

No. 679,039.

Patented July 23, 1901.

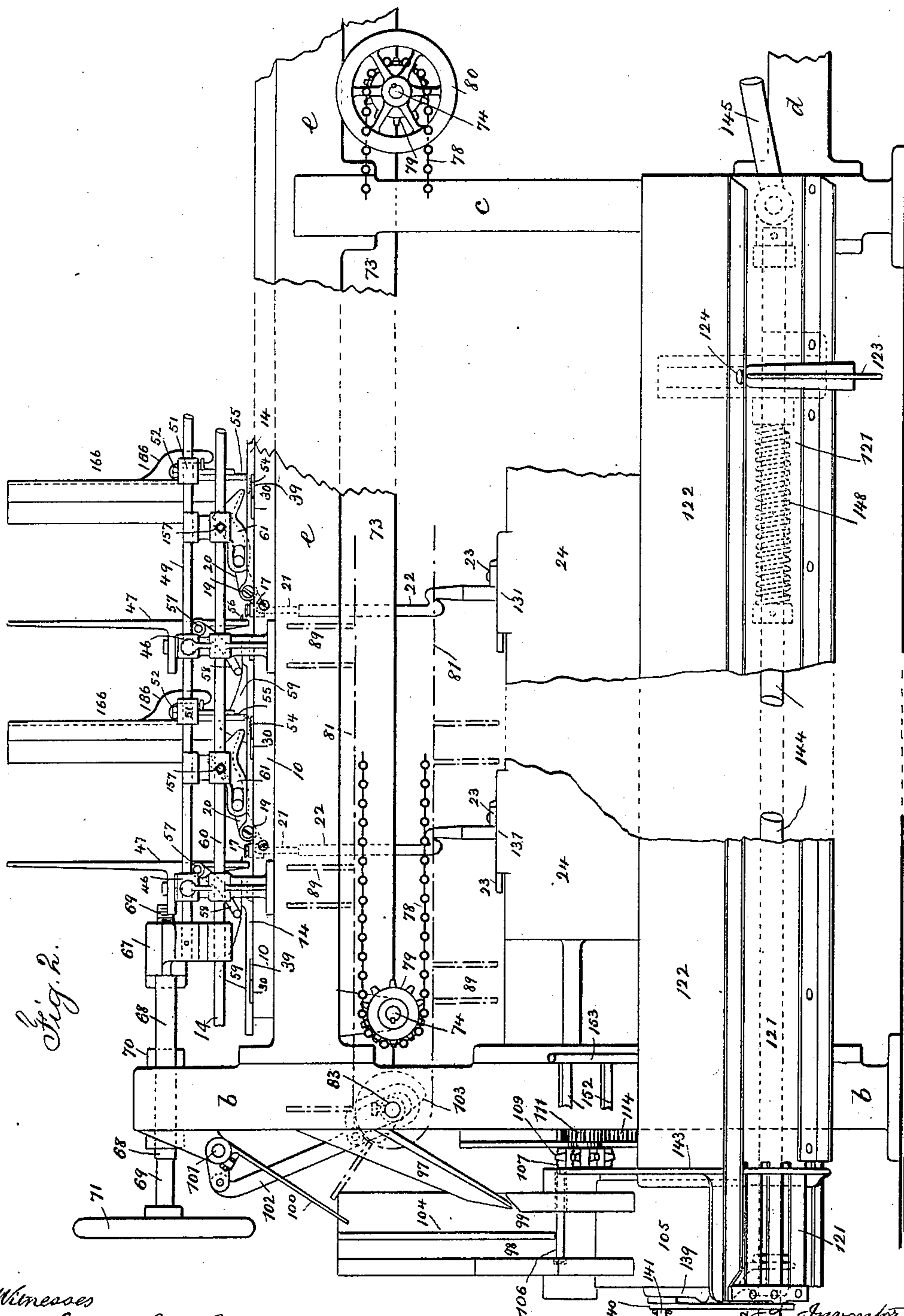
J. E. SMYTH,

MACHINE FOR GATHERING SIGNATURES.

(Application filed Sept. 24, 1900.)

(No Model.)

8 Sheets—Sheet 2.



Witnesses

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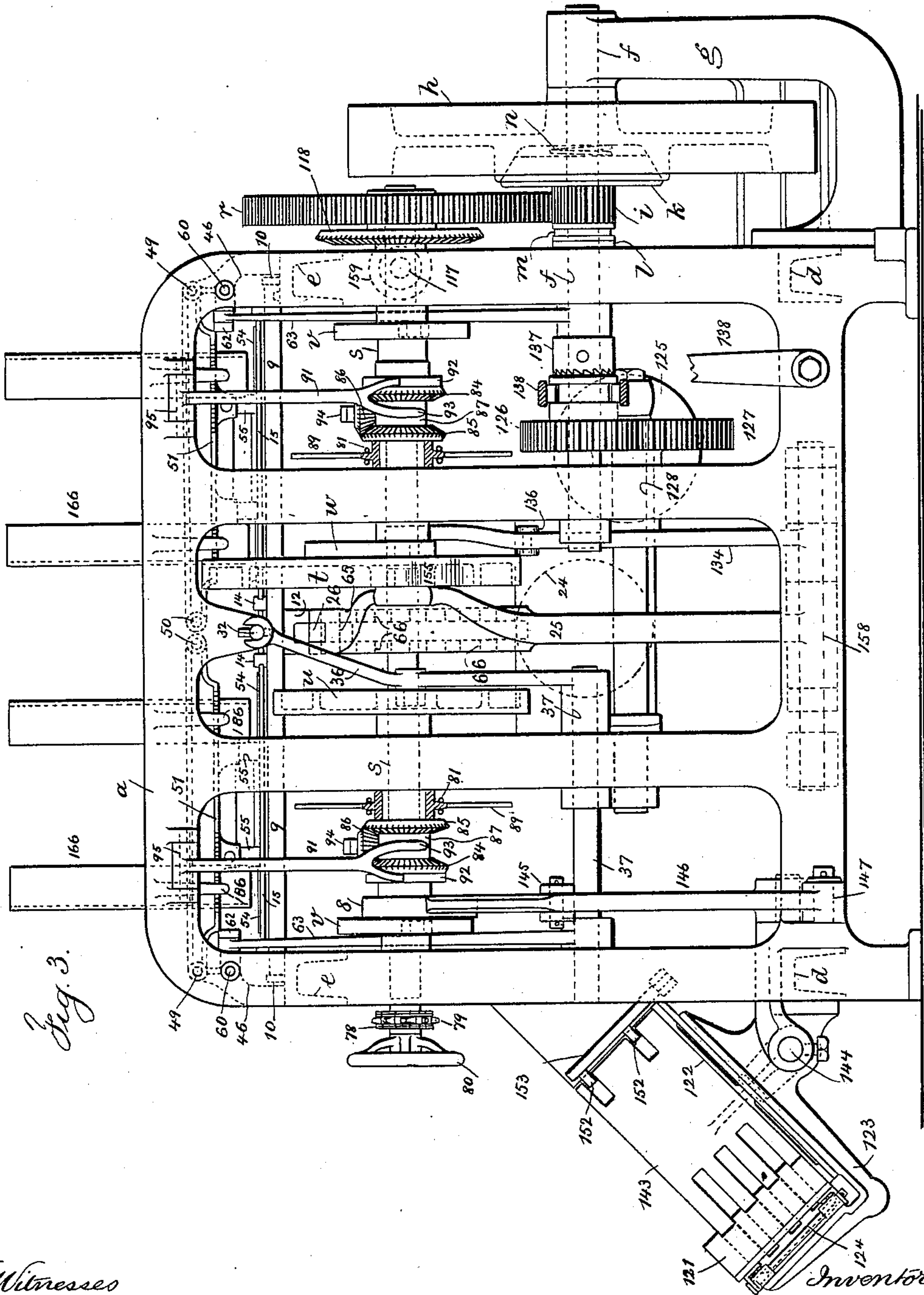
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8 Sheets—Sheet 3.



Witnesses

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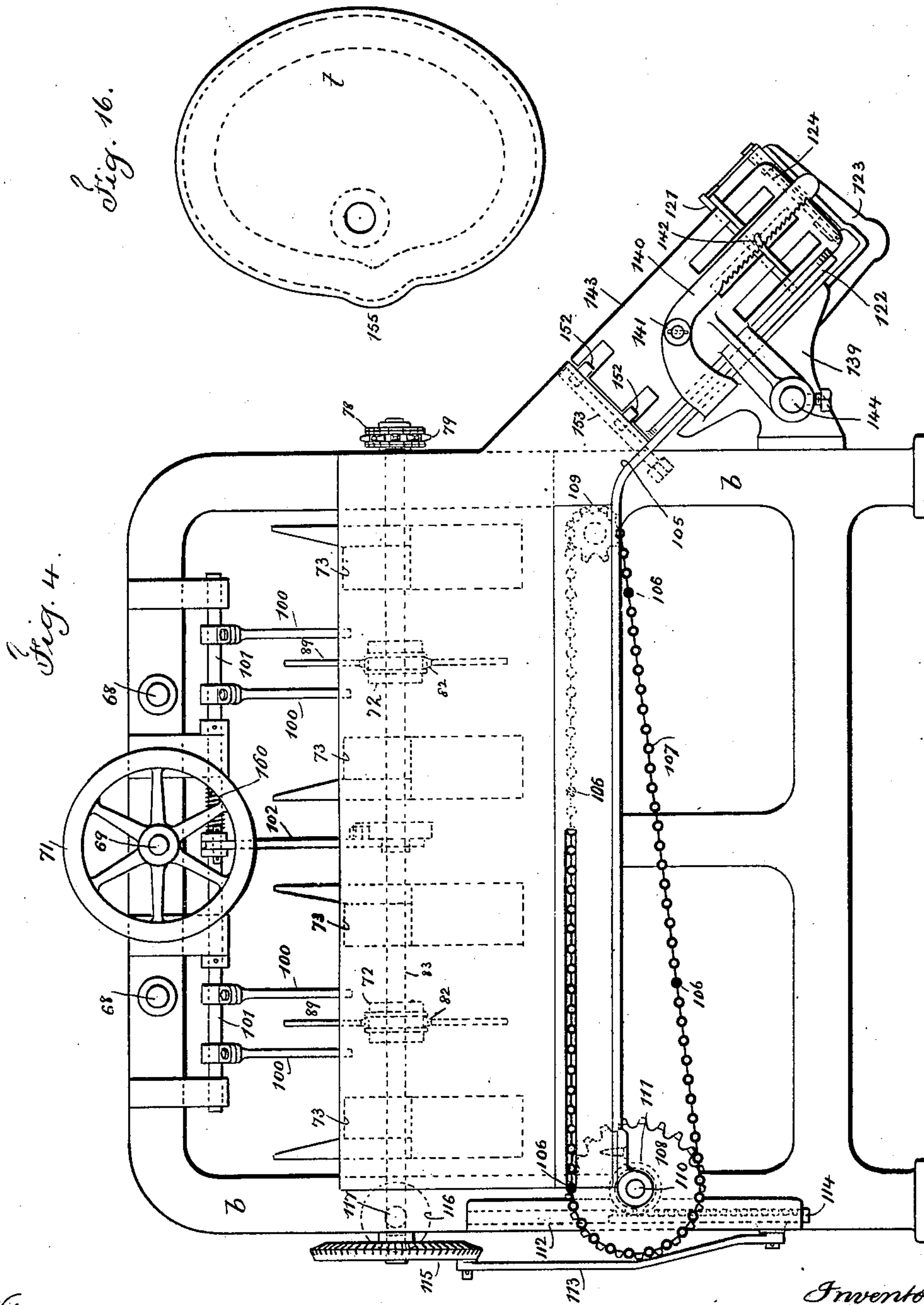
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(No Model.)

8 Sheets—Sheet 4.



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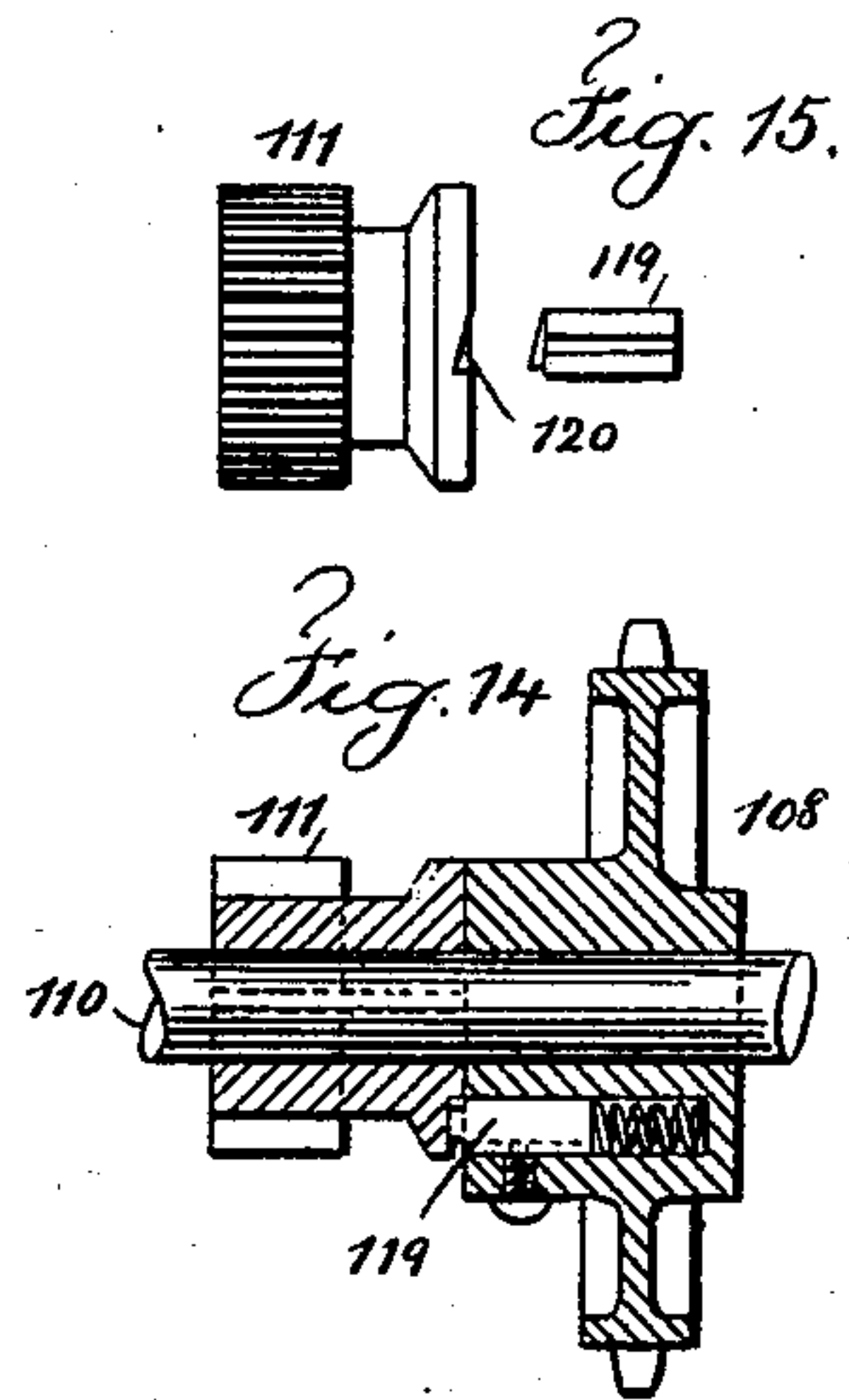
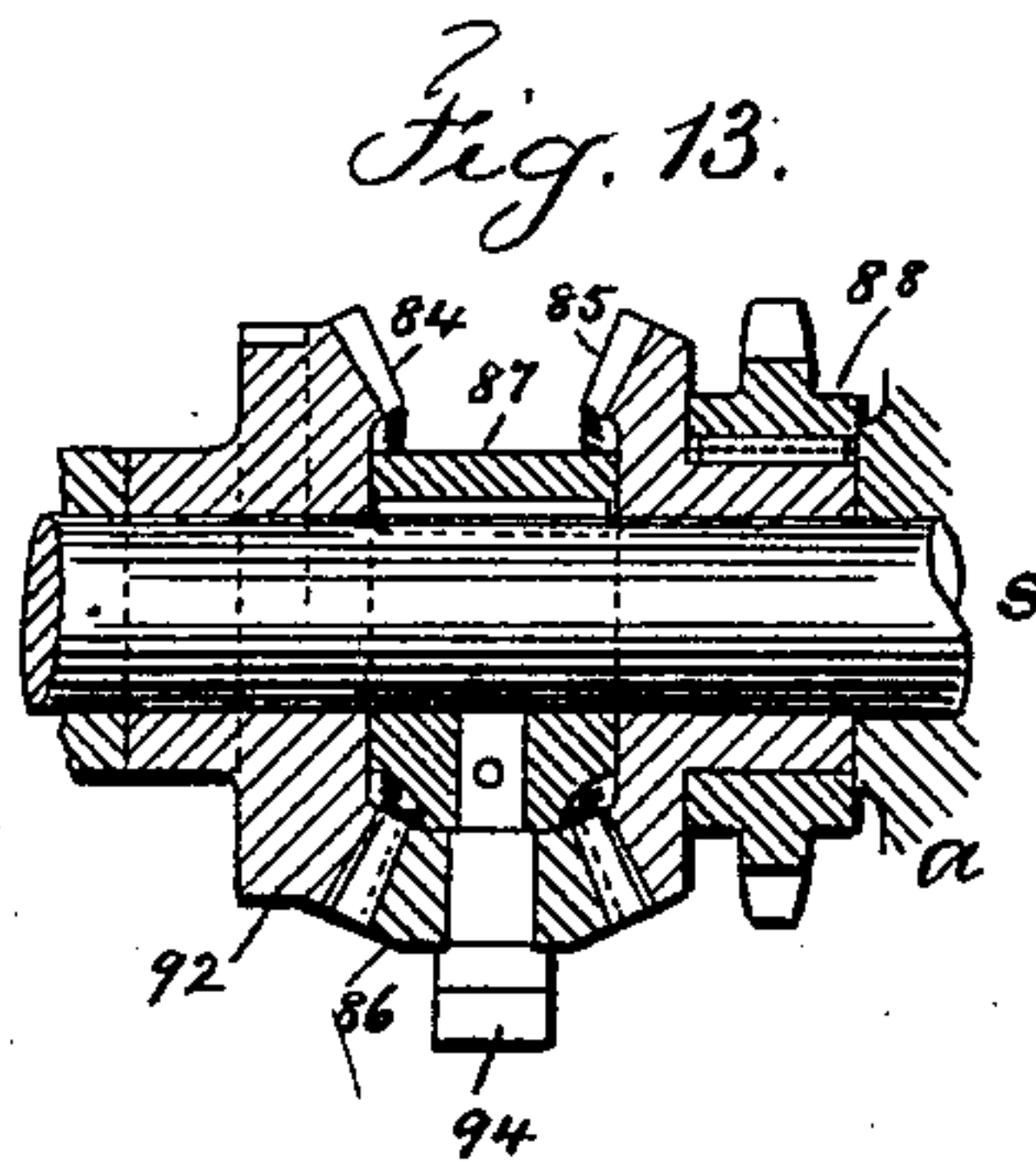
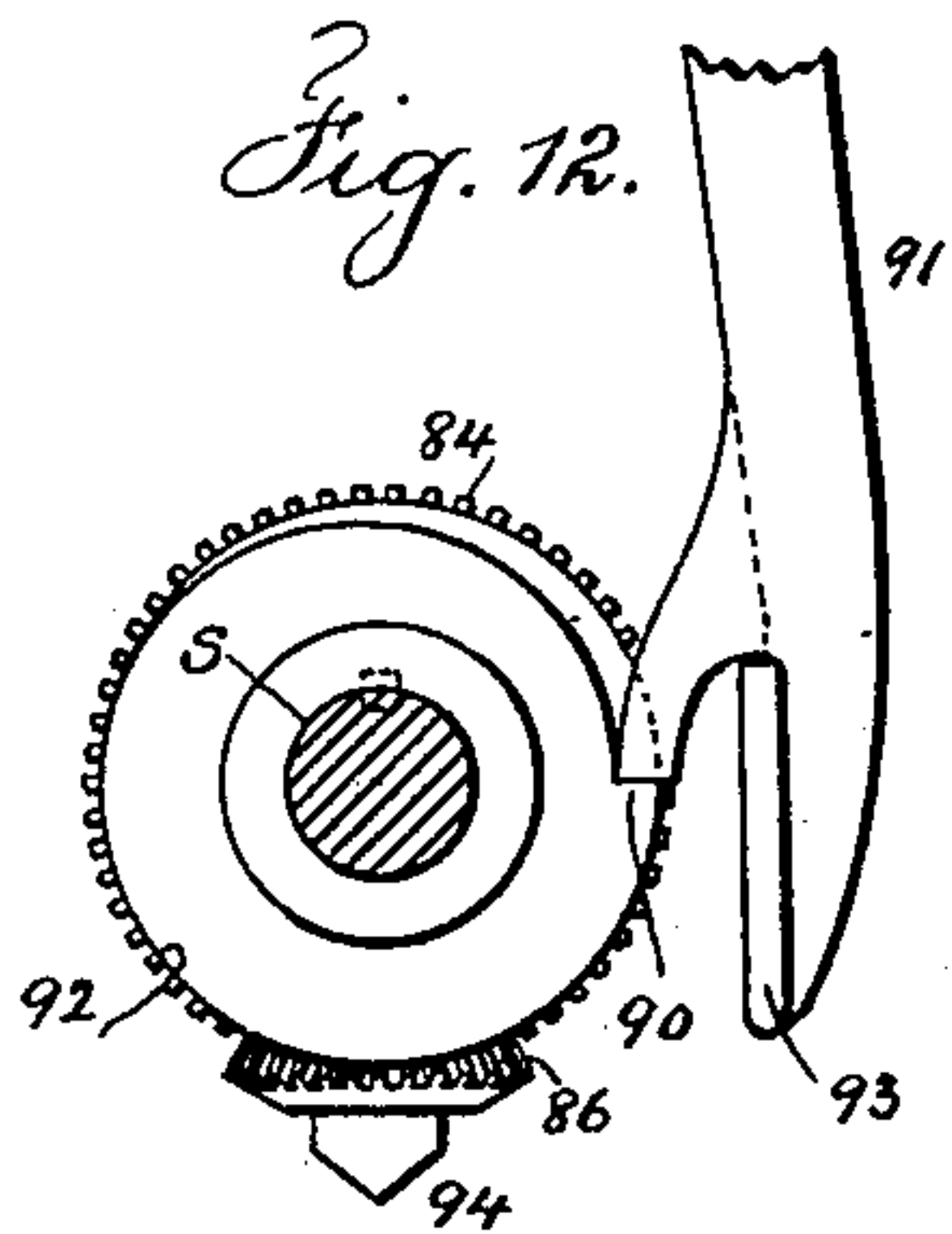
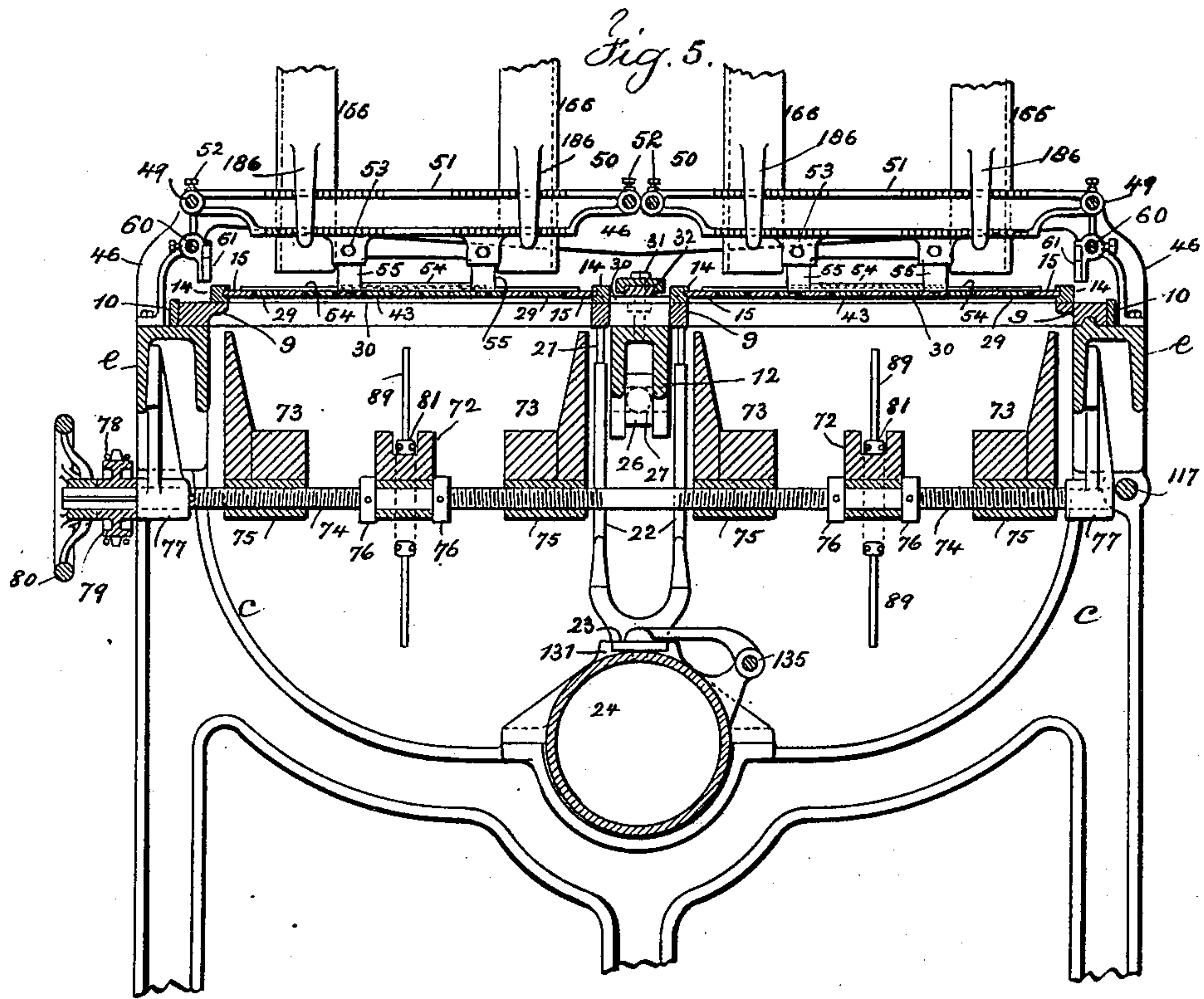
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8 Sheets—Sheet 5.



Witnesses

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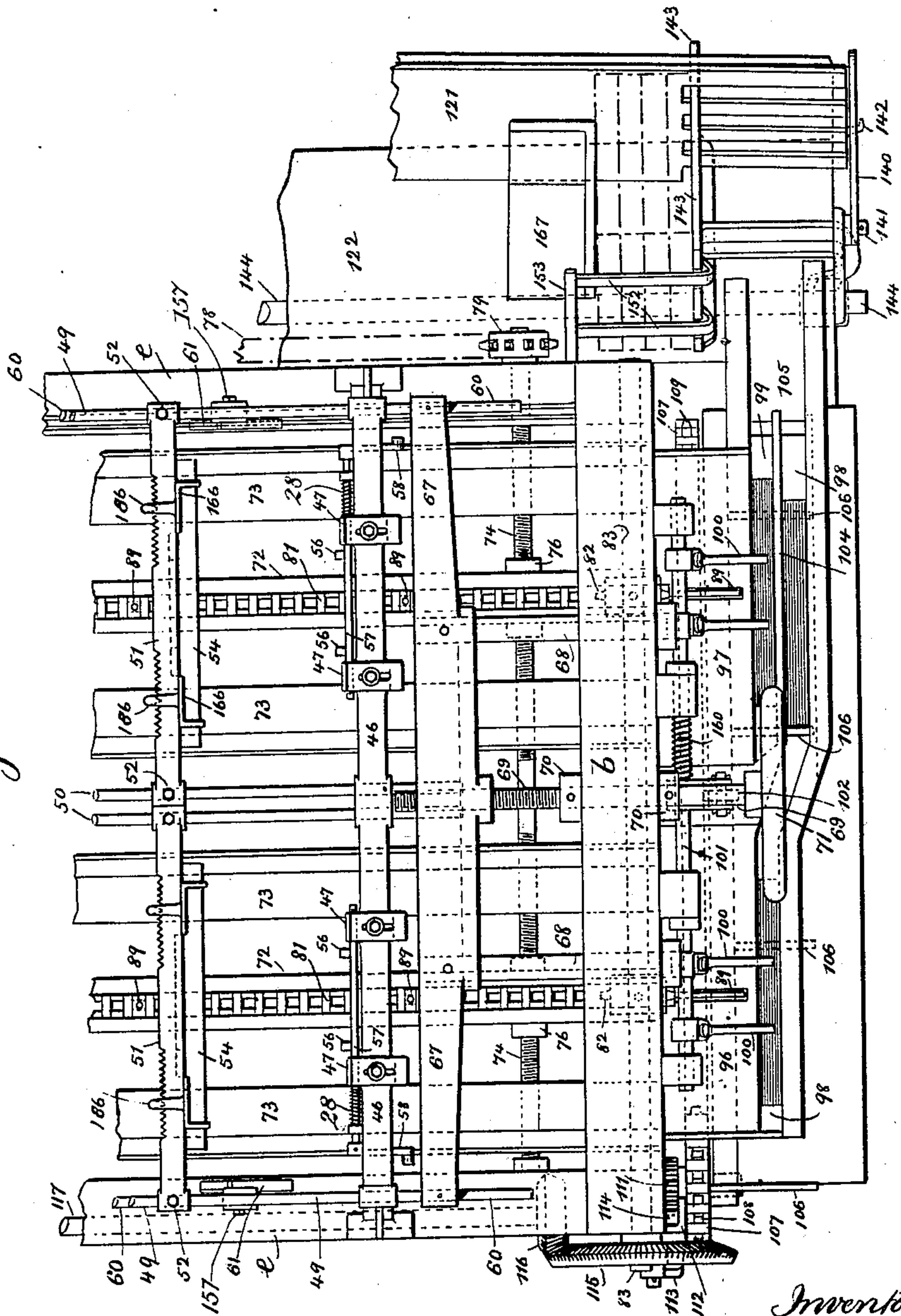
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8 Sheets—Sheet 6.

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Fig. 6.



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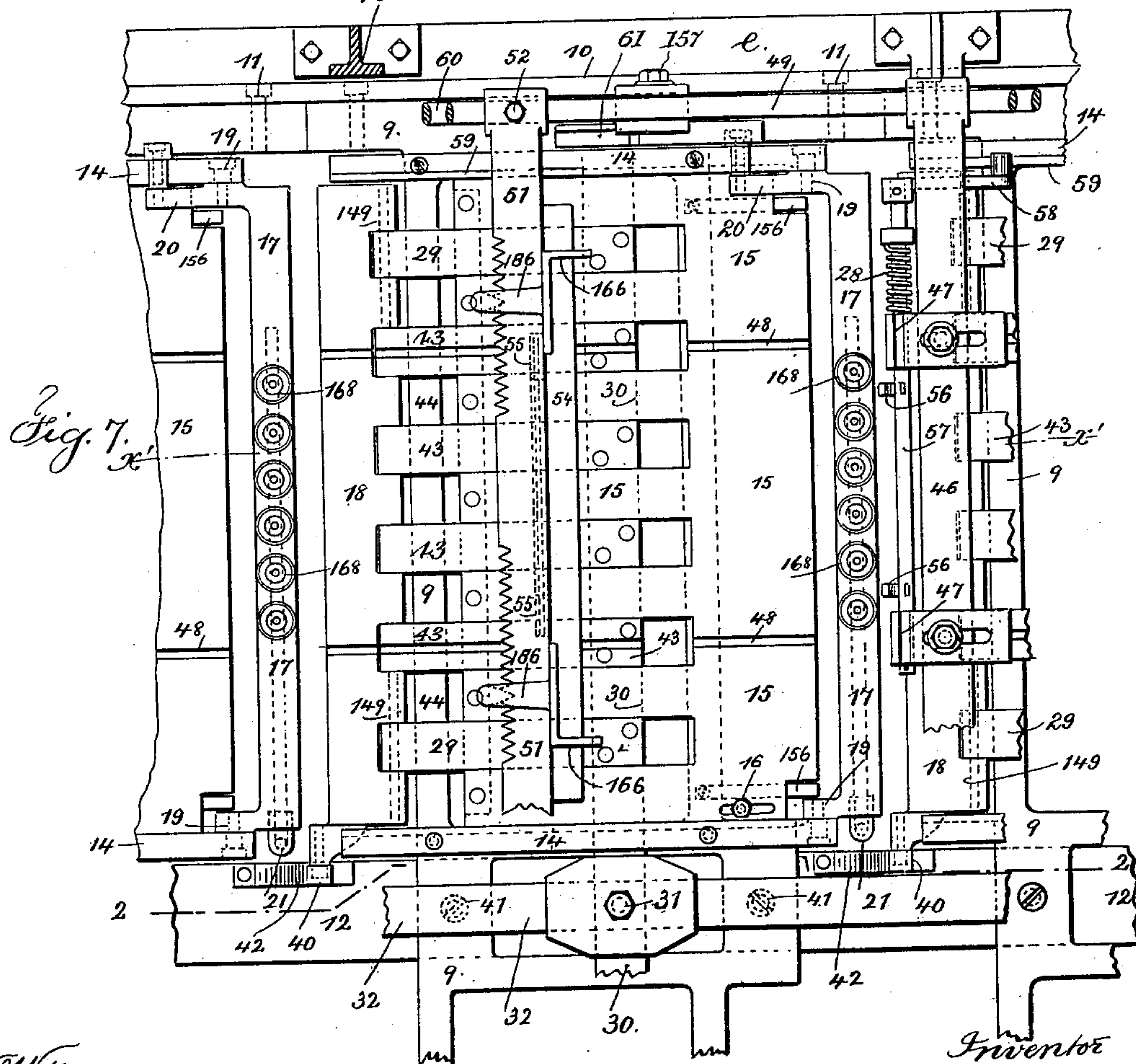
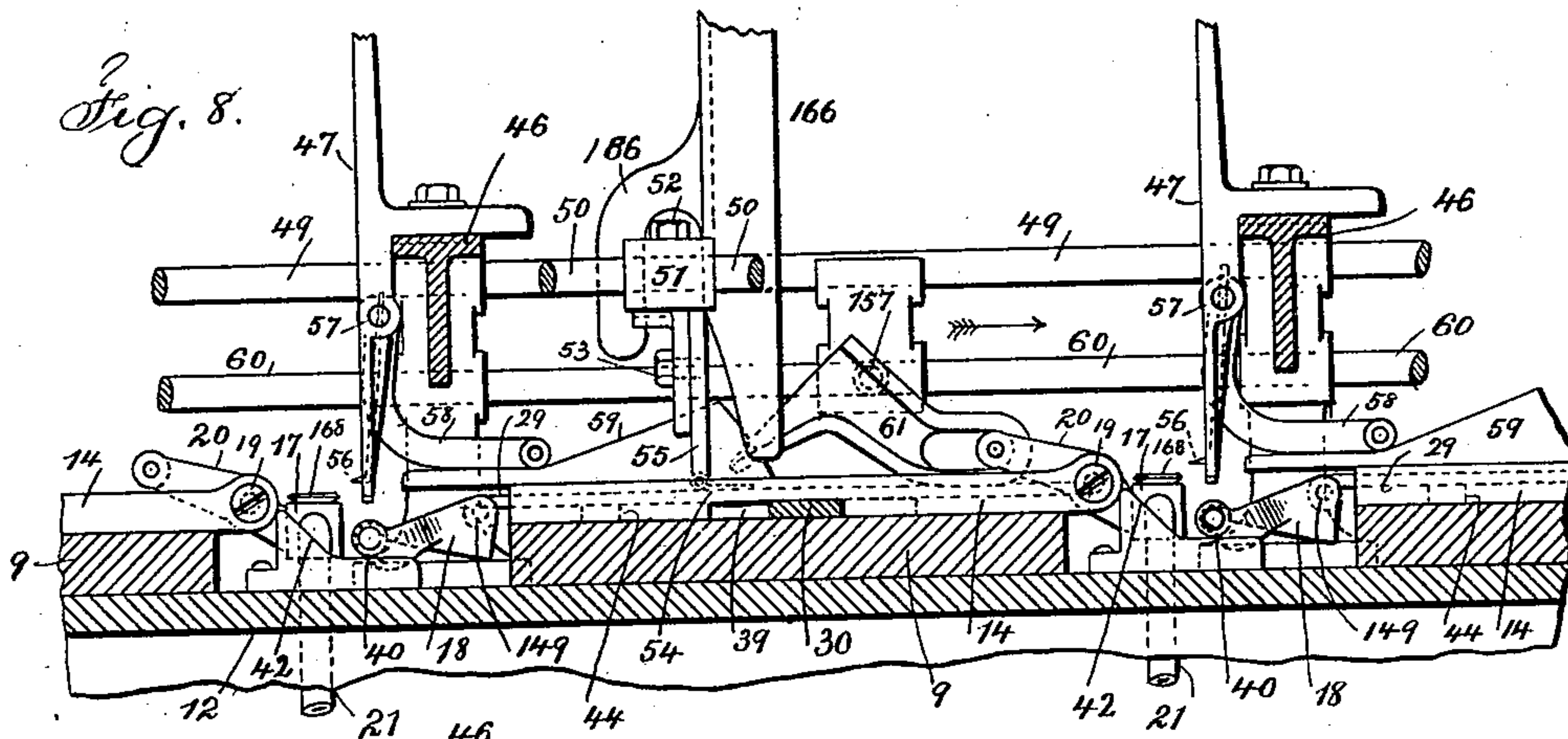
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8 Sheets—Sheet 7.

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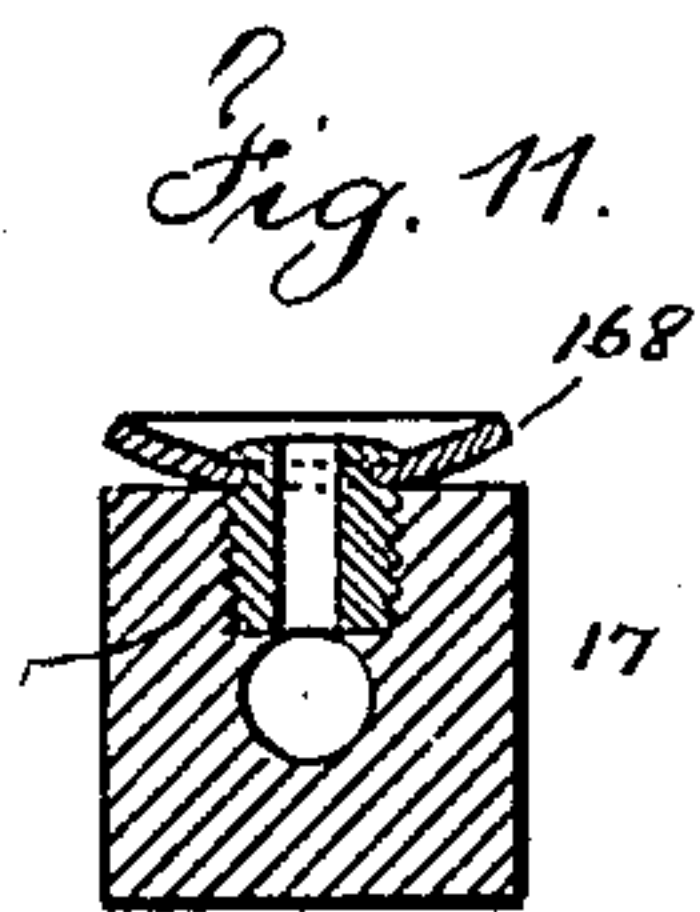
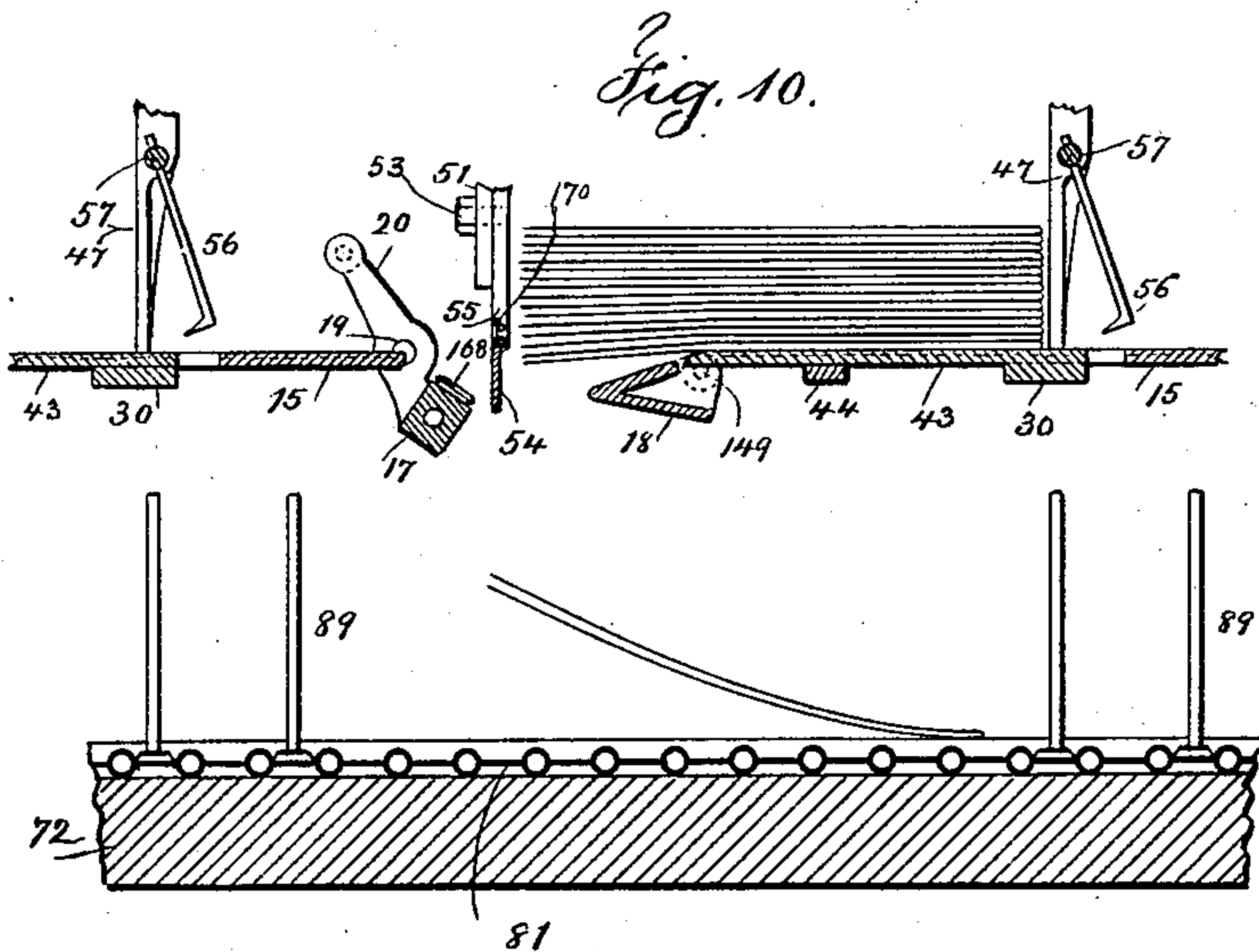
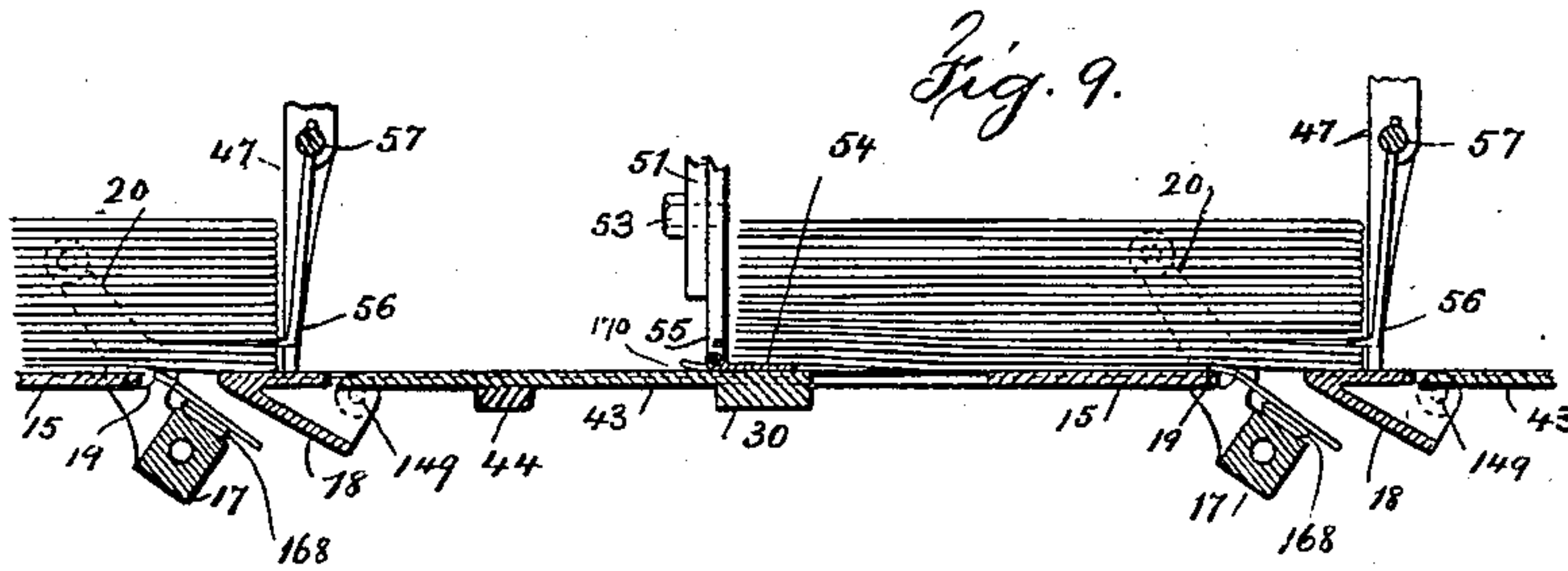
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8 Sheets—Sheet 8.



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UNITED STATES PATENT OFFICE.

JOSEPH E. SMYTH, OF PASADENA, CALIFORNIA.

MACHINE FOR GATHERING SIGNATURES.

SPECIFICATION forming part of Letters Patent No. 679,039, dated July 23, 1901.

Application filed September 24, 1900. Serial No. 30,893. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH E. SMYTH, a citizen of the United States, residing at Pasadena, in the county of Los Angeles and State of California, have invented an Improvement in Machines for Gathering Signatures, of which the following is a specification.

In an application for patent filed by me June 29, 1900, Serial No. 22,066, a machine for gathering signatures is shown and described, in which the signatures to be gathered are in boxes above a reciprocating table, and said table is slotted at each box, and an atmospheric separator is applied at each slot. Said separators act upon the lower signature of each pile of signatures, near the folded back edges thereof, and bend the same downward, so that said signatures pass through the slots in the table, and the signatures so bent down are separated from the piles of signatures by the reciprocating table passing between the signatures bent down and the signatures above.

In my present invention I make use of the slotted reciprocating table and the atmospheric separators, and I employ in addition a hinged deflector adjacent to each separator, to pass in quickly between the signature bent down by the separator and the next signature above it before the reciprocating table moves forward, so as to insure but one signature at each pile of signatures passing down through the slot in the reciprocating table at each downward movement of the separators. I provide means for adjusting simultaneously all the signature-receptacles to adapt them to the width of the signature to be gathered, and I provide for adjusting the movement of the reciprocating table, so as to give said table a movement about equal to the width of the receptacles. I make use of hooks for supporting the signatures at their folded back edges, so as to take the weight off the signatures below said hooks, and thereby lessen the risk of the folded back portions of the lowermost signatures passing into the slots when the separators are depressed. I also provide means for determining the length of that portion of the signatures bent by the separators, as thick paper requires a greater length of bend than thin paper, so as to adapt the machine to op-

erating upon all kinds of paper. I also provide means for giving to the reciprocating table at the end of its forward movement a short and quick forward-and-backward movement, so as to "jog" the signatures and separate and loosen them at their front cut edges, where they are liable to mat together, and thereby prevent the sheets that are being separated being held at said front edges.

My invention also relates to means for adjusting the supports upon which the gathered signatures fall, so as to make them the proper width for the length of the signatures, to means for operating the chains that convey the signatures from said supports, to means for adjusting the receiving-trough into which the signatures are assembled, and to other features of invention hereinafter referred to.

In the drawings, Figure 1 is a side elevation of a portion of the machine at one end thereof. Fig. 2 is a similar view at the other end of the machine, but looking at the opposite side of the machine. Fig. 3 is an end view of that portion of the machine shown in Fig. 1. Fig. 4 is an end view of that portion of the machine shown in Fig. 2. Fig. 5 is a cross-section of the machine at about the middle thereof. Fig. 6 is a plan of the machine at the end shown in Fig. 2. In this view the reciprocating table and its parts are not shown. Fig. 7 is a plan view of a portion of the reciprocating table, showing the devices at one signature-receptacle. Fig. 8 is a section at about the line 2 2 of Fig. 7. Figs. 9 and 10 are sectional views at about the line $x' x'$ of Fig. 7. In Fig. 9 the reciprocating table is about to commence its forward movement and in Fig. 10 said table is at the end of its forward movement. Figs. 7, 8, 9, and 10 are drawn to the same scale, but in larger size than the previously-recited figures. Fig. 11 is a cross-section of the atmospheric separator, also in larger size. Fig. 12 is an elevation, and Fig. 13 is a section, of the devices that control the movement of the endless chain that moves the signatures along upon the signature-slide. Fig. 14 is a section, and Fig. 15 is an elevation, of the devices that control the movement of the endless chain that moves the signatures along in the transverse troughs. Fig. 16 is an elevation of the cam that gives movement to

the reciprocating table. Fig. 17 is a detached view of part of the clutch for the power-shaft.

The frame of the machine is composed of the end frames *a* and *b*, a frame *c* at about the middle portion of the machine, and the longitudinal bars or rails *d e*, forming the side frames. Said rails *d e* are securely bolted to the frames *a b c*.

f is a shaft supported in the standard *g* and end frame *a*, and *h* is a pulley firmly secured to said shaft, and power is applied to said pulley by a belt to rotate said pulley and shaft.

i is a pinion loose upon the shaft *f*, and *k* is a conical friction-clutch keyed or otherwise secured to a sleeve of said pinion, and said friction-clutch is adjacent to a conical recess in the pulley *h*.

l is a collar secured to the shaft *f*, and *m* is a wedge between the collar *l* and pinion *i*, and said wedge is slotted for the passage of the shaft *f*.

n is a spring between the friction-clutch *k* and pulley *h*.

When the wedge *m* is moved in one direction, it forces the pinion *i* and clutch *k* sideways and brings the conical surface of *k* in contact with the surface of the conical recess in the pulley *h*, thereby causing the pinion *i* to rotate with the shaft *f*, and when the wedge is moved in the reverse direction the spring *n* forces the clutch away from the pulley *h* and the pinion ceases to revolve with the shaft *f*. As a convenient means for moving said wedge *m* I have shown said wedge as connected with a lever *o* by a rod *q*, and said lever at its upper end is connected to a rod *p*, that may extend the entire length of the machine, and by moving said rod in one direction or the other the wedge is operated as aforesaid to start or stop the machine.

The pinion *i* gives motion to a wheel *r*, keyed to a shaft *s*, supported in bearings on the frame *a*, and on said shaft is a cam *t* for giving movement to the reciprocating table, a cam *u* for actuating the deflector, cams *v v* for operating the atmospheric separators, a cam *w* for actuating the valves of an exhaust-cylinder, hereinafter referred to, and a cam *8* for giving movement to the device that draws along the assembled signatures in the receiving-trough.

The reciprocating table and devices for actuating the same.—The reciprocating table 9 is composed of a number of sections of open-work castings. Said castings are between the side bars 10, and screws at 11 pass through said bars and into the sections for securely holding them in place, and there is a channel-bar 12 below said sections and centrally of the same, to which said sections are screwed at 41. The reciprocating table at its sides rests upon the upper surface of the top rails *e*, and upon one of said rails there is a V-shaped rib extending the entire length of the rail, and said rib passes into a correspondingly-shaped groove in the under side of the table-sections, so as to guide the table in its

movement. The table 9 receives its movement from the cam *t*, acting upon a lever 25, and a connecting-rod 26 is connected at one end to the lever 25 and at the other end to the table 9 at 27. I make use of two ranges of receptacles for the signatures to be gathered—one at each side of the center line of the machine—and as said receptacles are alike and as the devices for taking the signatures from said receptacles are the same at each receptacle I will describe but one receptacle and the parts operating in connection with it.

14 14 are metal bars screwed to the table 9, as shown in Fig. 7, and the inner faces of said bars are grooved to receive the ends of a plate 15, upon which plate the pile of signatures is supported. Said plate can be moved lengthwise of the table to adjust it to position, and after adjustment said plate is clamped by a screw 16 passing through a slot in said plate 15 and into the table 9, so that said plate and table move together when the table is reciprocated. The sections forming the table 9 are shaped, as shown in Figs. 7 and 8, so that there is an opening or slot between each two sections, and at this opening is located the atmospheric separator 17 and the deflector 18.

The atmospheric separator and means for operating the same.—The atmospheric separator is represented as a rectangular bar perforated horizontally the greater part of its length and having a number of perforated plugs screwed into the same, with a cup-shaped disk of rubber forming a sucker 168, attached to the outer end of each plug. Said atmospheric separator is pivoted at 19 to the bars 14, and it has an arm 20 projecting therefrom, with a roller at the end of said arm for a cam to act upon that raises and lowers said separator, as hereinafter explained. A metal tube 21 is screwed into one end of the separator and communicates with the horizontal perforation therein, and a flexible tube 22 is connected to the tube 21 and to a tubular projection on a valve 23 of an exhaust-cylinder 24. The exhaust-cylinder 24 extends the entire length of the machine and centrally of the same, and it is supported by the end frames *a b* and central frame *c*. The pump for exhausting the air from said cylinder 24, and said pump is driven by a pinion 126 on the shaft *f*, meshing with a wheel 127 on a stud 128, supported by the end frame *a*, there being a rod 129 connected at one end to the wheel 127 and pivoted at the other end to the piston-rod 130 of the pump. The exhaust-cylinder has valve-seats 131 at regular distances apart, and there is a valve 23 upon each valve-seat, and each valve is connected to a rod 135, that is moved at the proper time, so that each valve covers or uncovers the opening in the valve-seat at the same time, and thereby allows the suction to act in all the atmospheric separators simultaneously or cuts off said suction action. In

order to actuate said rod 135, I employ the cam *w* on the shaft *s*, and said cam acts upon a roller at the upper end of a lever 134, pivoted at 158, and said lever is connected to the rod 135 by a link 136.

The pinion 126 is loose upon the shaft *f*, and the hub of the pinion is provided with clutch-teeth to engage teeth upon a collar 137, fixed to said shaft *f*, so that when the pinion is moved sidewise the teeth upon the respective parts engage and the pinion revolves with the shaft and the pump 125 is driven. When the pinion is moved in the reverse direction, the teeth separate and said pinion ceases to rotate, and the pump is not operated. Any suitable device may be employed for moving the pinion 126. I have shown a lever 138 in Fig. 3 for said purpose.

The deflector.—The deflector 18, Figs. 7, 8, 9, and 10, is triangular in cross-section, with its pointed end toward the atmospheric separator, and it has a flat upper portion, and it is slightly longer than the longest signature to be gathered. Said deflector is hinged or pivoted at 149 to straps 29 29, which straps are riveted or otherwise firmly secured to a cross-bar 30, and this latter is connected to the pull-bar 32 by a bolt or screw 31. There is an arm, with a roller 40 at its end, projecting from one end of the deflector, and upon the bar 12 there is an incline at 42, that acts upon said roller for raising or lowering the deflector at the proper time, as hereinafter explained. There are several fingers 43, each secured at one end to the cross-bar 30, and the plate 15 is slotted to receive the straps 29 and fingers 43, and said straps and fingers are supported near the deflector by a cross-bar 44, secured to the under side of the plate 15. The fingers 43 at their free ends prevent the signatures sagging down between the deflector and said plate 15. The surfaces of the plate 15 and straps 29 and fingers 43 are upon the same level, and the pile of signatures rests upon said plate, fingers, and straps. It is to be understood that each deflector 18 is connected, as aforesaid, to the pull-bar 32, so that all the deflectors are moved simultaneously when said pull-bar is moved, and it is also to be understood that where the word "forward" is used with respect to the movement of the reciprocating table and pull-bar it means a movement in a direction toward the end frame *a* and that where "backward" or "return" movement is used it means a movement toward the end frame *b*.

Means for giving movement to the pull-bar.—The bars 14 are slotted at 39 for the passage of the cross-bars 30, (see Figs. 1, 2, and 8,) and there is a spring 33, (see dotted lines, Fig. 1,) acting between a downwardly-projecting arm 34, secured to the pull-bar 32, and a projection 45 on the under side of the table 9. The outer end of the pull-bar 32 is adapted to pass into the upper forked end of a lever 36, pivoted at 37, said forked end acting upon a cross-pin near the end of said pull-

bar, and said lever is acted upon by the cam *u* on the shaft *s*.

38 is an adjustable stop on the pull-bar 32.

The cam *u* is so shaped as to allow of and give the following movements to the pull-bar: Just before the table commences to move forward the spring 33 moves the pull-bar in a direction toward the end frame *a*, thereby moving all the deflectors forward in the same direction a short distance and stops. Then the table 9 is moved in the same direction, and by the projection 45 on the table, the spring 33, and the arm 34 on the pull-bar the table, pull-bar, and deflectors all move together until the stop 38 on the pull-bar comes against the end frame *a*, when the pull-bar and deflectors are arrested in their movement; but the table goes a short distance farther, thereby compressing the spring 33. During the aforesaid movement of the table and pull-bar the cam *u* swung the lever 36 so that the forked end of the lever was below the path of the pin upon the pull-bar, and thereby allowed the pull-bar to be carried forward with the table, as aforesaid. As soon as the table commences its return movement the spring 33 expands, and when the forward ends of the slots in the bars 14 strike the cross-bars 30 then the pull-bar and deflectors move back with the table, and when the table reaches its extreme backward movement the cam *u* acts upon the lever 36 and the latter upon the pull-bar and moves the pull-bar and deflectors back farther until the cross-bars 30 are at the rear end of the slots 39 in the bars 14, and the spring 33 is again compressed for again giving the forward movement to the pull-bar.

The signature-receptacles.—46 is the support for what I term the "front stops," and said support is formed as two standards connected by a cross-bar, preferably made integral with said standards, and the standards are bolted to the rails *e e*. Each front stop 47, Figs. 7 and 8, is made as a vertical bar or plate, having a flange at its rear that rests upon the top surface of the support 46, and said flange is slotted for a bolt that clamps it to said support. I have shown two of said front stops for each signature-receptacle, and the folded-back edges of the signatures are adjacent to said front stops as they rest upon the plate 15 and adjacent parts. The lower part of each front stop is reduced in size and passes into a channel 48 in the plate 15, fingers 43, and deflector, so as to prevent the folded-back edges of the signatures passing beneath said front stops during the reciprocation of the table. There are horizontal perforations in the standards of the supports 46 and also in the central portions of the cross-bars of said supports for the rods 49 and 50, which rods are fitted to slide in said supports for the purpose of adjusting the back stops or partitions, as hereinafter explained.

The support 51 for the back stops is made as a horizontal bar suspended from and clamped to the rods 49 and 50 by bolts 52.

Said bar has downward-projecting portions to which the back stops 55 are clamped by bolts 53. Said back stops are vertical bars or plates, and a plate 54 is hinged to the lower ends of said back stops.

166 166 are L-shaped metal plates supported from the bar 51 by projecting fingers 186 passing over said bar, and the vertical portion of said fingers is V-shaped to pass into the notched edge of the bar 51, and thereby prevent said plates moving sidewise after being adjusted to position.

170 is a stop-finger upon the hinged plate 54 to limit its swinging movement. (See Figs. 9 and 10.)

It is now to be understood that the folded-back edges of each pile of signatures to be gathered are adjacent to the front stops 47, that the front cut edges at the lower portion of the pile are adjacent to the back stops 55, and that the L-shaped plates form guides for the pile of signatures at the front, top, and bottom edges of the signatures.

56, Figs. 7, 8, 9, and 10, represents hooks secured to a shaft 57, fitted to turn in bearings upon the front stops, and at the outer end of said shaft are an arm 58 and roller, and there is a spring at 28 around said shaft that tends to force the pointed end of said hooks in between the signatures at the folded-back edges near the bottom of the pile of signatures, so as to support said signatures and take the weight off the few signatures below said hooks, and thereby prevent the lowermost signatures of the pile being forced into the opening in the reciprocating table by the weight of the signatures above.

59 is an incline secured to the reciprocating table that acts upon the arm and roller 58 to move the hooks away from the piles of signatures when the reciprocating table commences its forward movement.

60 60 are rods supported by and fitted to slide in the supports 46 46, and to these rods are secured the grooved cam-plates 61 by screws 157, and there is one of these cam-plates for each atmospheric separator. Each rod 60 is connected by a link 62 to a lever 63, one lever being pivoted upon the stud 37 and the other being pivoted upon the shaft *f*, and said lever is acted upon by a cam *v* upon the shaft *s*.

64 is a spring around the rod 60, and between the frame *a* and a collar on said rod 60 and said spring moves the rod 60 and cam-plates in one direction, and the cam *v* moves them in the other direction.

I will now describe the operation of taking a signature from one of the receptacles, remarking that the operation is the same at all the receptacles.

Referring to Figs. 1, 7, and 8, the parts are in the position when the reciprocating table is at the end of its extreme return movement and the atmospheric separator 17 has been brought up into position with the suckers 168 to act upon the lowest signature of the pile

of signatures. The rod 60 and cam-plates 61 are now moved in the direction of the arrow, Fig. 8, and said cam-plates acting upon the roller and arm 20 of each atmospheric separator swing the separator upon its pivots 19 into the position shown in Fig. 9, and the exhaust action of the separator bends down the folded-back edge of the lowermost signature, as indicated in said Fig. 9. As soon as said atmospheric separator commences to move down, as aforesaid, the deflector is quickly moved forward by the spring 33 acting upon the pull-bar 32, and said deflector passes in between the signature bent down by the separator and the next signature above, with its pointed end on a line below the level of the table, so as to insure the pointed end of the deflector passing between the signatures, as aforesaid. The roller 40 upon the deflector runs up the incline 42 during this forward movement of the deflector and swings the deflector upon its pivot or hinge 149 into the position shown in Fig. 9, and by inspection of this figure it will be seen that the top surface of the deflector is now level with the surface of the plate 15 of the reciprocating table and that the front portion of the deflector forms a ledge to support the folded-back edges of the pile of signatures, so that they cannot drop into the slot during the movement of the reciprocating table. The exhaust is now cut off from the atmospheric separator, and the reciprocating table commences its forward movement through the action of the cam *t*, lever 25, and connecting-rod 26, and by the projection 45, spring 33, and arm 34 on the pull-bar the reciprocating table and the deflector move together beneath the pile of signatures and the sheet that is being separated, which latter passes down through the opening or slot in the reciprocating table and falls upon the signature-slide, as illustrated in Fig. 10. When the suction action is cut off at the separator, as aforesaid, the folded-back edge of the signature naturally springs upward, but it comes against the inclined under side of the deflector, and by said deflector the signature is directed downward. Before the table reaches the end of its extreme forward movement the stop 38 upon the pull-bar 32 comes in contact with the frame *a*, and the deflector is stopped, while the table continues its movement. This increases the distance between the atmospheric separator and the deflector, as seen in Fig. 10, and gives ample space between said parts for the sheet that is being separated to pass down. At the same time it allows the hinged plate 54 to drop vertically between the separator and deflector and act as a stop to prevent the front edges of the lowest signatures of the pile being carried below the back stops in case said front edges should drop in the opening in the reciprocating table. Fig. 10 illustrates the position of the parts at the extreme forward movement of the table. During said forward movement of the table the top part

of the deflector remained level with the surface of the reciprocating table; but when said deflector was arrested the incline 42 on said table moved forward with said table and allowed the deflector to drop to the position shown in Fig. 10. Upon the return movement of the reciprocating table the edge of the atmospheric separator takes against the hinged plate 54 and swings the same up, and if any of the front portions of the signatures have dropped into the opening in the table said hinged plate lifts them up. As the table continues its return movement the incline 42 runs under the roller on the deflector and the deflector is swung up, so that its top is level with the reciprocating table, and the deflector moves back with the table beneath the pile of signatures until the end of the movement of the table. Then the cam *u* acts on the pull-bar and moves the deflector farther away from the separator, and said deflector drops into the position shown in Fig. 8 in consequence of the roller 40 on the deflector running down the incline 42. The spring 64 now acts upon the rod 60 and moves the same and the cam-plate 61, and the latter acts upon the roller at the end of arm 20 and swings the atmospheric separator into the position shown in Fig. 8. During the return movement of the reciprocating table the roller upon the arm 58 runs down the incline 59 and the hooks 56 pass in between the folded-back edge of the signatures to sustain the weight of said signatures, as before described. The plate 15 of the reciprocating table completes the lifting of the hinged plate 54, and a part of the lowest signature of the pile rests upon said plate 54, and said plate 54 protects the front edge of said lowest signature from injury during the movement of the table under said signature.

The front cut edges of the signatures are generally rough and uneven, and said edges are liable to mat together by contact with the back stops, and the lowest signature of the pile is liable to get caught between the hinged plate and the edges of the rest of the pile and not drop entirely free from the pile. To overcome this, the cam *t* is shaped at 155 (see Fig. 16) so as to give a short quick forward-and-backward movement to the reciprocating table just before it commences its regular return movement. This quick return movement of the table "jogs" the signatures on the table and moves the pile of signatures away from the back stops and hinge, separating the signatures at their matted edges, so that the sheet that is being separated from the pile falls freely away.

By reference to Figs. 7, 8, 9, and 10 it will be seen that the edge of the plate 15 is in line with the pivots on which the separator swings and that the folded-back edge of the signature as carried down by the separator is bent at such edge. When the bending-line of the paper is in line with the pivots of the separator or back of said pivots, there is no strain

on the signature tending to pull it away from the separator; but if the bending-line is in front of the pivots—that is, nearer the front stops 47—then in consequence of the distance between the bending-line of the paper and the line of suction of the separators being less than the distance between the pivots of said separator and said line of suction there will be a strain upon the signature as the separator bends the same down and the signature will be torn or separated from the separator in the effort to pull the signature partially from beneath the pile of signatures. Therefore the line of bend of the signature should be in line with the pivots of the separator for thin or ordinary paper; but when operating upon very heavy paper the line of bending may be back of the pivots—that is, nearer the back stops—because the greater the distance between the line of suction and the line of bend of the paper the less strain on the paper and less liability of the suckers separating from the paper when the separator is swung down. To provide for varying the bending-line of the paper, the plate 15 is fitted to slide in grooves in the bars 14, as before mentioned, and after said plate has been moved to position it is clamped by the screw or bolt 16, that passes through a slot in said plate and into the reciprocating table. (See Fig. 7.) To prevent the hinged plate 54 passing down between the separator and the edge of the plate 15 when the edge of said plate is back of the line of the pivots of the separator, I provide the stops 156, that are secured to the reciprocating table 9, (see Fig. 7,) and the ends of said stops adjacent to the separator are in line with the pivots of the separator. Hence they act to lift up the hinged plate 54 the same as would the edge of the plate 15 if the edge of the latter were in line with the pivots of the separator.

When the signatures are of very thin paper, it is possible if the suckers of the separators are brought perfectly parallel with and in direct contact with the paper that the suction action might be strong enough to penetrate the lowest signature and hold a second or even a third signature. To prevent the suckers coming up to a perfectly-parallel position with the signatures, the grooved cam-plate 61 must be placed nearer the front stops than shown in Fig. 8 and clamped by the screw 157 to the rod 60, so that the roller upon the arm of the separator will not pass into the horizontal portion of the cam-groove. Thereby the separator will receive a movement that at the end thereof the suckers stand at an inclination to the lowest signature of the pile and not parallel with it, and the exhaust action then will be sufficient only to draw down one signature to the suckers.

Means for regulating the movement of the reciprocating table.—The length of movement given to the reciprocating table should be about equal to the width of the signatures being gathered, for if when gathering signa-

tures of small width the same movement is given to the table as when gathering larger signatures the deflector would strike the hinged plate 54. Further, if the edge of the deflector passed beyond the back stops 55 the lowermost signatures at the front cut-edge portions would be carried by the friction of the table against the lowest signatures down through the opening in the table and beyond the back stops. Therefore I provide for giving to the reciprocating table a length of movement about equal to the width of the signatures being gathered, as follows: As before mentioned, the reciprocating table receives its movement from the grooved cam *t*, lever 25, pivoted at 158, and connecting-rod 26, which latter is connected to the lever by a pin 65 and to the reciprocating table by a pin at 27. In the lever 25 there are a number of holes, as shown by dotted lines at 66 in Figs. 1 and 3, each adapted to receive the pin 65, and these holes are arranged in the direction of the length of the lever. Hence when the rod 26 is connected to the lever by the pin 65 in the hole nearest the pivot 158 of the lever 25 the reciprocating table will receive its least movement, and when the rod 26 is connected to said lever at the hole 66 farthest from the pivot of said lever said table will receive its greatest movement, and when said rod and lever are connected at one of the intermediate holes the table will receive a proportionate movement, thereby the amount of movement given to the reciprocating table can be regulated as desired.

Means for adjusting the signature-receptacles.—In order to adjust all the back stops 55 simultaneously according to the width of the signatures to be gathered, I connect the rods 49 and 50, which carry the supports for said back stops, to a cross-head 67, (see Figs. 2 and 6,) which cross-head is supported by two rods 68, fitted to slide in the end frame *b*. 69 is a rod fitted to turn in a hole in said frame *b* and kept from moving lengthwise by the collars 70, and at one end of said rod there is a hand-wheel 71, and the other end of said rod is screw-threaded for a nut portion upon the cross-head 67. By turning the hand-wheel and screw-rod 69 the cross-head 67, rods 49 and 50, and back-stop supports of all the receptacles are moved to bring the back stops 55 nearer to or farther from the front stops 47, according to the direction in which the screw-rod is turned, and thereby adjust the width of the signature-receptacles as desired.

Means for adjusting the signature-slide.—The separated signatures fall upon the signature-slide, and said slide (see Fig. 5) is composed of a central bar 72 and two side bars 73 for each range of signature-receptacles, and said bars extend nearly the entire length of the machine, and they are supported by the rods or shafts 74 74, that are fitted to turn in bearings 77, secured to the rails *e e*, and said shafts are provided with right and left hand screw-threads, as shown

in Figs. 5 and 6. The center bar 72 is stationary and is kept in position by collars 76 on the shafts 74, and the side bars 73 are each made with beveled vertical portions to keep the signatures in place as they fall upon the signature-slides. Upon the under side of each side bar 73 there is a nut portion at 75 for the screw-shaft, and there are two of said screw-shafts 74, connected by an endless chain 78, passing around sprocket-wheels 79 upon said shafts. At the outer end of one of said shafts 74 there is a hand-wheel 80, and by turning the same both shafts are rotated, and by the threaded portions of the shafts turning in the nuts on the side bars said side bars are brought nearer to or farther from the central bar, according to which way the screw-shafts are turned. Thereby both signature-slides are adjusted at the same time to the desired width.

Means for operating the endless chain that moves the signatures progressively upon the signature-slide.—There is an endless chain 81 (see Figs. 3, 5, and 6) for each signature-slide, and said chain passes around the sprocket-wheels 82 88 on the shafts *s* and 83. The wheels 82 are loose on the shaft 83, and said chain is provided with pusher-fingers 89 at regular distances apart, and the signatures accumulate in piles between said fingers as said chain is moved along progressively by the means next described. Upon the shaft *s* there are two bevel-gears 84 85, both loose on said shaft, and meshing with them is a bevel-pinion 86, and this latter gear is upon a stud secured to a collar 87, keyed to said shaft *s*. The wheel 84 has a tooth 90, formed by cutting away a portion of a circular part 92 upon said wheel 84. (See Fig. 12.) The sprocket-wheel 88, around which the endless chain 81 passes, is secured to and turns with the wheel 85.

91 is a pawl pivoted at 95, and its lower end rests by gravity against the circular portion 92 of the wheel 84, and said pawl has a finger 93 projecting therefrom, which finger is in the path described by a projection 94, which is a prolongation of the stud of the pinion 86.

It is now to be understood that the shaft *s* is continuously rotating and that the pinion 86 is carried around with said shaft, and when the pawl 91 is not in contact with the tooth 90 the wheel 84 is carried around by the wheel 86; but the wheel 85 and sprocket-wheel 88 are not rotated in consequence of the weight of the chain and signatures and the friction of the chain upon the center bar of the signature-slide. During the aforesaid movement the wheel 85 becomes a stationary circular rack and the wheel 86 is turned upon its axis by traveling over said wheels 85 as said wheel 86 is carried around by the shaft *s*. Consequently the wheel 84 is rotated by the pinion 86 as well as carried with it, and as the diameters of the wheels 84 and 86 are in the proportion of two to one the wheel 84 will

receive a complete revolution for each half-revolution of the shaft *s*. The rotation of the wheel 84 is stopped by the tooth 90 thereon coming in contact with the pawl 91. Then the wheel 84 becomes a stationary circular rack for the wheel 86 during the next half-revolution of the shaft *s*, and the wheel 86 gives a complete revolution to the wheel 85 and sprocket-wheel 88, thereby giving the desired movement to the endless chain and the signatures carried along with it. As the wheel 86 approaches the end of said second half-revolution of the shaft *s* the projection on the stud 94 comes in contact with the finger 93 of the pawl 91 and finally moves said pawl away from the tooth 90. Then the wheel 85 and sprocket-wheel 88 are stopped and the wheel 84 is rotated by the wheel 86, as before described.

By the aforesaid mechanism the chain is moved the required distance during one-half the revolution of the shaft *s*, and during the other half-revolution of said shaft the chain is stationary, and it is while the chain is stationary that the forward movement is given to the reciprocating table and the lower signature of each receptacle separated from the pile and dropped upon the signature-slide, it being understood that the movement given each time to the endless chain is slightly more than the greatest width of the signature-receptacles. The piles of signatures are passed off successively from the signature-slides down the inclines 96 and 97 into the transverse troughs 98 and 99.

Means for bringing the advancing folded edges of the signatures into line before they pass off the signature-slide.—The signatures as they fall upon the signature-slide do not always drop one exactly over the other, but are more or less “shingled.” In order to bring the advancing folded edges of the signatures in line before they pass down the inclines 96 97, I provide the fingers 100, secured to the shaft 101, (see Figs. 2, 4, and 6,) and they detain the signatures while the pushers on the endless chain 81 push the signatures up into an even line. The fingers 100 are then moved out of the way by a cam 103 on the shaft 83 acting upon a rod 102, connected to a crank-arm on the shaft 101, and the signatures pass down the inclines 96 and 97, as aforesaid. There is a spring at 160 around and connected at one end to the shaft 101 and at the other end connected to one of the bearings for said shaft, which spring tends to keep the ends of the fingers toward the advancing end of the piles of signatures. The cam 103 is secured to the shaft 101 by a set-screw, so that the cam may be varied in its position, and thereby actuate the fingers at the proper time, according to the width of the signatures being gathered.

Means for pushing the signatures from the transverse trough into the receiving-trough.—The transverse troughs 98 and 99 (see Figs. 2 and 6) are separated by a partition 104, and

the signatures are pushed from said troughs by horizontal pusher-fingers 106 and pass down the incline 105 into a receiving-trough. The pusher-fingers 106 are upon an endless chain 107, that passes around the sprocket-wheels 108 and 109, and the piles of signatures from one range of receptacles pass into one of the transverse troughs and from the other range of receptacles into the other transverse trough, and at each movement of the endless chain 107 a pile of signatures from each trough is carried out by a pusher 106 and passed down the incline 105 into the receiving-trough, while simultaneously the following pusher 106 pushes a pile of signatures along in the trough 98 to bring said pile into line with the trough 99. Thereby there will be always two piles of signatures properly assembled to be pushed into the receiving trough each movement of the endless chain 107.

I make use of the following devices for giving the intermittent movement to the endless chain 107: The sprocket-wheel 108 (see Figs. 4, 6, 14, and 15) is loose upon a shaft 110, and keyed or pinned to said shaft is a pinion 111, meshing with a rack 114, guided between the end frame *b* and a plate 112, secured to or cast with said frame *b*. A rod 113 is connected at one end to the rack 114 and at the other end to a bevel-wheel 115, meshing with a wheel 116 on a horizontal shaft 117, and at the other end of said shaft there is a bevel-pinion 159, meshing with a wheel 118 on the shaft *s*. There is a spring-bolt 119 in the hub of the sprocket-wheel 108, and the outer end of said bolt is inclined, and in the face of the hub of the pinion 111, adjacent to the hub of the sprocket-wheel 108, there is an inclined notch forming a tooth 120. (See Figs. 14 and 15.) It is now to be understood that the wheel 115 rotates continuously and through the rod 113 gives an up-and-down movement to the rack 114, and during the upward movement of said rack the pinion 111 rotates the sprocket-wheel 108 by the tooth 120 on the pinion taking against the spring-bolt 119 in the hub of said sprocket-wheel. Thereby the desired movement is given to the endless chain 107. During the downward movement of said rack 114 the pinion 111 is rotated in the reverse direction to that given by the upward movement of said rack, and the inclined notch in the hub of the pinion 111 forces back the spring-bolt 119 and the sprocket-wheel 108 is not turned, and the endless chain 107 remains stationary during said downward movement of the rack 114.

Trough for receiving the assembled signatures.—The receiving-trough into which the assembled signatures are received (see Figs. 2, 3, 4, and 6) is composed of a bottom portion 121 and a back portion 122, and the latter is supported by one or more brackets 123, bolted to the rail *d* of the frame of the machine, and the bottom 121 is hinged at 124 to a bracket 123, so that the free end of said

bottom may be raised or lowered to adapt the trough at said free end to the length of the signatures being gathered.

139 is a bracket or support secured to the end frame *b*, (see Fig. 4,) and 140 is a latch-bar pivoted at 141 to said bracket, which latch-bar has teeth upon its under side to engage a tooth at 142 upon a bar secured to the bottom 121 of the receiving-trough, and thereby hold said bottom after being moved to the desired position. The signatures in the receiving-trough are moved along progressively by a pusher 143, secured to a rod 144, supported in the brackets 123 and 139.

145 is a rod connected at one end to the rod 144 and at the other end to a lever 146, pivoted at 147, and a cam 8 acts upon the lever 146 to actuate aforesaid parts and move the pusher and signatures along in the trough, and a spring at 148 moves back the pusher to give space for the next volume of signatures that pass down the incline 105 into said receiving-trough.

The pusher 143 and the end of the bottom 121 are slotted, as shown in Figs. 2 and 4, so as to allow of the bottom 121 being adjusted as before mentioned. I provide fingers 152, on spring-blades connected to a stud 153, to take against the rear of the volumes in the receiving-trough and support them when the pusher is drawn back. Said fingers are inclined, and they are moved aside by the signatures the pusher is moving, and when the pusher has passed beyond the fingers the blades spring back and the fingers come behind the rear volume and keep the volumes upright in the trough. The pusher 143 is notched to allow the fingers to pass without touching the pusher, and there is a block 167 in the trough to keep the signatures from falling over at the advancing end of the row of volumes. The volumes of signatures in the receiving-trough are indicated by dotted lines in Fig. 6.

It is to be understood that in starting the machine incomplete piles of signatures will be delivered into the transverse troughs. Thus if there are ten signature-receptacles the first nine piles delivered will be incomplete, but the tenth and following deliveries will be complete piles. When the machine is stopped, the last nine piles of signatures will also be incomplete, but when put with the first nine piles will form complete volumes.

The devices hereinbefore described are adapted to operate upon single sheets of paper as well as upon folded signatures.

I claim as my invention—

1. The combination in a signature-gatherer, with a range of receptacles for holding the piles of signatures, of a sectional table acting in connection with the receptacles and means for reciprocating said table, pivoted atmospheric separators acting in the spaces between the table-sections, means for swinging said separators at predetermined periods, pivoted deflectors adjacent to the separators, and means for actuating said deflectors to cause

them to pass between the signatures engaged by the separators and the next signatures thereto, substantially as specified.

2. The combination in a signature-gatherer, with a range of receptacles for holding the piles of signatures, of a table composed of sections beneath the receptacles, and means for reciprocating said table, pivoted atmospheric separators between one table-section and the next, means for swinging said separators after the folded edges of the signatures have been drawn to the separators by atmospheric action, a pivoted deflector adjacent to each separator, and means for actuating the deflectors so that each deflector passes in between the signature carried down by the separator and the signature next above, substantially as set forth.

3. The combination in a signature-gatherer, with a range of receptacles for holding the piles of signatures, of a table composed of sections beneath the receptacles and means for reciprocating said table, pivoted atmospheric separators between one table-section and the next, means for swinging said separators after the folded edges of the signatures have been drawn to the separators by atmospheric action, a pivoted deflector adjacent to each separator, and means for actuating the deflectors so that they are moved forward and swung upward upon their pivots in advance of the movement given to the reciprocating table, substantially as set forth.

4. The combination in a signature-gatherer, with a range of receptacles for holding the piles of signatures, of a table composed of sections beneath the receptacles and means for reciprocating said table, pivoted atmospheric separators between one table-section and the next, means for swinging said separators after the folded edges of the signatures have been drawn to the separators by atmospheric action, a pivoted deflector adjacent to each separator, and means for actuating the deflectors so that they are moved forward and swung upward upon their pivots and then carried forward with the reciprocating table, substantially as specified.

5. The combination in a signature-gatherer, with a range of receptacles for holding the piles of signatures, of a table composed of sections beneath the receptacles and means for reciprocating said table, pivoted atmospheric separators between one table-section and the next, means for swinging said separators after the folded edges of the signatures have been drawn to the separators by atmospheric action, a pivoted deflector adjacent to each separator and means for actuating the deflectors so that they are moved forward and swung upward upon their pivots and then carried forward with the table and arrested and swung down before the table reaches the end of its forward movement, substantially as specified.

6. The combination in a signature-gatherer, with a range of receptacles for holding the piles of signatures, of a table composed of sec-

tions beneath the receptacles and means for reciprocating said table, pivoted atmospheric separators between one table-section and the next, means for swinging said separators after the folded edges of the signatures have been drawn to the separators by atmospheric action, a pivoted deflector adjacent to each separator, and means for actuating the deflectors so that they are moved forward and swung upward upon the pivots and then carried forward with the table and arrested and swung down, and then swung upward again upon the return movement of the table, substantially as specified.

7. The combination in a signature-gatherer with a range of receptacles for holding the piles of signatures, a table composed of sections beneath the receptacles, means for reciprocating said table, pivoted atmospheric separators between one table-section and the next, and means for actuating said separators, of a deflector adjacent to each separator, cross-bars to which the deflectors are pivoted, a pull-bar to which the cross-bars are connected, inclines upon the table for raising and lowering the deflectors, and means for actuating the pull-bar, substantially as set forth.

8. The combination in a signature-gatherer, with a range of receptacles for holding the piles of signatures, a table composed of sections beneath the receptacles, means for reciprocating said table, pivoted atmospheric separators between one table-section and the next, and means for actuating said separators, of a deflector adjacent to each separator, cross-bars to which the separators are pivoted, a pull-bar to which the cross-bars are connected, inclines upon the table for raising and lowering the deflector, a stop upon the pull-bar, a spring acting to move the pull-bar in one direction and a cam and lever for moving the pull-bar in the other direction, substantially as set forth.

9. The combination in a signature-gathering machine, with a range of signature-receptacles, a reciprocating table beneath the receptacles, means for reciprocating said table, pivoted atmospheric separators between one section and the next, and means for actuating said separators, of a plate 15 at each table-section adapted to be moved lengthwise of the table so that the edge of said plate may be brought nearer to or farther from the line of the pivots of the separator, and means for clamping said plate to the table, substantially as set forth.

10. The combination in a signature-gathering machine, with a range of signature-receptacles, a reciprocating table beneath the receptacles, means for reciprocating said table, pivoted atmospheric separators between one table-section and the next, and means for actuating said separators, of an adjustable plate 15 at each table-section, means for clamping said plate to the table at the desired place, the hinged plate 54 and the plates 156 secured to said table and with their outer

ends on line with the pivots of the separator, substantially as set forth.

11. The combination in a signature-gatherer, with a range of signature-receptacles, a reciprocating table beneath the receptacles, means for reciprocating said table, pivoted atmospheric separators between one table-section and the next, and an arm upon each separator, of grooved cam-plates to act upon the arms of the separators and raise and lower them, a slide-rod to which said cam-plates are adjustably secured, and means for moving said slide-rod, substantially as set forth.

12. The combination in a signature-gatherer, with a range of signature-receptacles, a reciprocating table beneath the receptacles, means for reciprocating said table pivoted atmospheric separators between one table-section and the next, and an arm upon each separator, of grooved cam-plates to act upon the arms of the separators to raise and lower them, a slide-rod to which said cam-plates are adjustably secured, a spring around said rod for moving the same in one direction, and a cam, lever and link for moving said rod in the other direction, substantially as set forth.

13. The combination in a signature-gatherer, with a table and means for reciprocating the same, of front and back stops forming the front and back partitions of the signature-receptacle, means for supporting said front and back stops, a shaft fitted to turn in each pair of said front stops, hooks connected to said shaft and adapted to support the folded-back edges of the pile of signatures between said stops, a spring around said shaft tending to press the fingers between said signatures, an arm at the end of said shaft, and an incline on the table to take against said arm and move the hooks away from the signatures, substantially as set forth.

14. The combination in a signature-gatherer, with a table and means for reciprocating the same, of the front stops and their supports, horizontal rods fitted to slide in said supports, the supporting back-stop bars clamped to said rods, back stops secured to said back-stop bars, and means for moving said rods to adjust all the back stops simultaneously, substantially as set forth.

15. The combination in a signature-gatherer, with a table and means for reciprocating the same, of the front stops and their supports, horizontal rods fitted to slide in said supports, the supporting back-stop bars clamped to said rods, back stops secured to said back-stop bars, a cross-head to which said rods are secured, guide-bars for said cross-head, a support for said guide-bars, and a screw-rod for moving said cross-head, substantially as set forth.

16. The combination in a signature-gatherer, with a table and means for reciprocating the same, of the front stops and their supports, horizontal rods fitted to slide in said supports, the back-stop bar supported by said rods and having teeth upon one side of said

bar, back stops secured to said back-stop bar, and the angle-pieces having fingers thereon to set over said back-stop bar and pass between the teeth, substantially as set forth.

5 17. The combination in a signature-gatherer, with a table and means for reciprocating the same, atmospheric separators each pivoted to the table between one section and the next, a pivoted deflector adjacent to each separator and means for swinging the separators and deflectors, of the front and back stops and means for supporting the same, and hinged plates attached to the back stops that drop vertically when the table is near the end
10 of its forward movement, substantially as set forth.

18. In a signature-gatherer, the combination with means for supporting the signatures and delivering them upon a signature-slide, of a
20 signature-slide composed of a central stationary bar and two movable bars, a shaft for supporting said bars, said shaft having right and left hand screw-threads thereon, supports for the ends of said shaft and a bearing
25 for the shaft at the central bar, and nuts for said screw-shaft upon the under side of the movable bars, so that by turning said shaft the movable bars are brought nearer to or farther from the central bar according to the
30 direction of turning said screw-shaft, substantially as set forth.

19. In a signature-gatherer, the combination with two ranges of devices for supporting the signatures and delivering them upon two signature-slides, of a signature-slide beneath
35 each range of supporting and delivering devices, each slide being composed of a stationary central bar and two movable bars, screw-shafts extending across beneath said signature-slides, each shaft having right and
40 left hand screw-threads, bearings for the ends of each shaft and bearings at the central bars also, nuts upon the under side of said movable bars to receive the screw-threaded portions of said shafts, sprocket-wheels upon
45 said shafts, and an endless chain passing around said sprocket-wheels, so that when either shaft is rotated the other shaft is rotated also and all the signature-slides adjusted simultaneously, substantially as set forth.

20. In a machine for gathering signatures, the combination with two ranges of devices for supporting the signatures and delivering them upon two signature-slides, of a signature-slide beneath each range of supporting
55 and delivering devices, each slide being composed of a central bar and two movable bars, a screw-shaft extending across beneath said signature-slides and supported at its ends, said shaft having right and left hand screw-threads for each signature-slide, bearings for
60 said shaft at the central bars, and nuts upon the movable bars for receiving the screw-threaded portions of said shaft, so that by turning said shaft both signature-slides are adjusted, substantially as set forth.

21. In a machine for gathering signatures,

the combination with means for supporting and delivering the signatures, a signature-slide upon which the signatures fall, and an
70 endless chain and pushers for conveying the signatures progressively along said slide, of a shaft supported above and transversely of the signature-slide, fingers connected to said shaft for detaining the signatures and bringing the
75 advancing edges of the signatures in line before they pass off the signature-slide, and means for actuating said fingers, substantially as set forth.

22. In a machine for gathering signatures, the combination with means for supporting and delivering the signatures, a signature-slide upon which the signatures fall, an endless chain and pushers for conveying the signatures progressively along said slide, of a
80 shaft supported above and transversely of the signature-slide, fingers connected to said shaft for detaining the signatures and bringing the advancing edges of the signatures in line before they pass off the signature-slide, bearings
85 for said shaft, a rod connected to an arm on said shaft, a shaft and cam for actuating said rod, and a spring to force the fingers toward the advancing pile of signatures, substantially as set forth.

23. The combination in a signature-gathering machine with the signature-slide, the endless chain for conveying the signatures along said slide, and sprocket-wheels around which
90 said endless chain passes, of two loose bevel-gears, a continuously-rotating shaft passing through the same and to one of which gears one of said sprocket-wheels is keyed, a bevel-pinion meshing with said bevel-gears, a collar secured to said shaft, a pivot-stud secured
95 to said collar and upon which said bevel-pinion rotates, means for holding one bevel-gear stationary during one half-revolution of said continuously-revolving shaft to set the chain in motion and means for releasing said wheel
100 to stop the chain, whereby said endless chain is stationary during one half-revolution of said shaft and is moving during the other half-revolution of said shaft, substantially as set forth.

24. The combination in a signature-gathering machine, with the signature-slide, an endless chain for conveying the signatures along said slide and sprocket-wheels around which
105 said endless chain passes, of two bevel-gears, a continuously-rotating shaft upon which said bevel-gears are loosely mounted and to one of which gears one of said sprocket-wheels is keyed, a bevel-pinion meshing with said bevel-wheels, a collar secured to said shaft, a pivot-stud secured to said collar and upon which
110 stud said bevel-pinion rotates, a tooth upon the bevel-gear 84, a pendent pawl 91, and a finger 93 upon said pawl and in the path of the projecting end of the stud of the bevel-pinion, substantially as and for the
115 purposes set forth.

25. The combination in a machine for gathering signatures, having two horizontal ranges

of signature-gathering appliances, with transverse troughs into which the gathered signatures are passed, an endless chain and pushers for moving along the signatures in said troughs, and sprocket-wheels around which said chain passes, of a pinion fixed to a shaft upon which one of said sprocket-wheels rotates, a tooth upon the hub of said pinion, a spring-bolt in the hub of said sprocket-wheel, and means for rotating said pinion first in one direction and then in the other, substantially as set forth.

26. The combination in a machine for gathering signatures, having two horizontal ranges of signature-gathering appliances, with transverse troughs into which the gathered signatures are passed, an endless chain and pushers for moving along the signatures in said troughs, and sprocket-wheels around which said chain passes, of a pinion, a stud carrying said pinion and upon which one of said sprocket-wheels rotates, a tooth upon the hub of said pinion, a spring-bolt in the hub of said sprocket-wheel, a rack engaging said pinion, a gear-wheel and means for rotating the same, and a rod connected to said gear-wheel and rack for giving an up-and-down movement to said rack and rotating said pinion in opposite directions, substantially as set forth.

27. In a machine for gathering signatures a receiving-trough into which the gathered signatures are assembled in volumes, consisting of a back portion 122, a support for the same, a bottom portion hinged at one end and free at the other end, and a latch-bar for holding said bottom in place, in combination with a pusher for moving the volumes along

in said trough, said pusher and the bottom of the trough being slotted to allow of said bottom being adjusted, substantially as set forth.

28. The combination in a machine for gathering signatures, with a range of receptacles for holding the piles of signatures, a reciprocating table beneath said receptacles, atmospheric separators for drawing downward the folded-back edges of the signatures and means for swinging said separators, of a cam and its shaft for reciprocating said table, said cam having a curved projecting portion for giving a short quick forward-and-backward movement to said table before commencing to give the regular backward movement to said table, substantially as set forth.

29. The combination in a signature-gatherer, with the signature-receptacles, reciprocating table, separators and deflectors applied to said table and means for actuating said separators and deflectors, of a cam for actuating said table, a shaft for said cam, a pivoted lever upon which said cam acts, and a rod connected at one end to said lever and at the other end to said table, said lever having a number of holes arranged lengthwise of said lever so that said rod can be connected to said lever nearer to or farther from the pivot of said lever to regulate the movement given to the table, substantially as set forth.

Signed by me this 8th day of September, 1900.

JOS. E. SMYTH.

Witnesses:

CHAS. H. SMITH,
BERTHA M. ALLEN.