 8.

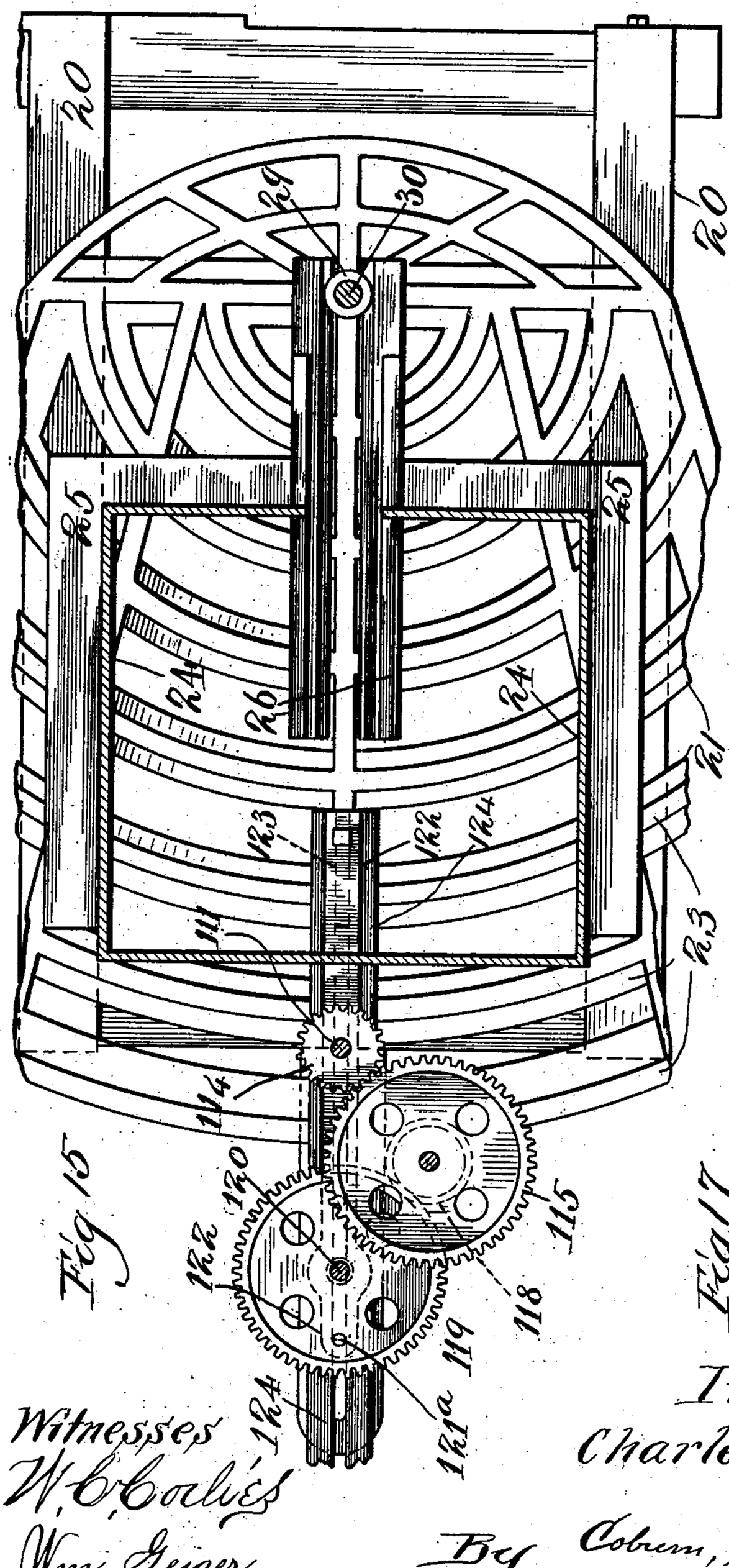

Fig 15

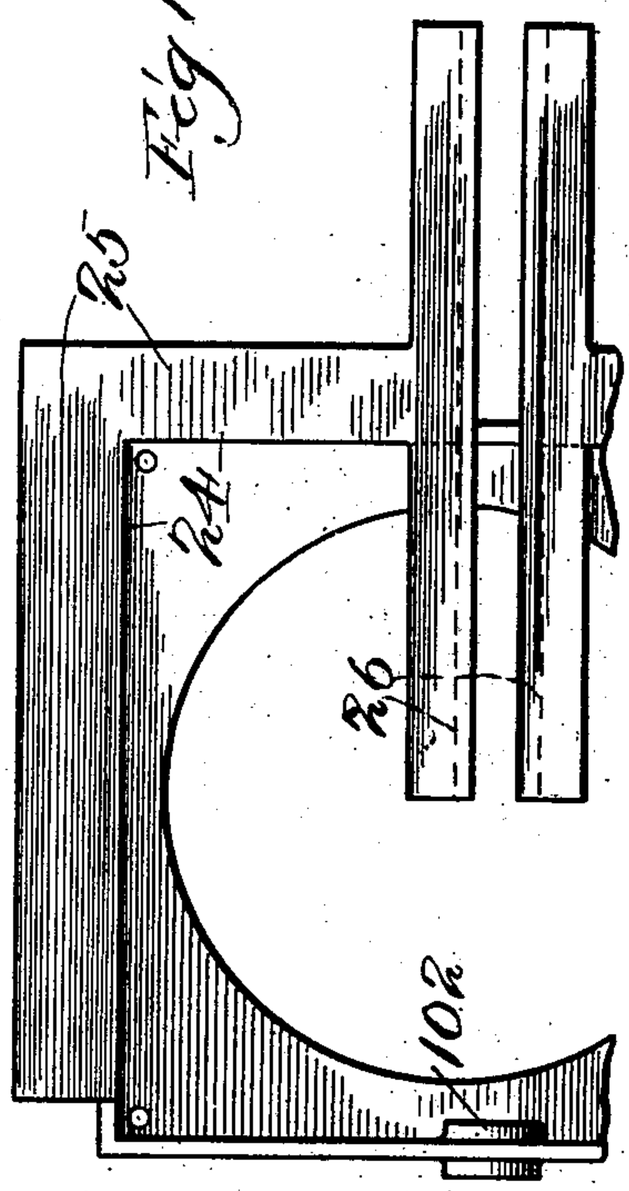

Fig 16

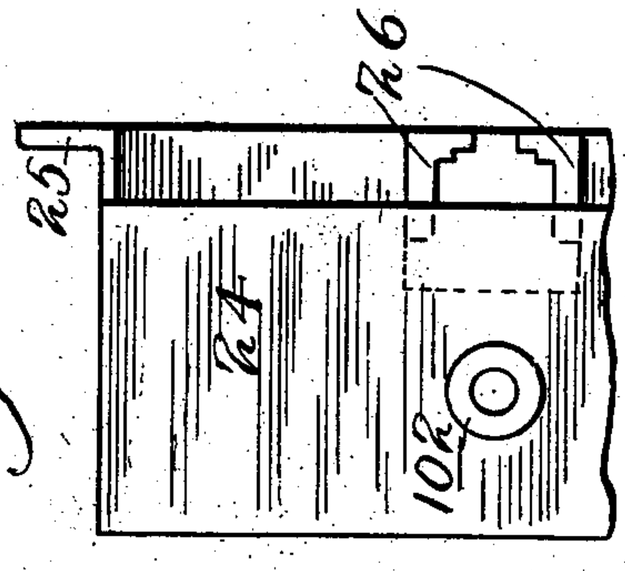

Fig 17

Witnesses
W. C. Coles
Wm. Geiger

Inventor
Charles E. Sandstrom,
By Coburn, Hibben & McElroy
Attys.

UNITED STATES PATENT OFFICE.

CHARLES E. SANDSTROM, OF CHICAGO, ILLINOIS.

MACHINE FOR FORMING ELLIPTICAL FRAMES.

SPECIFICATION forming part of Letters Patent No. 701,625, dated June 3, 1902.

Application filed August 9, 1900. Renewed April 2, 1902. Serial No. 101,053. (No model.)

To all whom it may concern:

Be it known that I, CHARLES E. SANDSTROM, a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Machines for Forming Elliptical Frames, of which the following is a specification.

My invention relates to a machine which may be employed in carrying out one or more steps in my new process for manufacturing elliptical picture-frames, as described in my application, No. 731,383, filed September 23, 1899. In my application, Serial No. 703,870, filed January 30, 1899, I have shown a machine for sawing and boring pieces from which the frame is formed, and in another application, Serial No. 705,806, filed February 17, 1899, I have shown a machine constructed specifically for the puttying of an elliptical frame cut out by machinery or otherwise from the several pieces joined together of which the frame is made, as shown in my aforesaid application, No. 731,383. In the present application I have shown a machine that is designed primarily, as is the machine in application Serial No. 705,806, above referred to, for forming a design in putty upon the surface of the elliptical frame after it is cut out and which is also constructed so that by a slight change in the parts it can be used to cut out a design in cross-section of the elliptical frame.

My invention, furthermore, relates to the mechanism for rotating an elliptical frame or surface thereon and at the same time reciprocating it so that the relatively stationary former will be properly applied to said frame or surface in spite its elliptical shape.

My invention further relates to the mechanism for giving the aforesaid rotating and reciprocating frame an additional vibration, which serves to compensate for the vibration of the mandrel or former which was necessary with the construction employed in my prior application, No. 705,806.

My invention further relates to mechanism for raising and lowering the forming-tool at any time desired by the operator and, further, to mechanism for automatically stopping said tool at the desired point in its ascent or descent. As the forming-tool was connected with the other mechanism in the structure shown in my prior application, No. 705,806, the forming-tool was raised and lowered at specific time in the operation of the machine, and consequently the removing of a finished frame and the insertion of a fresh one must be accomplished within a specific time, which was not always possible and occasionally resulted in spoiling a frame.

My invention further relates to other combinations of mechanism and details of construction, as will be fully set out in the annexed claims.

Referring to the accompanying sheets of drawings, in which the same reference characters are used to designate identical parts in all the figures, Figure 1 is a side elevation of the complete machine seen from the rear side. Fig. 1ª is a plan view, on an enlarged scale, of a portion of the top of the machine, showing the automatic belt-shifting mechanism for automatically stopping the upward or downward movement of the forming-tool. Fig. 2 is a sectional view on the line A A of Fig. 1. Fig. 3 is an inverted plan view of the table upon which the frame to be operated on is secured. Fig. 4 is a plan view of the swinging plate upon which the table is rotated and reciprocated and its bearing-support and actuating mechanism. Fig. 4ª, Sheet 4, is an inverted plan view of a portion of the swinging plate shown in Fig. 4. Fig. 5 is a front elevation of the machine with the swinging plate and its supports in section on the line B B of Fig. 2. Fig. 6 is a plan view of the plate supporting the rotating cutter and its bearings detached from the rest of the machine. Fig. 7 is a plan view of the complete machine, partially in section, on the line C C of Fig. 5. Figs. 7ª and 7ᵇ are a side elevation and plan view, respectively, of the bearing-stud and its supporting-bracket for the edge-cutting tool. Fig. 8 is a front elevation of the complete machine. Fig. 8ª is a detached portion of the belt-shifting mechanism shown in Fig. 1ª seen in elevation from the rear side of the machine. Fig. 9 is a plan view of the picture-frame being operated on, showing approximately its form and a portion of the general style of decoration. Fig. 10 is a rear end elevation showing the details of the gearing between the driving-shaft and the forming-tool. Fig. 11 is a plan view, on

an enlarged scale, showing the putty-forming tool and its bearings. Fig. 12 is a section, on an enlarged scale, on the line D D of Fig. 5. Fig. 13 is an enlarged plan view of the bearings and the coöperating support for the swinging plate. Fig. 14 is a detail in section on the line E E of Fig. 13. Fig. 15 is a plan view corresponding to Fig. 13, but on the section-line F F of Fig. 5. Fig. 16 is an inverted plan view of the support for the swinging plate, and Fig. 17 is an end elevation of the same.

In the foregoing figures, Figs. 1, 2, 5, 6, and 7 show the machine arranged with the cutting forming-tools attached for cutting out the design on the frame in wood, and Figs. 8, 10, and 11 show the machine arranged with the putty-forming tool in position for impressing the ornamental portion of the frame.

The main portion of the machinery by which the necessary elliptical movement is given to the table which carries the frame is mounted upon the rectangular base 20, which for lightness is preferably formed of a comparatively thin shell supported by four legs in the manner clearly shown. Rigidly secured upon the top of this frame in any desired manner is the segmental grid 21, the upper portion of which constitutes a bearing-surface, which is planed down perfectly level. To lighten the same, as well as to reduce the friction, as shown, it is made of a skeleton form, with the apertures 22 therein and the ribs 23 projecting above the main portion thereof and having their top surfaces planed down, as above described. Mounted to swing freely upon this grid is the supporting-frame 24, which, as will be seen by reference to Figs. 1, 2, 5, 8, 13, and 15 to 17, is of a generally rectangular shape, constructed in skeleton and having the horizontal flange 25 extending around three sides of its bottom edge to form a bearing, this flange being omitted on the outer end and part of the same side of the supporting-frame being cut away to permit a certain necessary movement of parts to be described. It has rigidly secured thereto, preferably by casting integrally therewith, the parallel ribs 26, extending from the center of the frame through the inner end to a substantially equal distance beyond the end. The shape of these ribs in cross-section is seen in Figs. 2, 14, and 17, and together they form a way or channel by which the position of the frame is adjusted nearer to or farther from its pivotal support, as may be necessary in adjusting the machine for operating on different-sized frames. This pivotal support is best shown in the detailed section constituting Fig. 14, where it will be seen to consist of an inverted truncated conical bearing-plug 27, pivotally seated in the correspondingly-shaped bearing-aperture 28, formed in the segmental grid 21. The frame after being adjusted to any desired position is then secured in place by screwing down the nut 29 upon the screw-threaded extension 30 of the bearing-plug, which extension projects upwardly between the ribs 26. The nut 29 when thus adjusted securely clamps the ribs 26, and consequently the frame 24, to the bearing-plug 27, so that the frame can vibrate back and forth upon the grid 21 about this bearing-plug as a center, as indicated by the dotted-line position of Fig. 4. The upper side of this frame 24 is shown in plan view in Fig. 13, and preferably has its center cut away, as shown, to give ready access to the parts thereof. Rigidly secured upon the top of this swinging frame 24 is the swinging plate 31, the general shape of which is shown in the plan view constituting Fig. 4, and it consists of the plate having its upper surface planed down smooth to furnish a bearing for the rotating and reciprocating table, to be mentioned, and its under side has projecting downwardly therefrom the angular projections 32, which rest upon the upper surface of the frame 24, to which they are rigidly secured by bolts or otherwise. The two outermost posts 32 are connected by the downwardly-projecting flanges 33, (shown in section in Fig. 5,) and the two posts at either side are connected by the downwardly-projecting flanges or ribs 34, which are continued from the inner posts, as shown in Fig. 4ª, at an angle, forming the ribs 35, which terminate in the horizontal ribs 36. Bolted or otherwise rigidly secured to the under side of the plate 31, between the ribs 36, is the bracket 37, which is of the general shape shown in Figs. 1, 4, 4ª, 5, and 8 and which has a horizontal journal-bearing 38, secured to its lowermost portion, and a vertical journal-bearing 39, secured to its innermost portion, these bearings being adapted to receive shafts to be hereinafter described.

Referring now especially to Fig. 4, the swinging plate 31 has extending longitudinally thereof the rectangular slot 40, in which the focal bearing 41 is adjustably mounted. As is best shown in Fig. 12, the plate adjacent to the rectangular slot 40 is thickened and has the shoulders 42 projecting into the slot, so as to form a guideway along which the block 43, in which the focal bearing 41 is mounted, can be adjusted. This block 43 is provided with the shoulders 44, resting on the shoulders 42, and the block is secured in any desired position of adjustment by means of the strap 45, which is arranged to be bolted by the bolts 46 at any desired position along the slot 40. The upper surface of the strap 45 does not quite come in contact with the bottom of the shoulders 42, so that the screw or bolt 47, passing through the center of the strap and screwing into the block 43, will operate to draw said block down upon the shoulders 42 and securely clamp it in place. The focal bearing 41 consists of an elongated rectangular block with its top narrower than its bottom and its sides 48 sloping down, as best shown in Fig. 12. This block has the conical recess 49 in its under side, into which the

conical end of the pivot 50 passes, the cylindrical lower end of said pivot resting in the cylindrical recess 51, formed in the block 43. From this construction it will be apparent that the focal bearing 41 can be turned freely about its pivot 50, so as to assume any angle relative to the plate. At the outer end of the slot 40 and in the thickened portion 52 of the plate between the slot 40 and the rectangular aperture 53 is mounted the other focal bearing 54, which is mounted upon a similar pivot secured in a similar recess and held in place, if deemed necessary, by the set-screw 55. While the focal bearing 54 is not adjustable, yet as the coöperating focal bearing 41 is adjusted to and from this bearing the distance between these focal bearings, which constitute the foci of the ellipse, can be varied, so that the machine is adapted to operate on ellipses having different equations. Resting on this swinging plate 31 is the table 56, upon which is secured the frame to be operated on by some means, such as the pins 57, projecting upwardly therefrom at certain fixed positions. This table 56 consists of a preferably elliptical plate having the four angular flanges 58 projecting downwardly from the under side thereof and forming the boundaries of the slots 59 and 60, which cross each other at right angles, as shown. The flanges 58 may be connected by the circular flange 61, and the inner edges 62 of said flanges 58, bounding the slots 59 and 60, are constructed at the same angle as the inclined sides of the focal bearings 41 and 54, with which they cooperate. This table has also secured to the under side thereof the elliptical rack 63, which is conveniently made of four separate sections 64, which are screwed to the under side of the table, as shown. If now the table be rotated, as by means of the pinion 65, which meshes with the rack 63, not for the present considering any swinging motion given to the table 31, the table will be moved so that any point of it will pass through an ellipse, the focal bearings 41 and 54 coöperating with the slots 59 and 60 to compel this elliptical movement, their operation being exactly the reverse of that of the well-known ellipsograph, in which the focal points are movable, while the frame is stationary.

Rigidly secured to the rectangular frame 20 at one end thereof is another integral portion of the frame, which takes the form of a column 66, which has projecting therefrom the two horizontal arms 67 and 68 on the outer side and the horizontal arm 69 at the upper and inner portion thereof. This column 66 and its various arms may be of any desired shape and construction to receive the working parts of the machine, but is of a generally cut-out open construction formed with strengthening ribs or flanges wherever they can be applied advantageously. When the machine is to be used for cutting the design of the molding, in which operation the relative speeds of rotation of the table and the forming-tool need not be synchronous, the power is applied to the table by means of the set of belt-pulleys 70, loosely mounted on the bearing-shaft 71, which is mounted in the bearings 72, formed on the bearing-bracket 73, which is supported by the portion 74 of said bracket, which is screwed or otherwise secured to the outer end of the horizontal arm 67. This shaft 71 has mounted to rotate thereon the gear-pinion 75, which is rigidly secured to the clutch member 76, which coöperates with the clutch member 77, which in its turn is rigidly secured to the belt-pulleys 70. A yoke 76^a, secured upon one end of the lever 77^a, which is pivotally mounted on the arm 78, secured to the horizontal portion 67 of the frame, coöperates with the customary annular groove 79 on the clutch member 77, so that by means of the link 80, connected to the lever 77^a, the machine can be instantly moved into and out of action by the operator. The link 80 is secured to the hand-lever 81, which is pivotally mounted on the framework at 82, as best seen in Fig. 7. The bracket 73 also carries a pair of bearings 84, in which is mounted the shaft 85, to which is secured the gear-wheel 86, which meshes with the gear-pinion 75. This shaft 85 is connected with the horizontal shaft 87, which is journaled in the bearing 88, secured upon the framework, as best shown in Fig. 5, by means of the extensible link 89, consisting of a sleeve surrounding a rod to which it is splined, which has the universal-joint connections at either end with the shafts 85 and 87. The shaft 87 has secured upon its outer end the bevel-gear 90, which meshes with the double idle bevel-pinion 91, which is loosely journaled on the bearing 92, formed upon the upper end of the screw-threaded portion 30 of the pivotal bearing 27, previously described, as shown in Fig. 14, a shoulder 93 being formed in the bottom of said bearing portion to support the idle bevel gear-pinion. A yoke 94 has its support 95 curved, as shown in Fig. 5, and supported by the collar 96, which terminates the portion 95 and is secured about the bearing 92 beneath the double bevel gear idler-pinion 91. The pins 97 on the yoke 94 take into the annular groove 98, formed in the sleeve 99, which terminates in the bevel gear-pinion 100, which meshes with the upper half of the double bevel gear-pinion 91. The sleeve 99 is splined to the elongated horizontal shaft 101, which is mounted at one end in the bearing 38, previously mentioned, and at the other end in the bearing 102, formed in the outer end of the swinging supporting-frame 24. The inner end of the shaft 101 has the bevel-gear 103 likewise splined thereon, the object of these splines being to permit the movement of the shaft 101 in the bevel-gears 100 and 103, so that the frame 24 can be adjusted as previously mentioned for changing the size of the ellipses upon which the machine operates. The bevel-gear 103 meshes with the bevel-gear 104, which terminates

the lower end of the vertical shaft 105, which is mounted in the bearing 39, previously referred to, and has the pinion 65, previously referred to, secured at its upper end, so that it will be seen that as the power is applied to the belt-pulleys 70 it will be transmitted eventually to the pinion 65, so as to rotate the same at a certain rate of speed, thus insuring the movement of the table through an ellipse by the mechanism previously mentioned. This same action takes place whether the machine is used with the cutters or puttying-tool, there being, however, some slight change in the connections for the puttying-tool, as will be hereinafter described.

As with the construction herein shown the forming-tool is not vibrated, as in my prior application, No. 705,806, to compensate for the axis of the cutting-tool not being always exactly at right angles to the line of movement, arrangements are made to vibrate the table 56 itself during each rotation thereof, so that the line of movement of the frame on the table will always be at right angles to the axis of the forming-tool. This vibration must necessarily be secured by vibrating the swinging frame 24 and its annexed plate 31 about the pivotal bearing 27, previously described. To secure this vibration, which must be of a certain extent and synchronous with the rotary movement of the table, the following mechanism is employed: Secured upon the outer end of the frame 24, as best shown in the plan view of Fig. 13 and as also shown in Figs. 1, 4, 5, and 8, is a bracket 106, which consists of two vertical flanges 107, bolted to the end of the frame and having the webs 108 projecting therefrom, which webs in turn are connected by the web 109. Formed in this web 109 is the vertical journal-bearing 110, in which is mounted the short vertical shaft 111, which has the bevel gear-pinion 112 secured to its upper end and meshing with the corresponding bevel gear-pinion 113, secured upon the outer end of the shaft 101. The lower end of the shaft 111 has secured thereon the gear-pinion 114, which, as will be best seen from Fig. 15, meshes with a gear-wheel 115, which is mounted upon the short vertical bearing or pintle 116, projecting downwardly from the extension 117 of the bracket 106. This gear-wheel 115 has secured on the under side thereof the gear-pinion 118, which in turn meshes with the gear-wheel 119, which in turn is mounted upon a depending stub shaft or pintle 120, projecting downwardly from the outer end of the extension 117 of the bracket 106. A vertical rib 121, extending from the bearing 110 out to the support for the pintle 120, serves to strengthen the bracket. The gear-wheel 119 has secured to the under side thereof, as by the screws 121^a, an arm 122, the inner end of which is bent upward, as best shown in section in Fig. 5, so as to snugly fit up against the web of the wheel. The outer end of the arm 122 has pivotally secured thereto the block 123, which slides in the elongated way 124, which has its inner end extending into the surface of the grid 21 and which is conveniently supported by being bolted to the piece or arm 125, which has its inner end 126 bolted to the under side of the grid, as shown in Fig. 5. This arm 125 has a slot 127 shown therein; but this slot serves no purpose in the operation of the device and the arm 125 might as well be solid. By a study of the mechanism thus described it will be seen that as the table 56 is rotated and reciprocated to cause it to move in an ellipse the train of gearing connected to the shaft 101 will cause the gear-wheel 119 to be rotated slowly, and inasmuch as it has the arm 122 rigidly secured thereto, with its inner end pivoted to the sliding block 123, the block 123 will be slid back and forth from one end of the way 124 to the other end, and to permit this movement the wheel 119, and consequently the frame 24 and all the superposed parts, must be swung first to the right and then to the left, as indicated by the dotted-line position, Fig. 4. This swinging movement serves to compensate exactly for the variation that would otherwise exist in the line of movement of the frame from the position at right angles to the axis of the forming-tool.

In the use of a cutting-tool for cutting off either the design for the top of the frame or its edge it is not necessary to have the tool move synchronously with the table, as is the case with the puttying-roll or former with which the machine is intended primarily to operate. Consequently in its use as a cutting-machine (illustrated in Figs. 1, 2, and 5 to 7) I employ the rotary cutting-tool 128, which is secured upon the shaft 129, which is mounted in the bearings 130, 131, and 132, secured upon the arms 133, 134, and 135, respectively, projecting outwardly from the frame 136, which is secured in any desired angular position by the bolts 137, (shown in Fig. 1,) passing through the concentrically-curved slots 138, formed in the bearing-plate 139, secured to slide vertically upon the horizontal portion 69 of the column 66 of the framework, the said bolts passing through said slots and into the frame 136, so as to clamp the frame 136 in position upon the main frame. A curved rib 139^a upon the bearing-plate 139 coöperates with the rear of the frame 136 to form a bearing-surface therefor. The shaft 129 has the belt-pulley 140 secured thereto so that a belt can be passed thereover, so as to run the cutting-tool 128 at any desired rate of speed. When the surfaces and edges of any desired number of frames are cut, the frame 136, with the cutting-tool, can be removed and the forming-tool, to be presently described, put in its place, after which the same machine can be used to putty the frames.

The inner side or back of the frame can have the rabbet cut therein by means of the forming-tool on the shaft just described; but to cut the outer edge of the frame I employ

another rotating cutting-tool 141, which with its operative connections is best shown in Figs. 1, 2, 5, and 7. It is mounted upon the short vertical shaft 142, which is suitably journaled in the bearings 143 and 144, which are secured upon the outer end of the L-shaped arm 145, which is pivotally mounted on the pintle 146, which is rigidly secured upon the bracket 147, which is bolted in any desired position of adjustment in the horizontal portion 68 of the frame, the adjustability being secured by the elongated slots 148, through which the bolts 149, which secure the bracket 147 in place, pass. A driving-pulley 150 is secured upon the shaft 142 between the bearings 143 and 144, and to drive this pulley conveniently without having the belting in the way of the operator's position at the machine, which is at the controlling-lever 81, I secure the two belt-pulleys 151 upon suitable bearings formed at the inner end of the arm 145, so that the belt 152 (shown in dotted lines in Fig. 7) can be conveniently applied to the pulley 150. As indicated by the dotted lines in Fig. 7, when it is desired to use the top cutter, which cannot be used simultaneously with the edge cutter, the latter can be swung out of the way into the dotted-line position therein shown.

After the frame is properly cut the design upon its surface in putty is formed by the puttying-roll 152. To apply this roll, it becomes necessary to remove the cutting-tool 128 and its support 136, and inasmuch as it is necessary to run the puttying-roll at a speed that shall be synchronous with the movement of the frame the mechanism for applying the power to the puttying-roll is geared up with the mechanism for applying the power for moving the table through the ellipse. I prefer to use the arrangement shown in Fig. 8, in which the frame 153, which carries the journals 154 for the puttying-roll, shall have an arm 155, suitably shaped, which shall support the driving-pulleys and the intermediate gearing. The main portion of the frame 153, which carries the puttying-roll 152, is of the same general shape as the frame 136 for carrying the cutting-tool 128 and is bolted to the sliding plate 139 in the same manner. However, the end of the shaft 156 upon which the puttying-roll 152 is secured is not journaled at that end, as is the shaft 129 of the cutting-tool. No belt-pulley is employed upon the shaft 156; but it is extended rearwardly, as shown, and has another journal 157, which is carried by the arm 158, which constitutes an extension of the main portion of its supports 153. The outer end of the shaft 156 has secured thereon the gear-pinion 159, which meshes with the gear-wheel 160, which is journaled, as best shown in Fig. 10, in a frame 162, which is pivotally mounted upon a stub-shaft 162, carried by the arm 155, previously referred to. This frame 161 is provided with the handle 163 and the segmental slot 164, through which a set-screw 165 passes into the arm 155, so that the gear-wheel 160 can be swung into any desired degree of mesh with the gear-pinion 159 and secured in that position. The gear-wheel 160 meshes with the idle pinion 166, which is journaled on the stub-shaft 162, previously mentioned, and this idle pinion 166 meshes with the gear-pinion 167, which is secured upon the shaft 85, previously mentioned, or a corresponding one, this shaft 85 being for the use of the puttying-tool journaled in the bearing 168, secured upon the bracket 169, formed integral with the arm 155, and also in another bearing (not shown) in said arm. This shaft 85 has secured thereon the gear-wheel 86, previously mentioned, or a similar one, which meshes with the previously-mentioned gear-pinion 75 upon the short shaft 71, which, with its pinion 75, clutch members, and belt-pulleys, is transferred to the bearings 170, formed in the bottom of the arm 155 and the bracket 169. A different form of bracket 171 to support the yoke-lever 77^a has to be substituted on account of the raising and lowering of the driving mechanism, to be subsequently described, and to accommodate this movement the support 171 is pivoted, as at 172, to the arm 173, which is secured to the horizontal portion 67 of the frame; but the operation of throwing the mechanism into and out of mesh is the same with both tools. From the construction thus described it will be apparent that as the table is moved through an ellipse the puttying-roll 152 will be rotated at a uniform rate of speed relative to the table, which is necessary in order that the ends of the design formed by the puttying-roll shall overlap properly when the frame is completed.

As it is necessary to raise and lower not only the puttying-roll 152, but also the rotating cutter 128, I provide means whereby the supporting-plate 139, upon which the supports for these various rolls are mounted, may be raised and lowered, and this raising and lowering movement I preferably leave under the control of the operator, instead of having it occur at regular intervals, as shown in my machine in my prior application, No. 705,806, above referred to. For this purpose the supporting-plate 139 is arranged to be raised and lowered in the ways formed by bolting the overhanging strips 174 upon the front side of the upper portion of the standard 66 and the extension 69 thereof. The reciprocating support 139 has the upward extension 175, which has the overhanging flange 176 projecting rearwardly therefrom, and this flange has a screw-threaded aperture therein, through which passes the screw-threaded shaft 177, which, as best shown in Figs. 1 and 8^a, is journaled in the bearing 178, formed in the extension 69 of the frame. This shaft 177 has rigidly secured thereon the bevel-pinion 179, which meshes with the bevel-pinion 180, secured upon the end of the horizontal shaft 181, which is journaled at one end in the bearing 182,

secured upon the extension 69 of the frame, and at the other end in the bearing 183, formed in the end of the frame. This shaft 181 has rigidly secured upon it two belt-pulleys 184 and 185, and loosely mounted thereon between them are the idle belt-pulleys 186 and 187. Two belts 188 and 189, (shown in dotted lines in Fig. 1,) running from the same shaft, are adapted to coöperate with the belt-pulleys 184 and 185, respectively, the belt 189 being crossed, so that when it coöperates with its pulley 185 the shaft 181 will be rotated in one direction, while if the belt 188 coöperates with its belt-pulley 184 the shaft will be rotated in the opposite direction. It will be apparent that when one belt engages with its belt-pulley the other will be upon one of the idle pulleys, and it will also be apparent that both of these belts may be engaged with the idle pulleys 186 and 187, in which intermediate position the shaft 181 will not be moved in either direction, but will stand still. To control the direction of movement of the shaft 181 and the consequent upward or downward movement of the frame 139, I employ the belt-shifting bar 190, which is best illustrated in Figs. 1, 1ª, 2, 5, 8, and 8ª. This bar 190 is mounted to slide freely back and forth in the ways 191 and 192, secured upon the top of the framework, and has its outer end projecting forwardly at right angles to the main body of the bar, forming the arm 193, while the parallel arms 194 and 195 may be formed thereon by bolting thereto the U-shaped piece 196, all these arms being supported by the bracket 197, bolted to the top of the frame in the manner clearly shown in Figs. 1 and 1ª. These arms 193, 194, and 195 form two yokes which embrace the belts 188 and 189, so that when the bar is swung to the extreme left the belt 188 will engage with the pulley 184 to rotate the shaft 181 in one direction, while when the bar 190 is swung to its farthest position to the right the belt 189 will engage the belt-pulley 185 to rotate the shaft 181 in the other direction, while when the bar 190 is in its intermediete position the belts 188 and 189 will engage the idle pulleys 186 and 187, respectively, so that the shaft 181 will not be moved in either direction. An operating-handle 198 is pivoted to the top of the frame, as at 199, and has a pin 200 projecting upwardly from the rear end thereof and engaging with the slightly-elongated slot 201 in the arm 202, which projects rearwardly from the right end of the bar 190. By this construction it will be apparent that the operator by swinging the lever 198 to either side of the central position can cause the plate 139 to be raised or lowered, as desired, or by leaving it in intermediate position can cause the plate to stop in any desired position.

In order to prevent any possibility of marring the work by lowering either the puttying-tool or the cutter too far down, thereby damaging the machine by permitting the plate 139 to move too far up, I provide automatic means for controlling the movement of this shifting-bar 190 and by that means the movement of the frame. As will be best seen in Fig. 8ª, I secure to the top of the framework the standard 203 and pivot thereto at 204 a lever 205, which has its lower end connected to the bar 190 by the pin or set-screw 206, passing through the slot 207 in said bar. Above and below the pivotal point 204 and upon opposite sides of the lever 205 I secure the cam-lugs 208 and 209, which are arranged to contact, respectively, by the cam-lugs 210 and 211, respectively, which are adjustably secured to and move with the post 212, secured to the flange 176 upon the top of the plate 139. On a consideration of the arrangement of the parts shown in Fig. 8ª it will be readily seen that the parts as therein shown are in position of rest with the bar 190 at its intermediate position. If now the bar be moved to the right and the screw 177 is rotated so as to carry the plate 139 downward, the lug 211 will contact almost immediately with the lug 209, so as to swing the bar 190 back to its neutral position and stop the machine, the parts being shown at substantially the limit of their downward movement. If now the bar 190 be swung to the left, so as to rotate the screw 170 in the direction to raise the plate, the cam-lug 208 will be rocked over into the path of the lug 210, which as soon as the plate 139 has been raised to the required distance will contact with the said lug 208 and shift the lever 205 and the bar 190 back to its initial position, so as to stop the upward movement of the plate 139.

If desired, a set-screw or bolt 213 may be screwed through the flange 176 and have the locking-nut 214 thereon, by which it may be adjusted in position, so that its lower end will contact with the top of the frame as the downward movement of the plate 139 is stopped and by this resistance to compression tend to immediately check the movement of the screw 177 and the shaft 181 and its associated parts, the momentum of which is thus instantly overcome.

While I have shown my invention as embodied in the form which I at present consider best adapted to carry out its purpose, it will be understood that it is capable of modifications and that I do not desire to be limited in the interpretation of the following claims, except as may be necessitated by the state of the art.

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

1. In a device of the class described, the combination with a supporting-plate having two pivoted focal bearings thereon, of a rotating and reciprocating table having the ways formed therein crossing each other at right angles and coöperating with said focal bearings, an elliptical rack rigidly secured to said table, a pinion meshing with said rack, and means for rotating said pinion.

2. In a device of the class described, the combination with a supporting-plate having two pivoted focal bearings thereon, one of said bearings being adjustable to and from the other, of a rotating and reciprocating table having the ways formed therein crossing each other at right angles and coöperating with said focal bearings, an elliptical rack rigidly but removably secured to said table, a pinion meshing with said rack, and means for rotating said pinion.

3. In a device of the class described, the combination with a supporting-plate having two pivoted focal bearings thereon, of a rotating and reciprocating table having the ways formed therein crossing each other at right angles and coöperating with said focal bearings, an elliptical rack rigidly secured to said table, a pinion meshing with said rack, a forming-tool mounted to rotate adjacent to the table, and means for synchronously rotating said pinion and forming-tool.

4. In a device of the class described, the combination with a supporting-plate having two focal bearings thereon, of a rotating and reciprocating table having the ways formed therein crossing each other at right angles and coöperating with said focal bearings, an elliptical rack rigidly secured to said table, a pinion meshing with said rack, a forming-tool mounted to rotate adjacent to said table, a frame in which said forming-tool is mounted, means for raising and lowering said frame to bring the forming-tool into and out of engagement with the work on the table, a driving-pulley supported by said forming-tool frame, connections between said driving-pulley and forming-tool for rotating the latter, and flexible connections between said driving-pulley and the pinion meshing with the rack to permit the movement of the pulley caused by the raising and lowering of the frame.

5. In a device of the class described, the combination with the frame, of a table mounted to rotate and reciprocate upon said frame, an elliptical rack secured upon said table, a pinion meshing with said rack, means for rotating said pinion, and connections between said frame and table to compel it to move in an elliptical path as its rotation is forced by said pinion.

6. In a device of the class described, the combination with a stationary frame having a supporting-plate pivoted thereto and adapted to swing horizontally thereon, two focal bearings mounted on said plate, a rotating and reciprocating table having the ways formed therein crossing each other at right angles and coöperating with said focal bearings, an elliptical rack rigidly secured to said table, a pinion meshing with said rack, means for rotating said pinion, and mechanism for automatically swinging said plate synchronously with the movement of the table.

7. In a device of the class described, the combination with a stationary framework, of a supporting-plate pivoted thereto and adapted to swing horizontally thereon, two focal bearings mounted on said plate, a rotating and reciprocating table having ways formed therein crossing each other at right angles and cooperating with said focal bearings, an elliptical rack rigidly secured to said table, a pinion meshing with said rack, a forming-tool adapted to rotate adjacent to said table, and means for synchronously rotating said pinion and forming-tool and automatically swinging said plate, substantially as and for the purpose described.

8. In a device of the class described, the combination with the stationary frame, of a swinging plate pivotally mounted thereon, a table mounted to rotate and reciprocate relative to said plate, an elliptical rack secured to said table, a pinion meshing with said rack, means for rotating said pinion, connections between said plate and table to compel the latter to move in an elliptical path as its rotation is forced by said pinion, and means for swinging said plate synchronously with the movement of said table, substantially as and for the purpose described.

9. In a device of the class described, the combination with the stationary frame, of a swinging plate pivotally mounted thereon, a table mounted to rotate and reciprocate relative to said plate, an elliptical rack secured to said table, a pinion meshing with said rack, means for rotating said pinion, connections between said plate and table to compel the latter to move in an elliptical path as its rotation is forced by said pinion, and means for swinging said plate synchronously with the movement of said table, said means comprising a rotating arm journaled in the support for the said plate and having a bearing portion thereof coöperating with an elongated slot or way in the stationary frame, substantially as and for the purpose described.

10. In a device of the class described, the combination with the stationary frame, of a swinging plate pivotally mounted thereon, a table mounted to rotate and reciprocate relative to said plate, an elliptical rack secured to said table, a pinion meshing with said rack, means for rotating said pinion, connections between said plate and table to compel the latter to move in an elliptical path as its rotation is forced by said pinion, and means for swinging said plate synchronously with the movement of said table, said means comprising a gear-pinion journaled in the support for said plate carrying an arm rigidly secured thereto having a bearing-piece pivoted thereto and coöperating with an elongated slot or way in the stationary frame, substantially as and for the purpose described.

11. In a device of the class described, the combination with the stationary frame, of a swinging plate pivotally mounted thereon, a table mounted on said plate, gearing for rotating and reciprocating said table upon said plate, and means for swinging said plate syn-

chronously with the movement of the table comprising a rotating arm journaled in the support for said plate and having a bearing portion thereof coöperating with an elongated slot or way in the stationary frame.

12. In a device of the class described, the combination with the stationary frame, of a swinging plate pivotally mounted thereon, a table mounted on said plate, gearing for rotating and reciprocating said table upon said plate, and means for swinging said plate synchronously with the movement of the table comprising a gear-pinion journaled in the support for said plate and carrying an arm rigidly secured thereto which has a bearing-piece pivoted thereto coöperating with an elongated slot or way in the stationary frame.

13. In a device of the class described, the combination with a forming-tool, of a work-carrying table mounted adjacent to said tool, and means for simultaneously giving an elliptical movement to said table and also swinging it so that the line of movement of any portion of said table as it passes beneath said tool shall always be exactly at right angles to the axis of said tool.

14. In a device of the class described, the combination with a forming-tool, of a work-carrying table and means for simultaneously rotating it and reciprocating it in one direction so as to cause any point of it to move through an ellipse relative to the forming-tool, a swinging support for said table, and means for vibrating said support synchronously with the elliptical movement of the table so that the line of movement of the portion of the table passing beneath the forming-tool is always at right angles to the axis of said tool.

15. In a device of the class described, the combination with a forming-tool, of a work-carrying table mounted adjacent to said tool, and means for simultaneously giving an elliptical movement to said table and also synchronously swinging it the same distance and at a corresponding rate of speed at any point on either side of the center of its arc of vibration so that the line of movement of the portion of the table passing beneath the forming-tool is always at right angles to the axis of said tool.

16. In a device of the class described, the combination with the plate carrying the forming-tool, of the mechanism for reciprocating said plate, and means for automatically stopping said mechanism comprising the belt-shifting bar having the lever pivotally connected thereto, and a cam-lug on said lever adapted to be contacted by a stop-lug on said plate when it reaches a certain point in its movement.

17. In a device of the class described, the combination with the plate carrying the forming-tool, of the mechanism for reciprocating said plate, and means for automatically stopping said mechanism at the limit of the movement of the plate in either direction, said means comprising the belt-shifting bar for the lever pivotally connected thereto, and a pair of cam-lugs on said lever adapted to be contacted by coöperating stop-lugs on the plate when it reaches the desired points in its movement.

18. In a device of the class described, the combination of a supporting-table, with mechanism for automatically moving it so as to cause any point on it to move through an ellipse, a tool-carrying frame movable to and from said supporting-table, and means for automatically moving said tool-carrying frame to and from the table at any time desired by the operator.

19. In a device of the class described, the combination of a supporting-table, with mechanism for automatically moving it so as to cause any point on it to move through an ellipse, a tool-carrying frame movable to and from said supporting-table, and means for automatically moving said tool-carrying frame to and from the table at any time desired by the operator, said means comprising a belt-shifting bar controlled by the operator and coöperating with fast and loose pulleys on a shaft geared to a screw coöperating with said tool-carrying frame, substantially as described.

20. In a machine of the class described, the combination of a supporting-table, with a forming-tool coöperating therewith, means for automatically raising and lowering said tool comprising a screw coöperating with the support of said forming-tool, and connections for automatically rotating said screw and mechanism for automatically moving said table so as to cause it to move through an ellipse relative to said tool.

21. In a machine of the class described, the combination of a supporting-table, with a forming-tool coöperating therewith, means for automatically raising and lowering said tool at any time desired by the operator, and mechanism for automatically moving the frame so as to cause it to move through an ellipse relative to said tool.

22. In a device of the class described, the combination of the table, and means for moving it through an ellipse, with the forming-tool coöperating therewith and mounted in a frame, means for automatically moving said frame to and from the table, means for stopping the movement of said frame toward the table at a certain distance therefrom, and an adjustable stop on the frame adapted to contact with the stationary part of the machine at the instant the stopping means comes into action.

23. In a device of the class described, the combination with a stationary framework, of a supporting-plate mounted to swing thereon, a table mounted on said plate, a forming-tool mounted to rotate adjacent to said plate, and mechanism for simultaneously swinging said plate, moving said table thereon in an ellipse, and synchronously rotating said tool so that

the design upon said tool will be accurately pressed upon an elliptical frame carried by said table.

24. In a device of the class described, the combination with a stationary framework, of a supporting-plate mounted to swing thereon, a table mounted on said plate, means for simultaneously rotating and reciprocating said table upon the plate to move it through an ellipse, and means for swinging said plate synchronously with the movement of the table for the purpose described, said means comprising a rotating arm journaled in connection with said plate and having a bearing portion thereof coöperating with an elongated slot or way in the stationary framework.

25. In a device of the class described, the combination with the grid having the pivotal bearing thereon, a swinging plate mounted on said grid by means of said pivotal bearing, a shaft having its stationary bearing on said grid and provided with a bevel gear-wheel at one end, a shaft having bearings in said plate and having a bevel gear-wheel secured thereon, and an idle bevel gear-pinion mounted in line with said pivotal bearing and engaging with the bevel gear-pinions on said shafts, substantially as and for the purpose described.

26. In a device of the class described, the combination with the grid having the pivotal bearing thereon, a swinging plate mounted on said grid by means of said bearing, a shaft having bearings supported by said grid and with a bevel gear-pinion secured to one end thereof, a shaft mounted in bearings in said swinging plate and having bevel gear-pinions at the end thereof and also an intermediate bevel gear-pinion, two shafts suitably mounted in relation to said swinging plate and having bevel gear-pinions on their ends meshing with the bevel gear-pinions on the end of the shaft in said plate, and an idle bevel gear-pinion mounted in line with said pivotal bearing and meshing with the bevel gear-pinion on the shaft mounted on the grid and with the intermediate bevel gear-pinion on the shaft mounted in the plate, substantially as and for the purpose described.

27. In a device of the class described, the combination with the stationary frame, of a swinging plate, an arm journaled in said plate and having a bearing at one end coöperating with an elongated slot or way in the swinging plate, and means for rotating said arm.

28. In a device of the class described, the combination with a table and means for rotating it, of a forming-tool and means for rotating it to coöperate with the edge of a frame placed on said table, a second forming-tool and means for rotating it to coöperate with the top of said frame, and mechanism whereby said forming-tools may be shifted alternately into position to operate on said frame.

29. In a device of the class described, the combination with a table and means for rotating it, of a forming-tool and means for rotating it, a support for said tool whereby it can be moved horizontally to bring it into and out of coöperative engagement with the edge of the frame placed on said table, a second forming-tool and means for rotating it, a support for said second tool which can be moved vertically to bring it into and out of coöperative engagement with the top of said frame, and mechanism whereby said supports may be shifted to bring said forming-tools alternately into position to operate on said frame.

30. In a device of the class described, the combination with a table, and means for rotating and reciprocating it simultaneously so as to cause it to move through an ellipse, of a forming-tool and means for rotating it to coöperate with the edge of an elliptical frame placed on said table, a second forming-tool and means for rotating it to coöperate with the top of said frame, and mechanism whereby said forming-tools may be shifted alternately into position to operate on said frame.

31. In a device of the class described, the combination with a table, and means for rotating and reciprocating it simultaneously so as to cause it to move through an ellipse, of a forming-tool and means for rotating it, a support for said tool whereby it can be moved horizontally to bring it into and out of cooperative engagement with the edge of the elliptical frame placed on said table, a second forming-tool and means for rotating it, a support for said second tool which can be moved vertically to bring it into and out of coöperative engagement with the top of said frame, and mechanism whereby said supports may be shifted to bring said forming-tools alternately into position to operate on said frame.

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