

Q. W. & I. E. BOOTH.  
UPPER FOLDING MACHINE.

(Application filed May 12, 1900.)

(No Model.)

11 Sheets—Sheet 1.

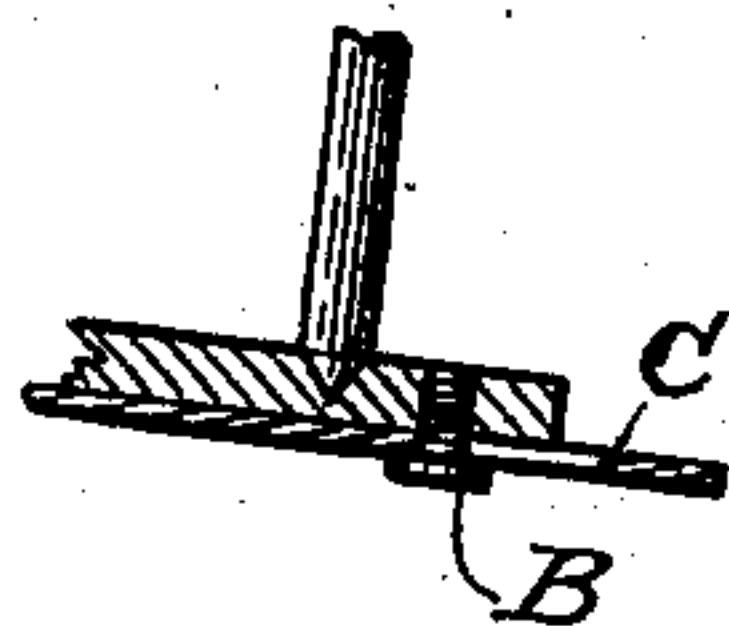


Fig. 1

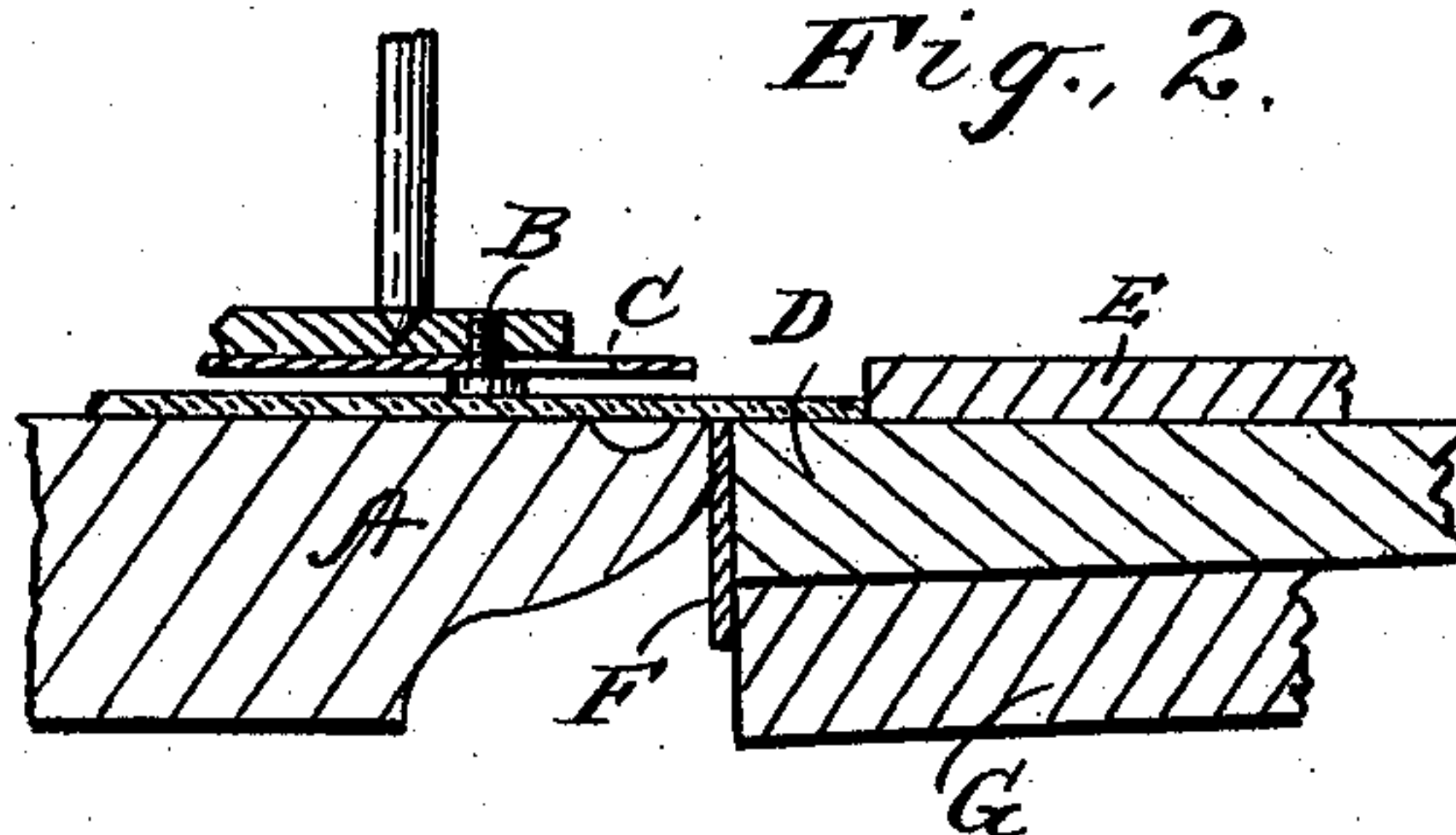
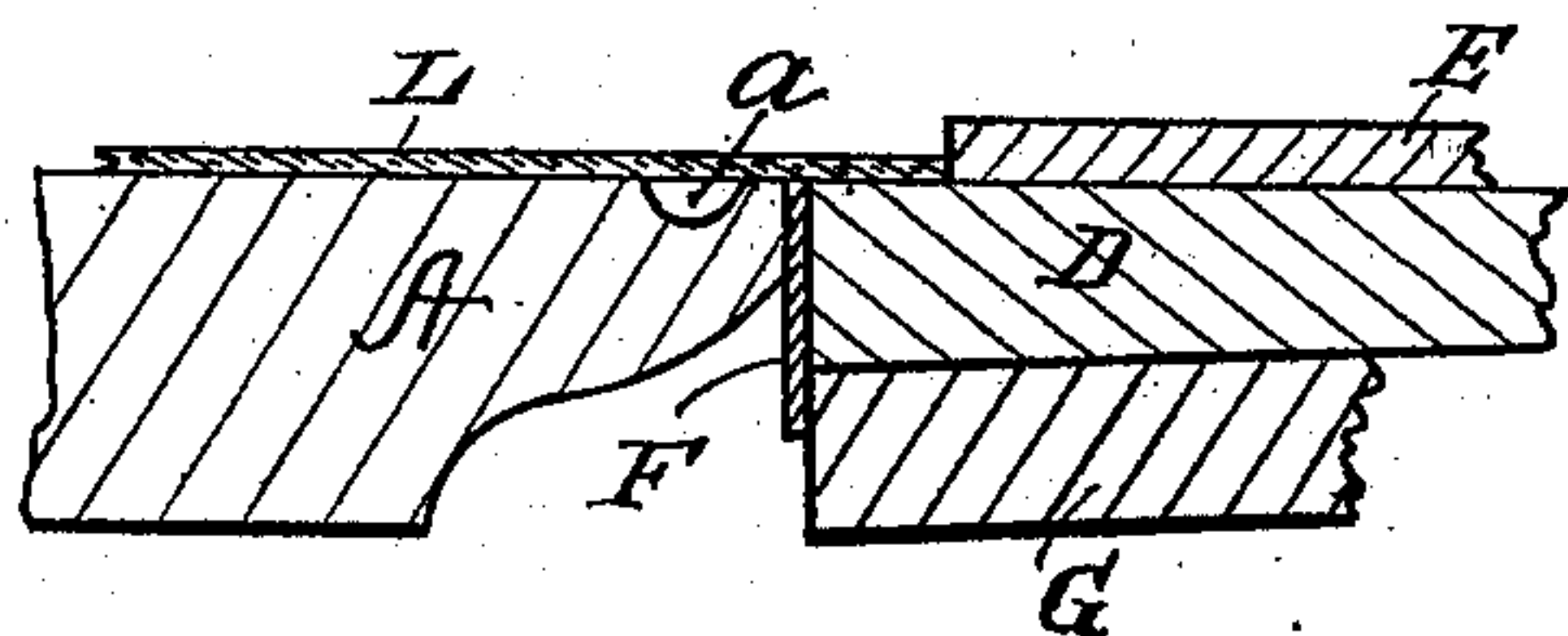


Fig. 2.

Fig. 3.

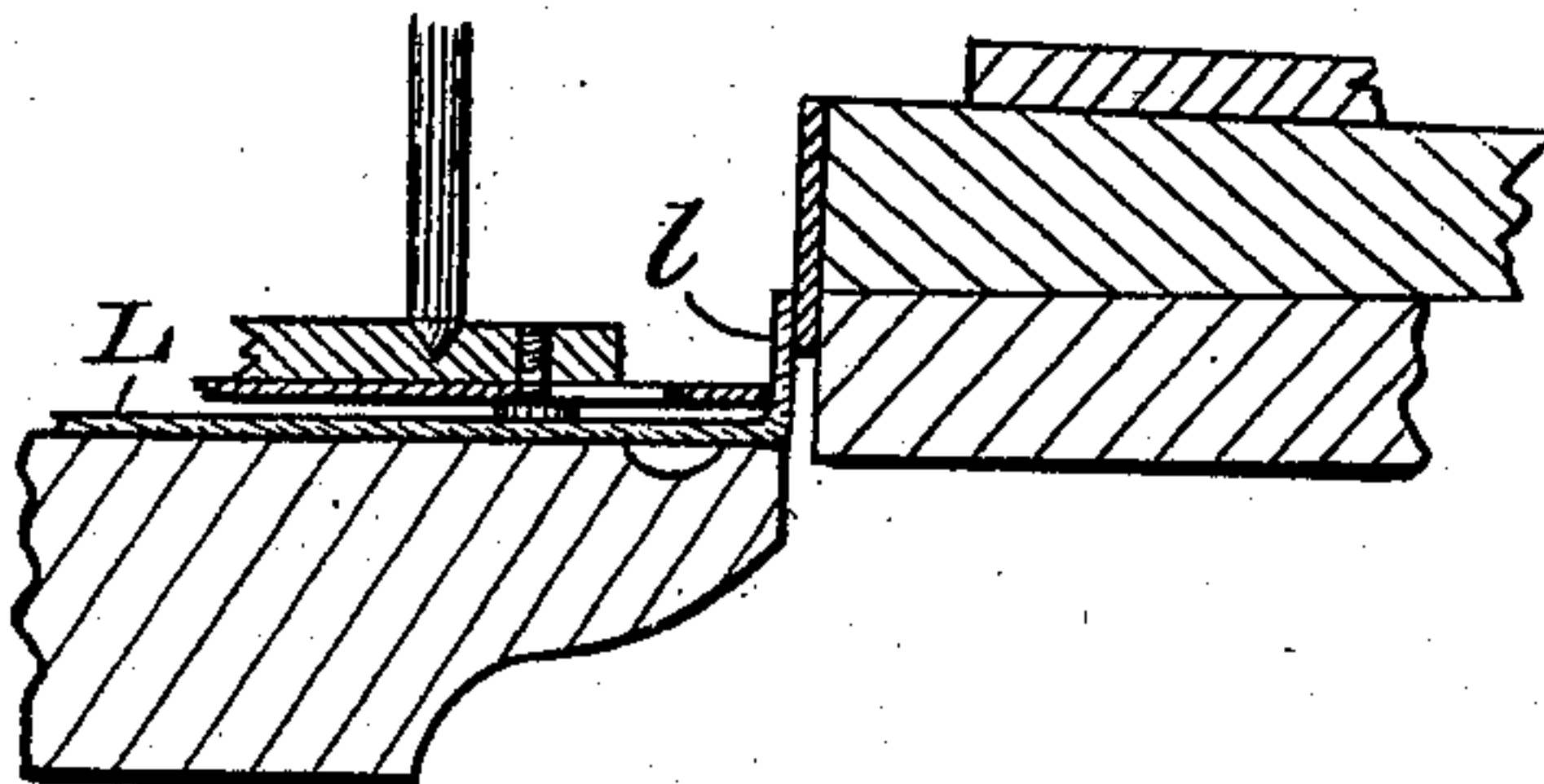


Fig. 4.

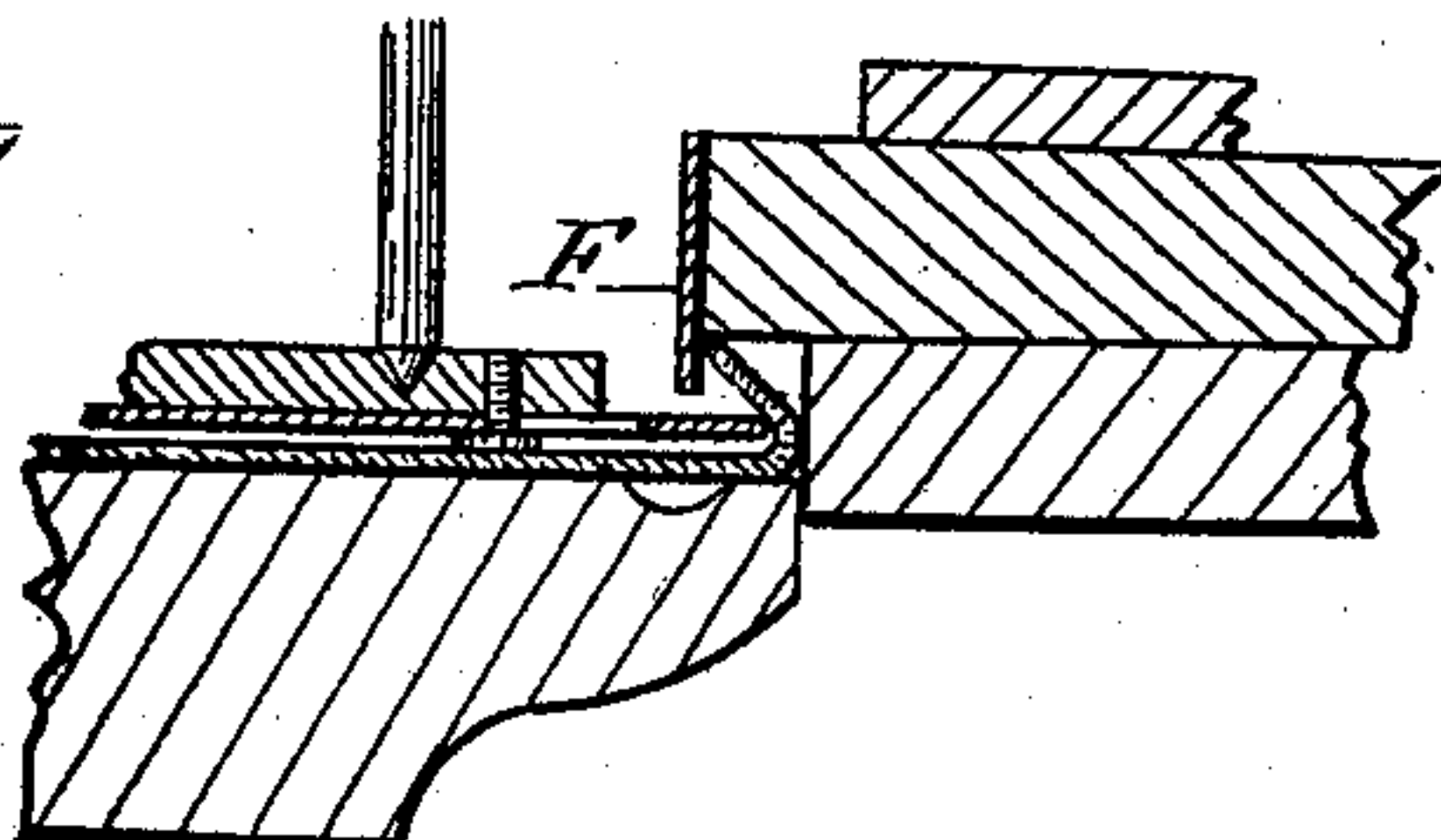


Fig. 5

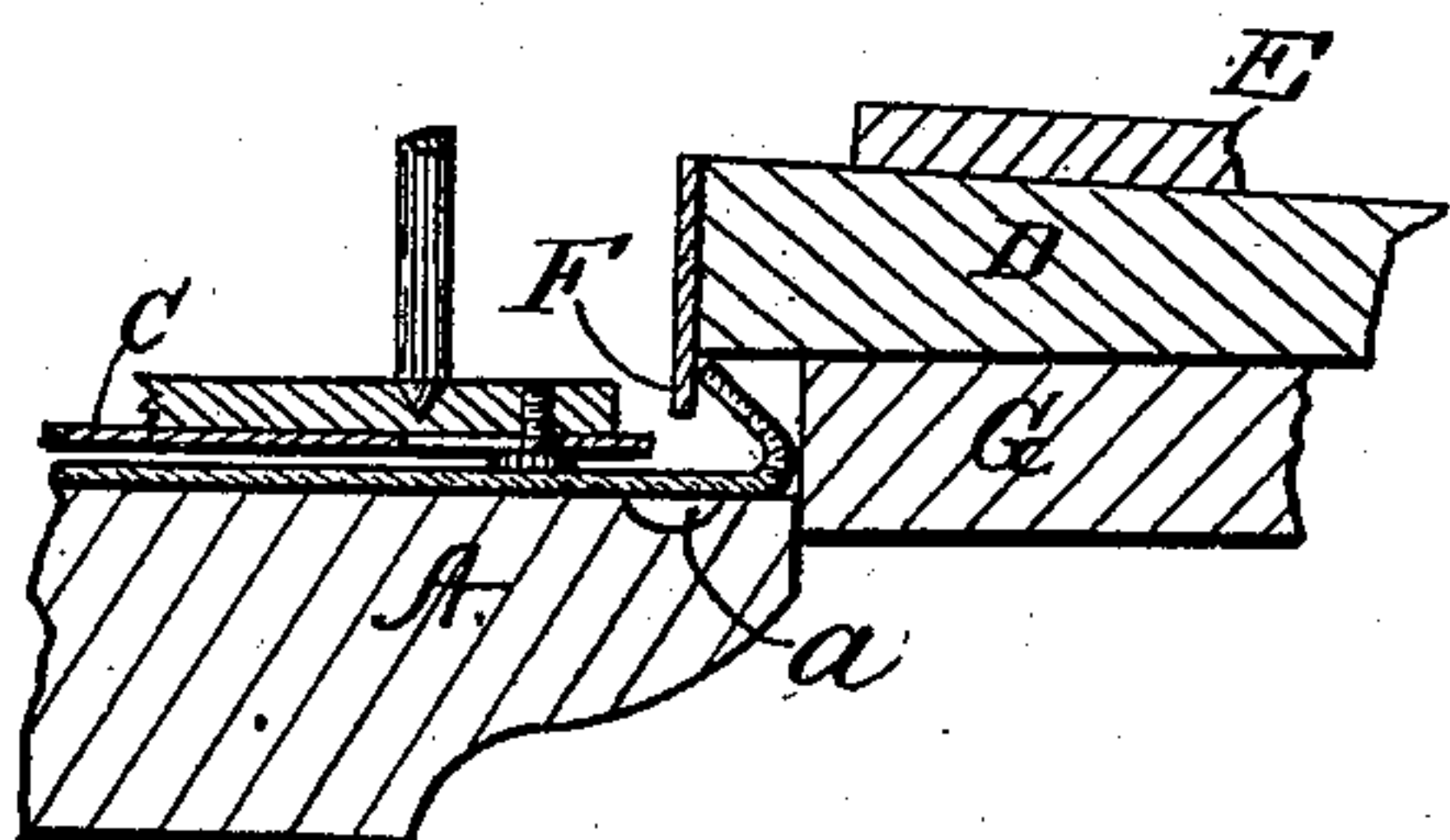
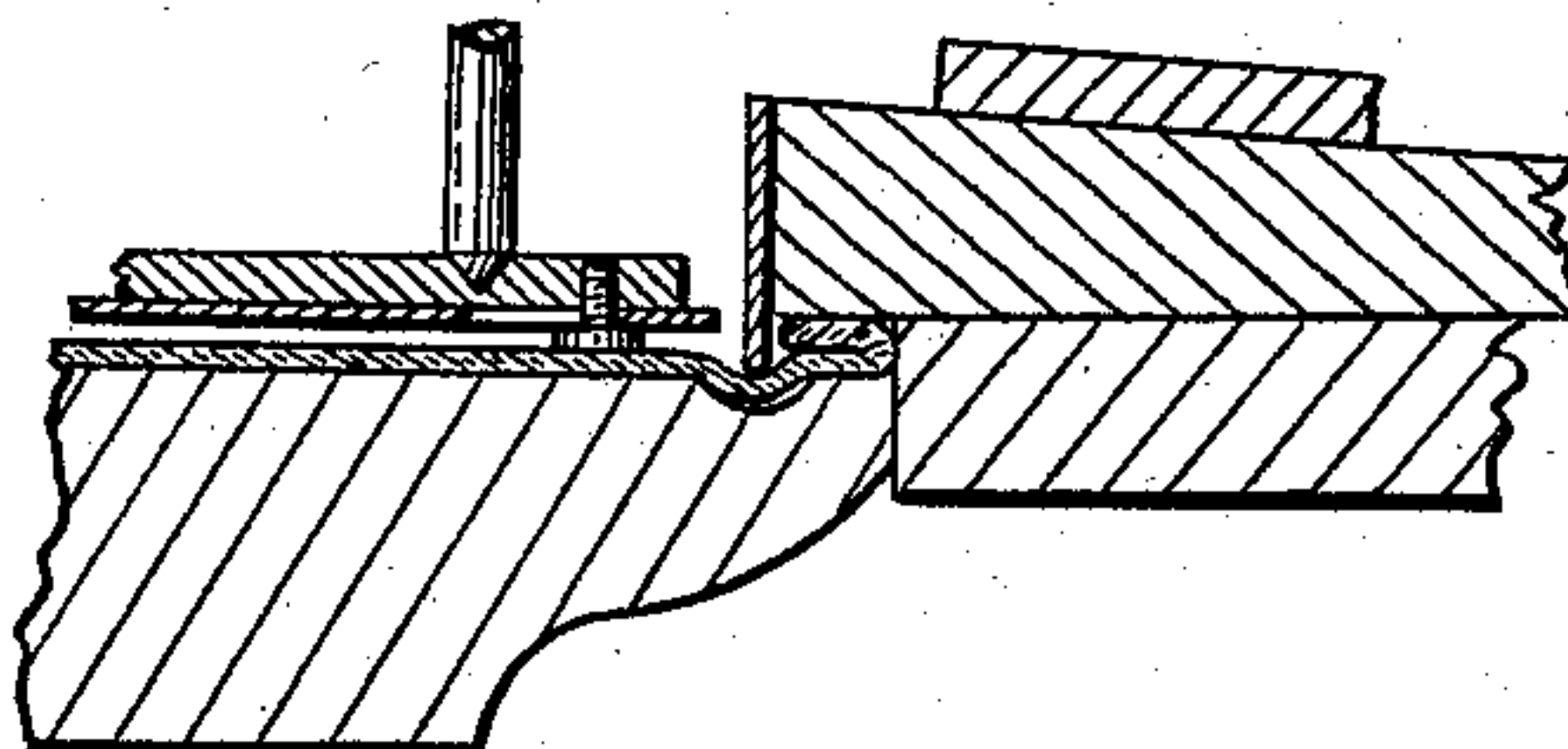


Fig. 6.



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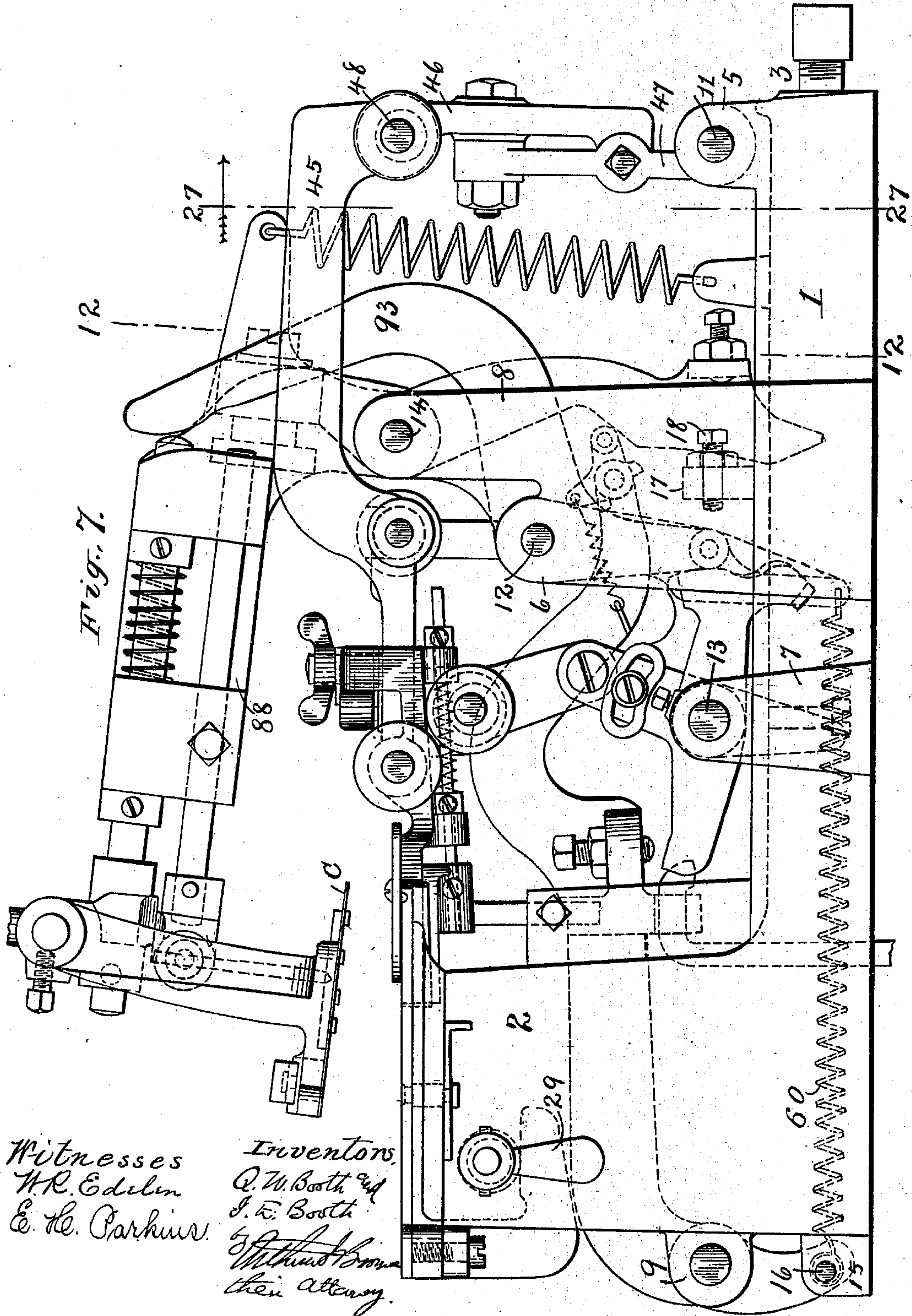
Patented Mar. 18, 1902.

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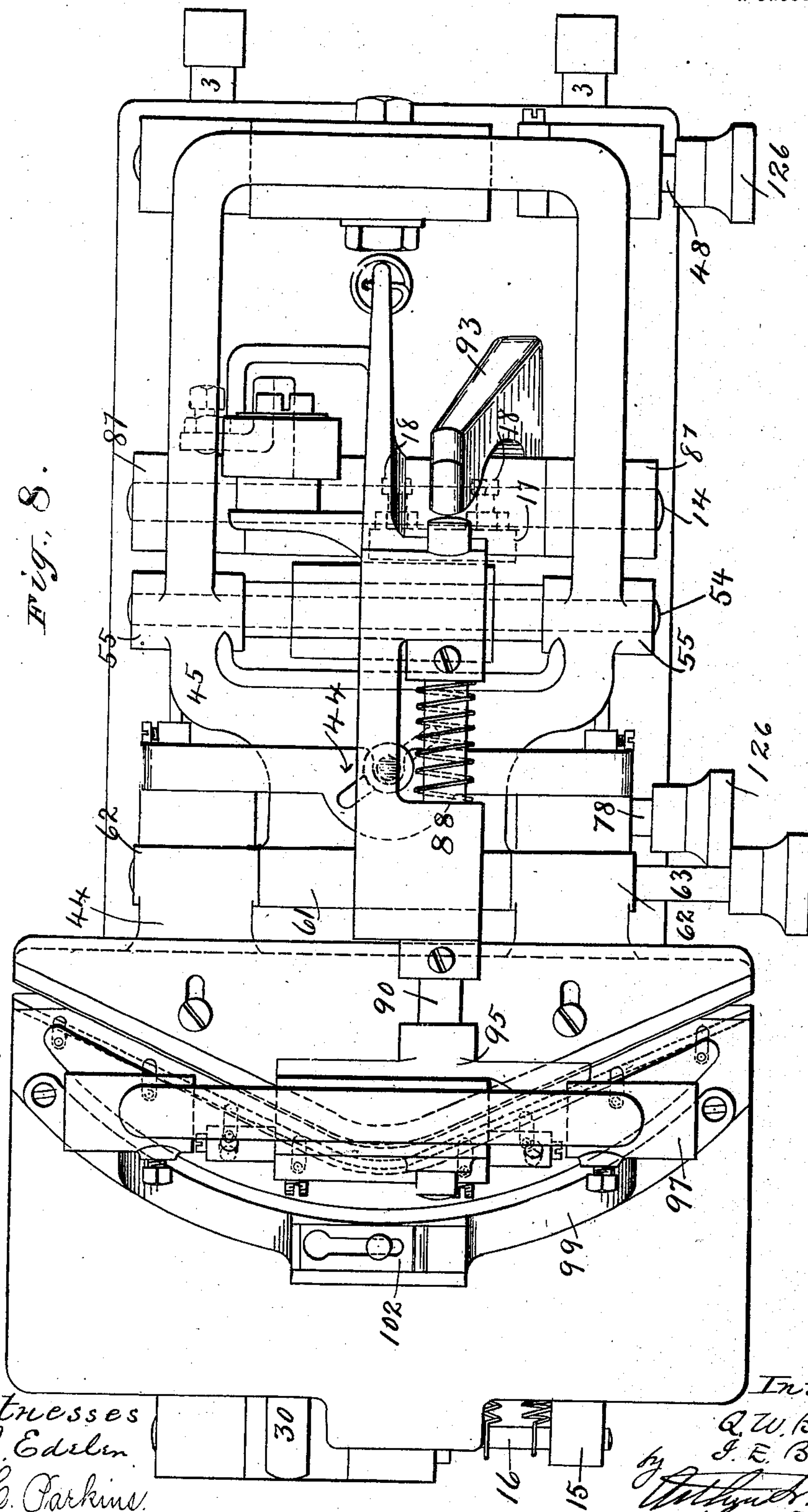
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11 Sheets—Sheet 3.



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Fig. 9.

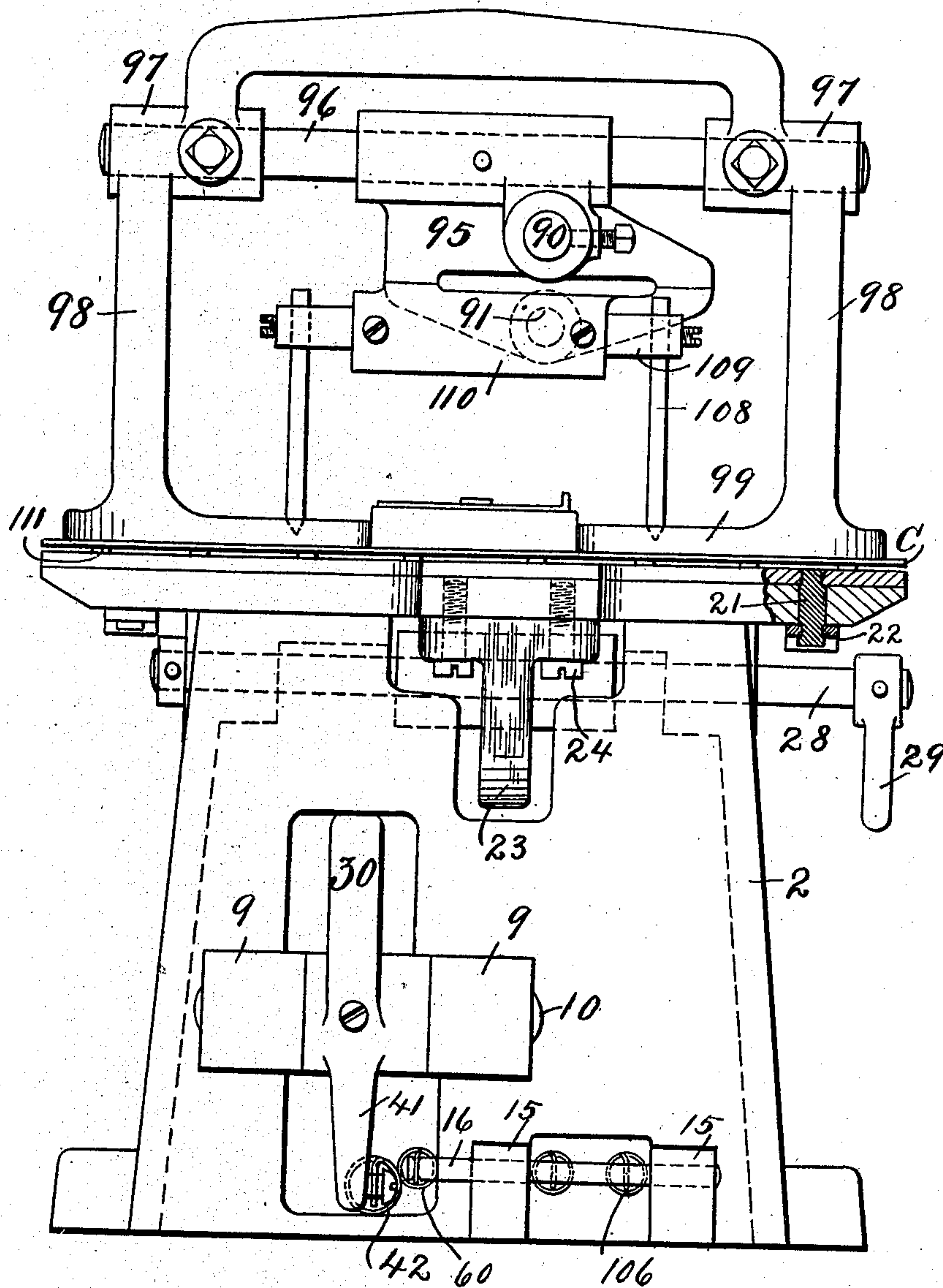
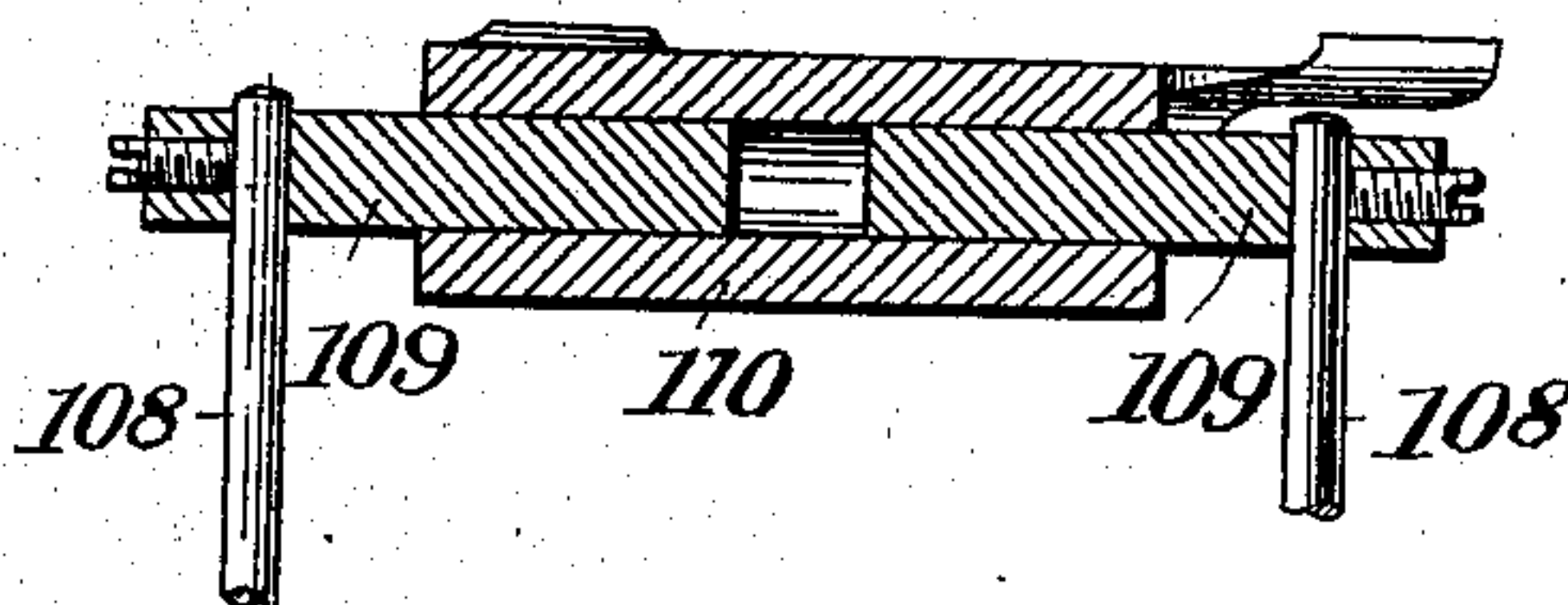


Fig. 9a.



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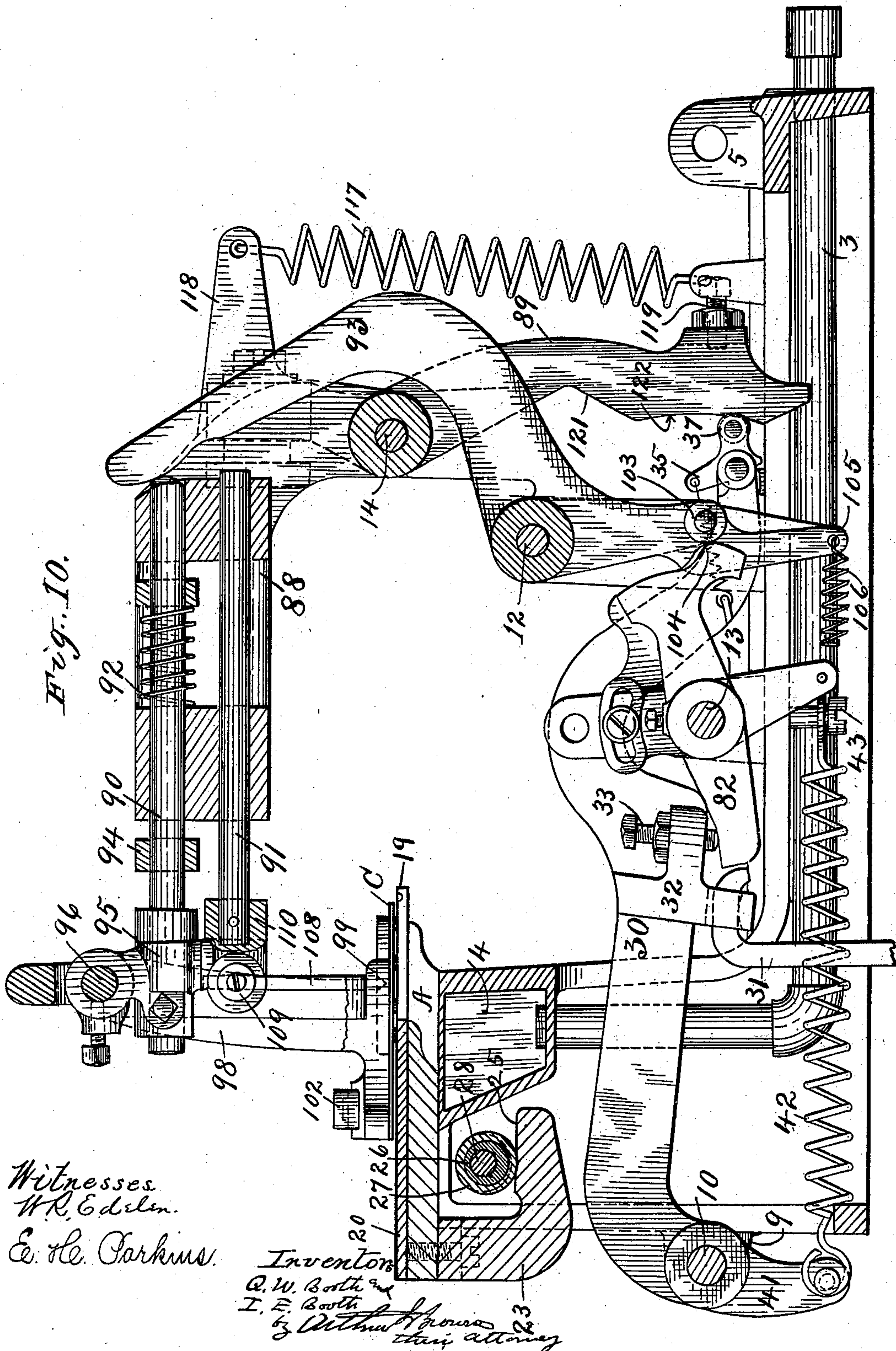
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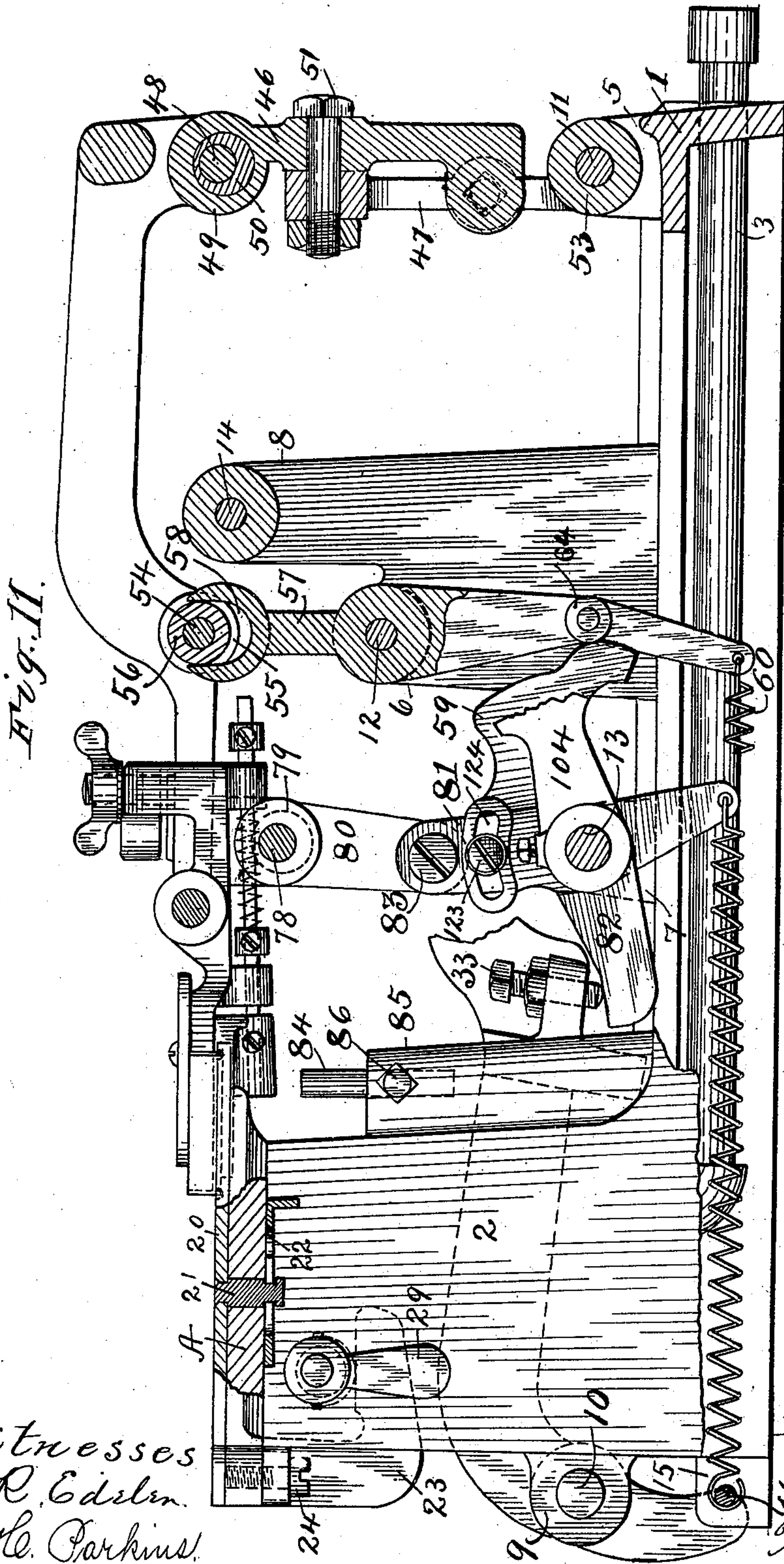
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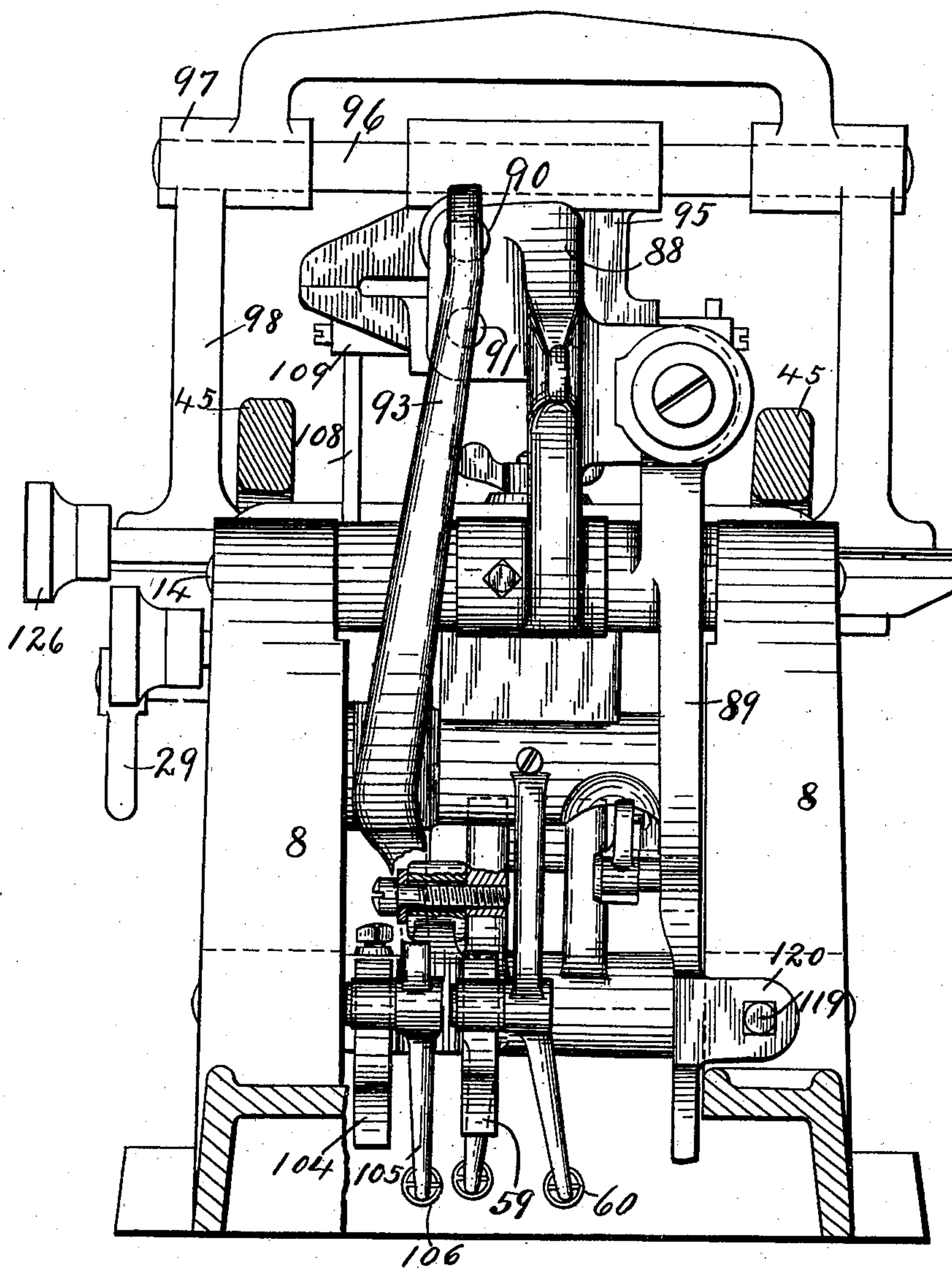
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Fig. 12.



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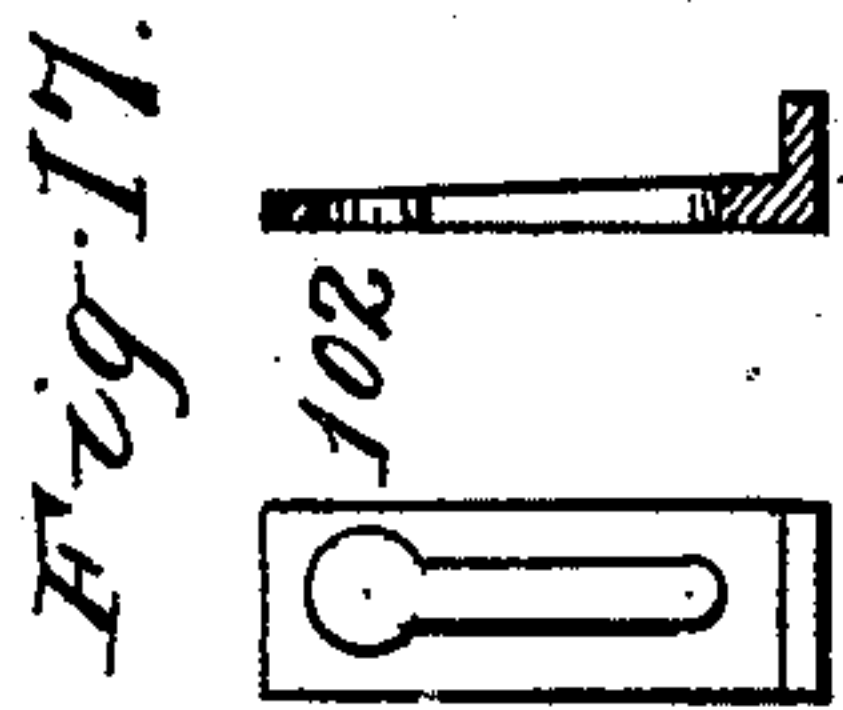
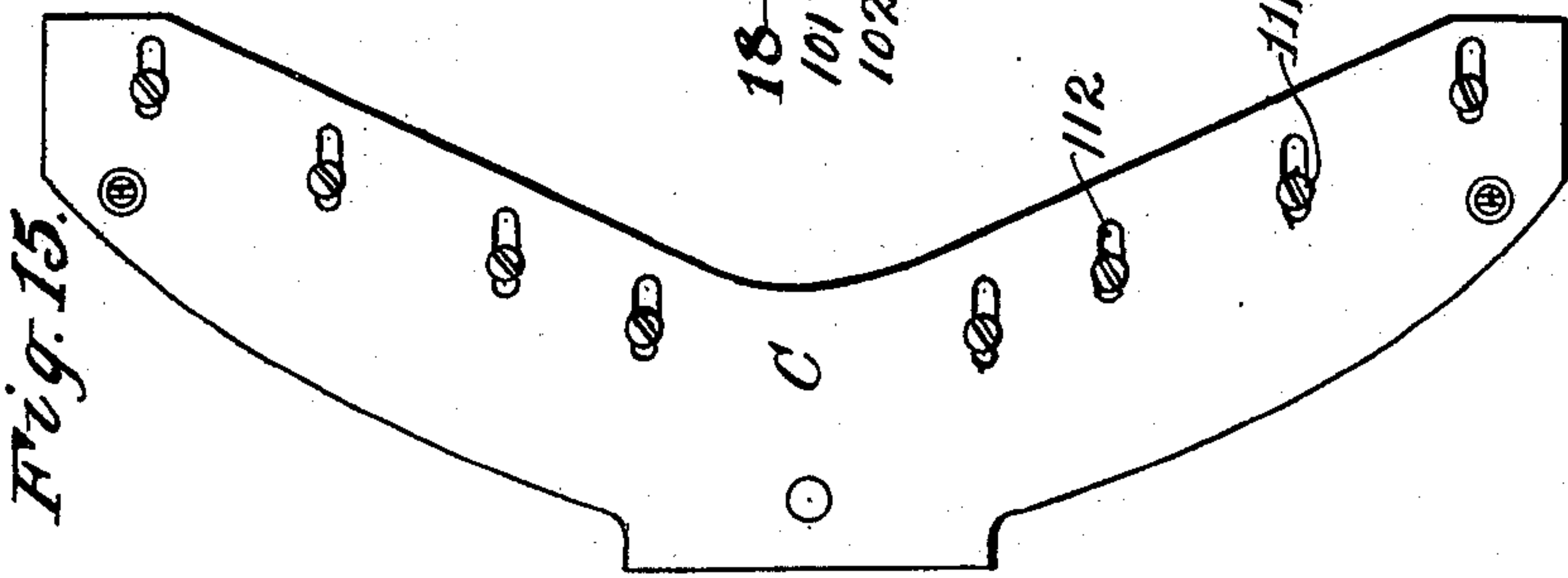
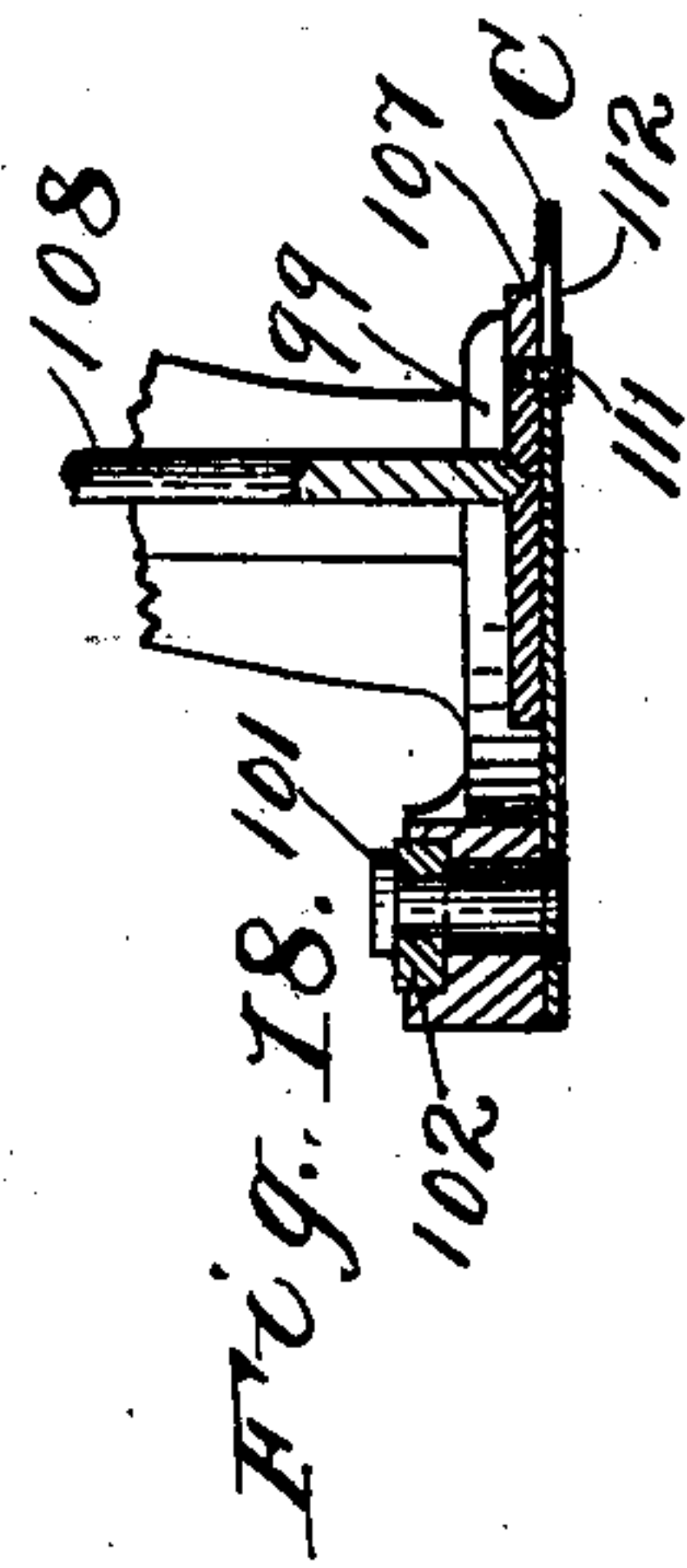
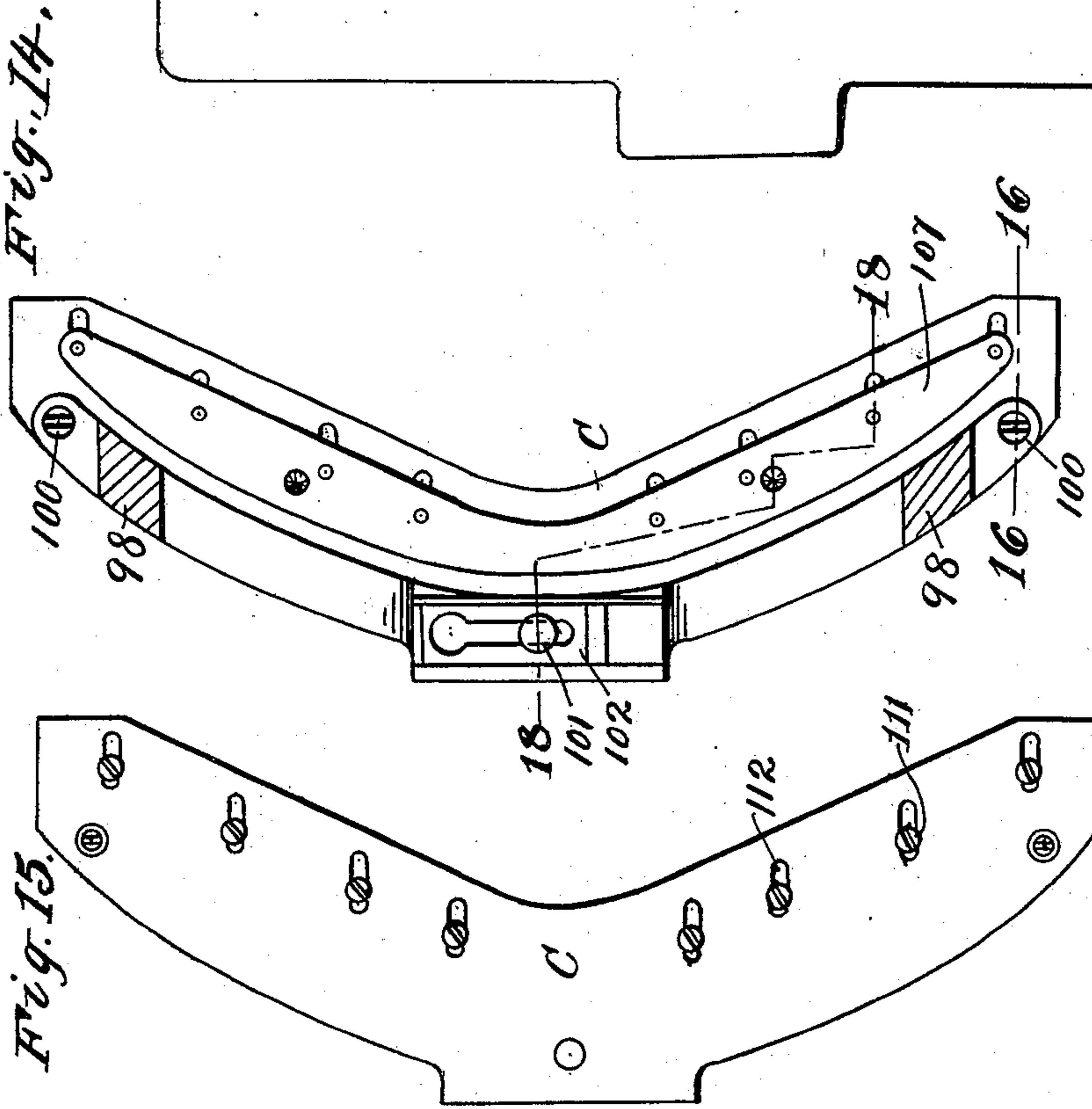
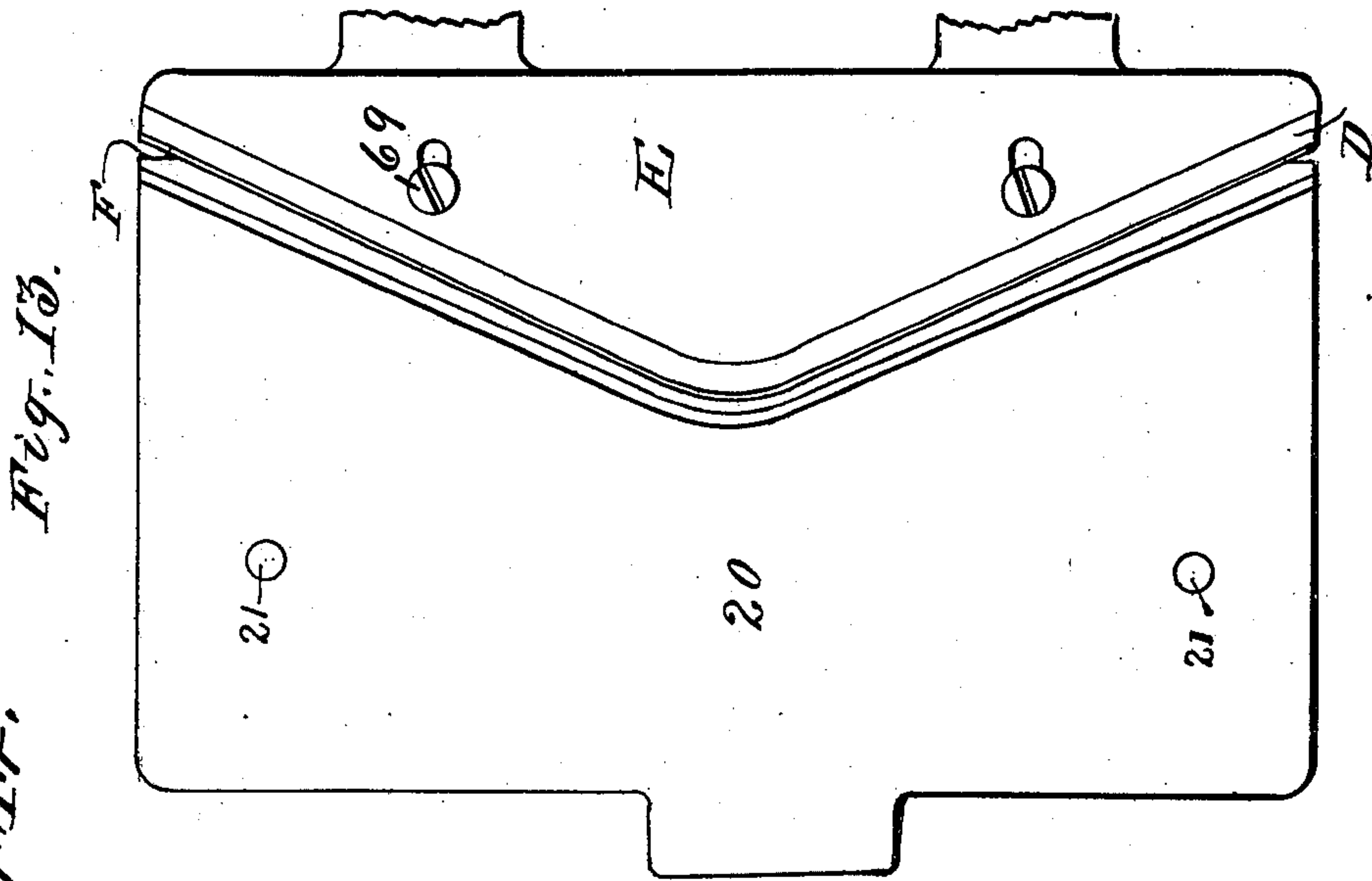


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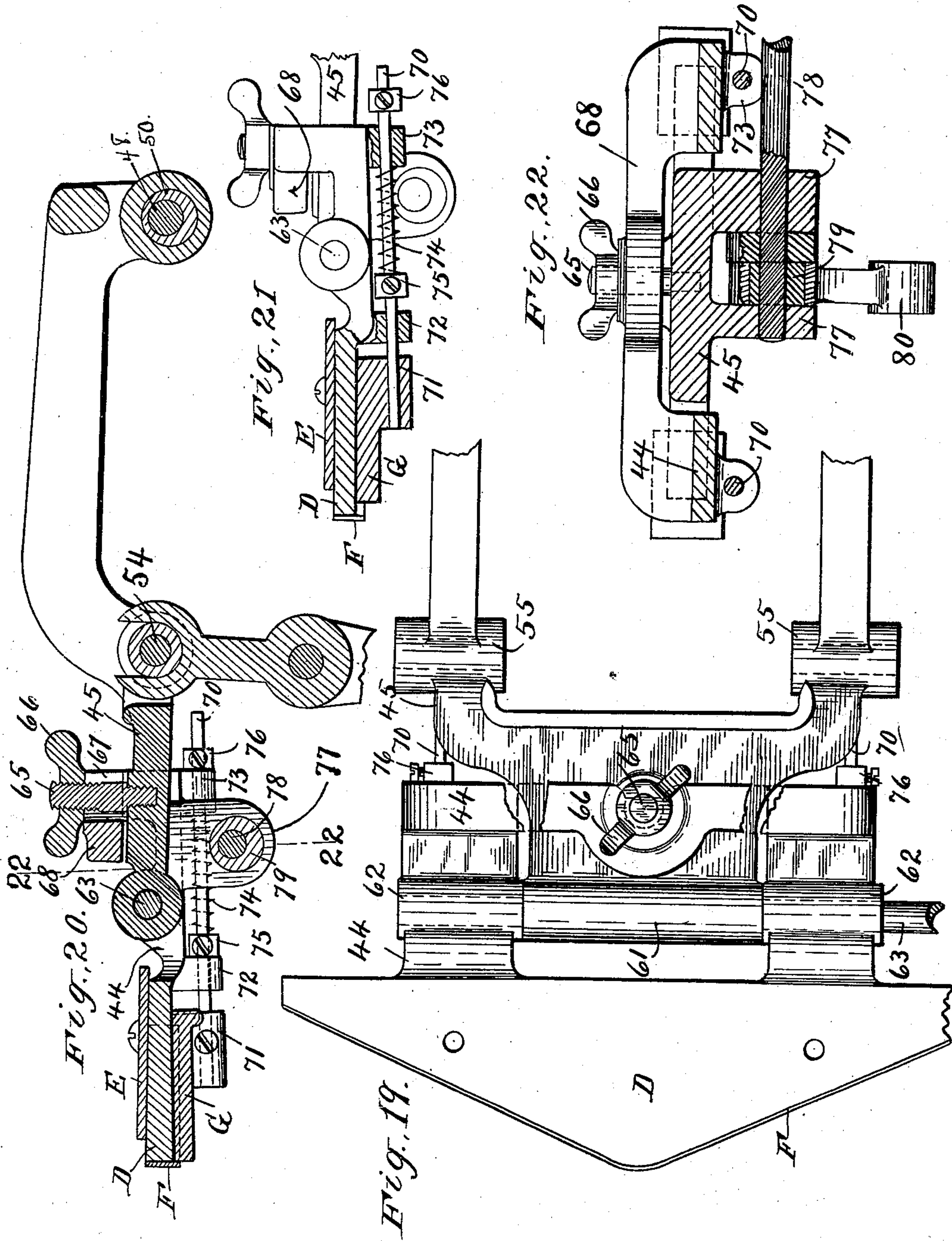


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11 Sheets—Sheet '9.



Witnesses.  
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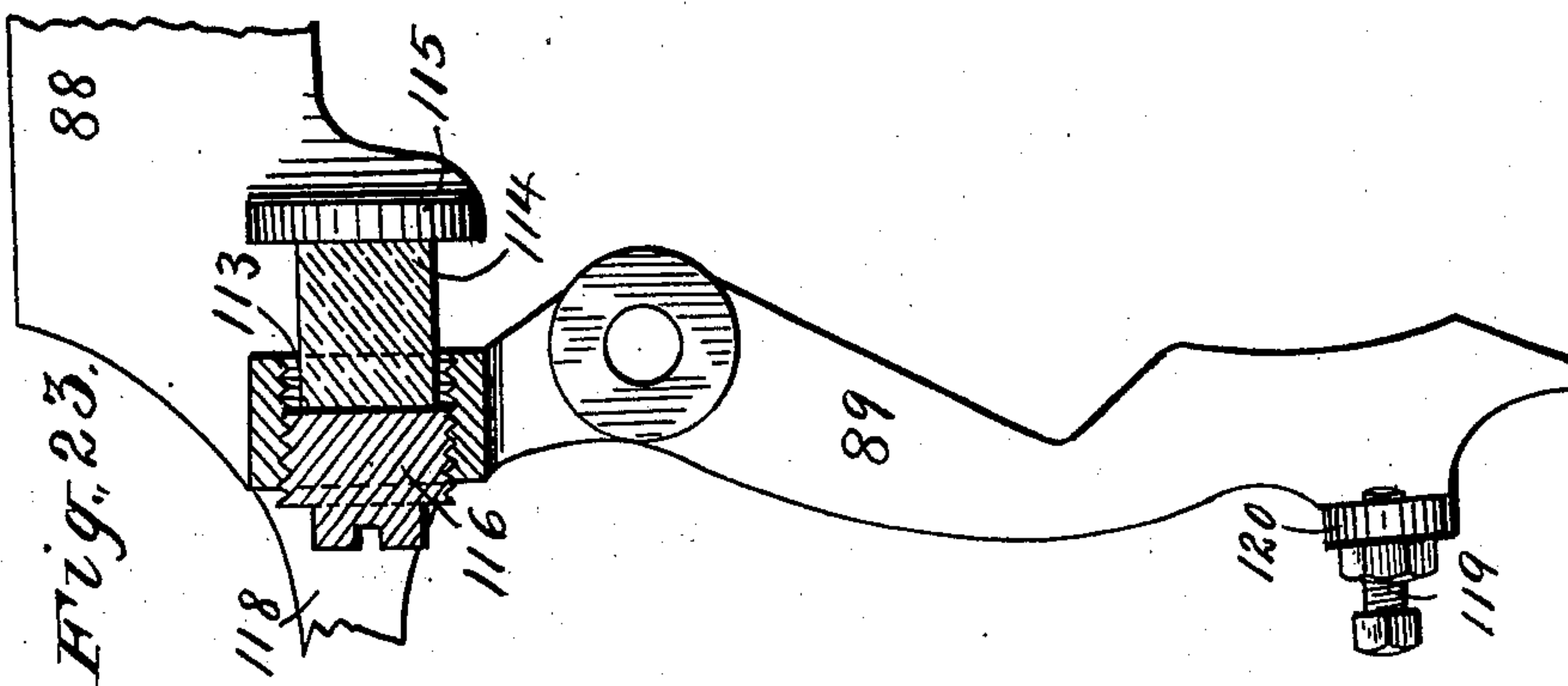
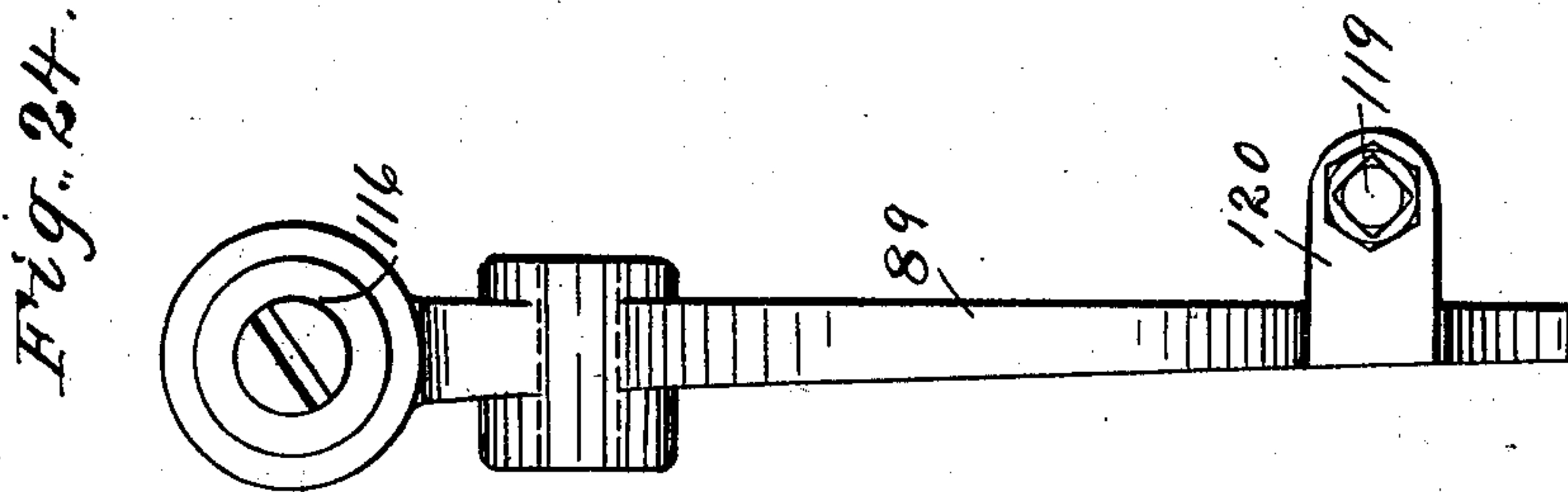
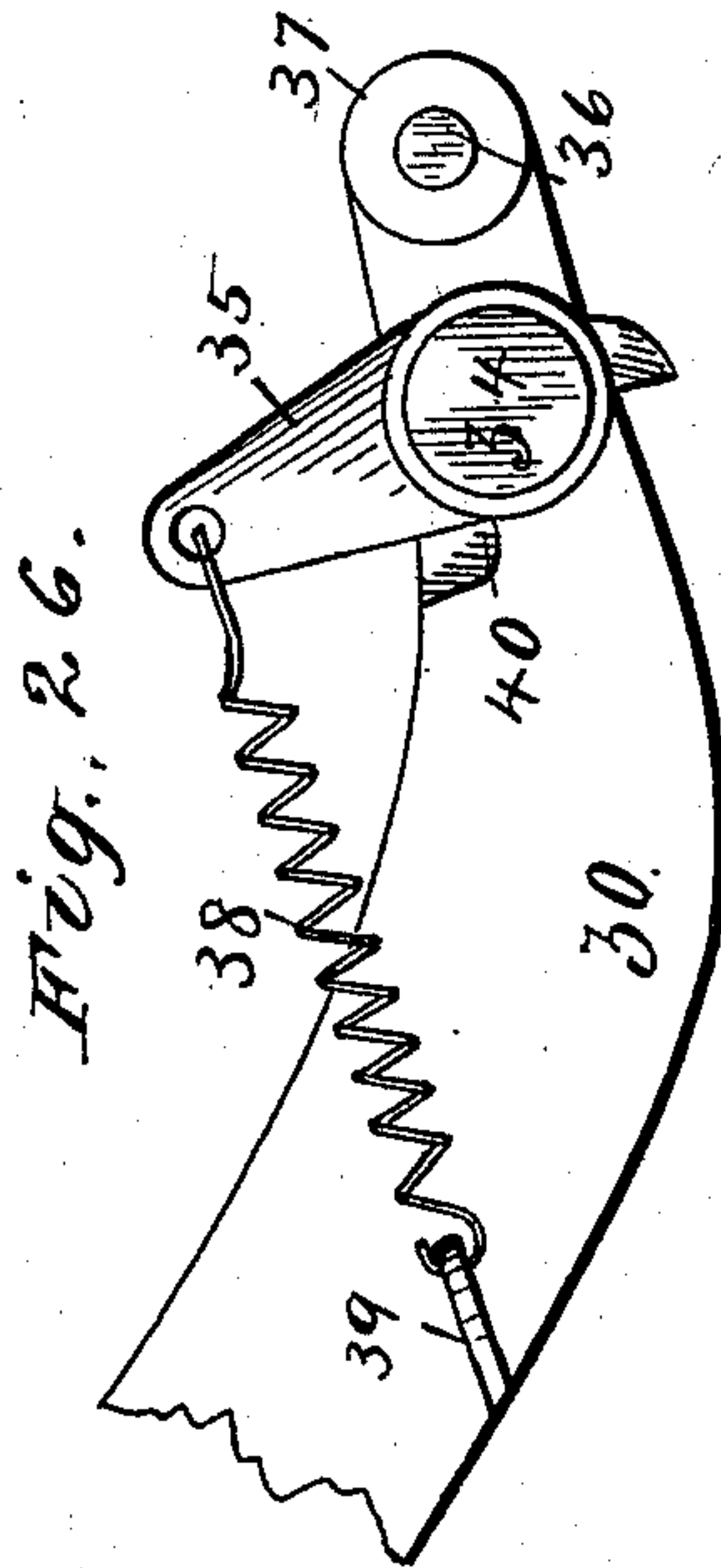
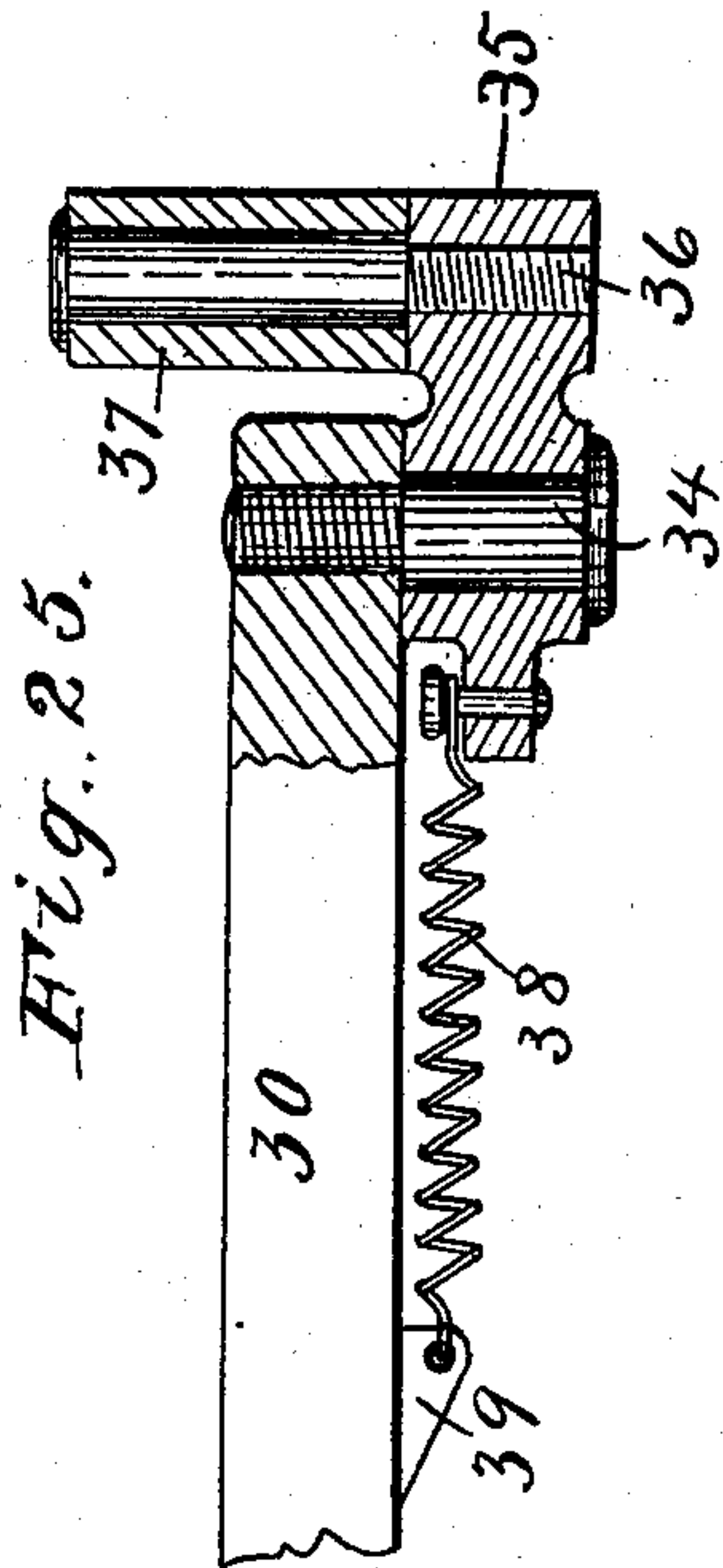
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11 Sheets—Sheet 10.



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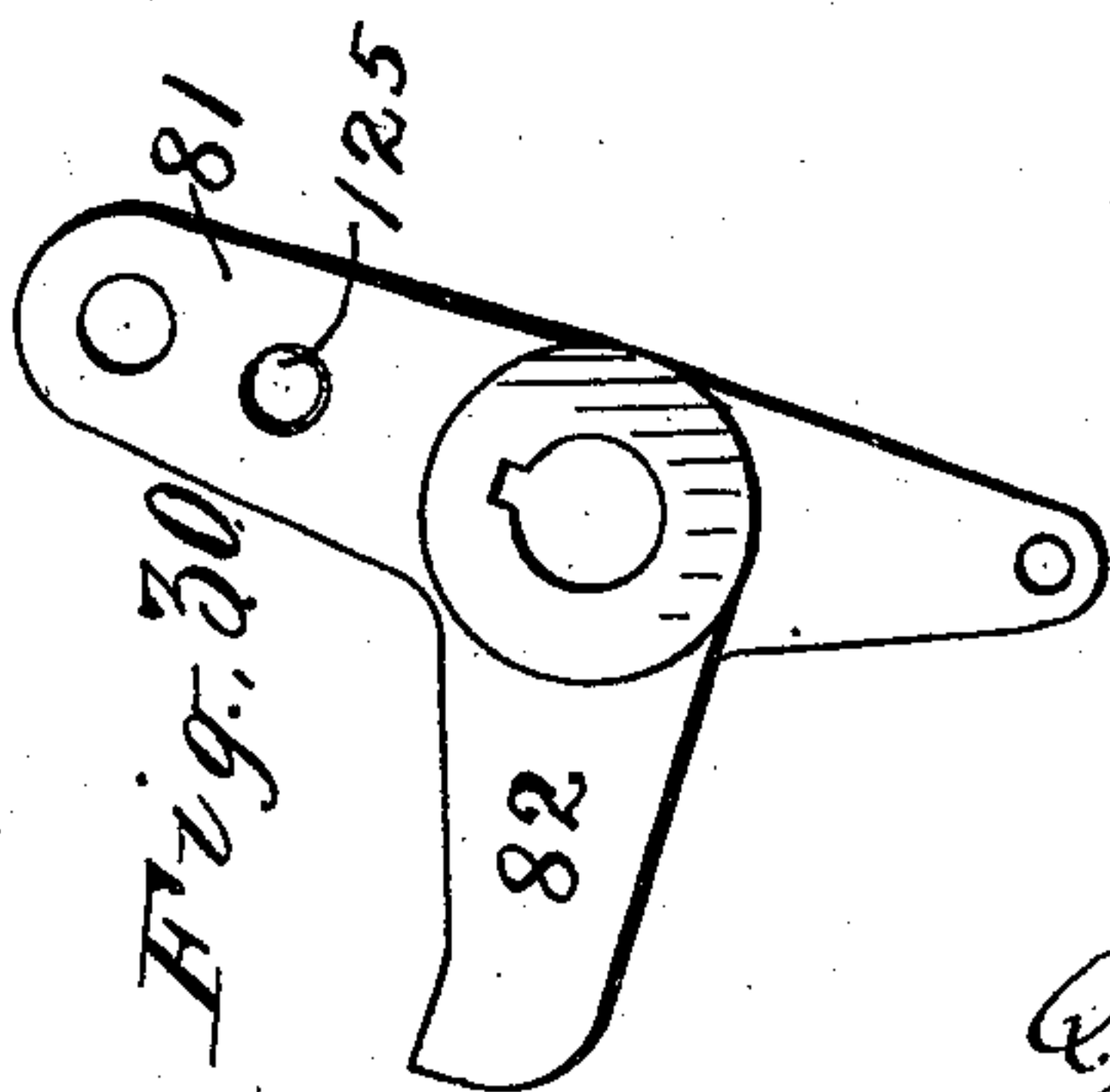
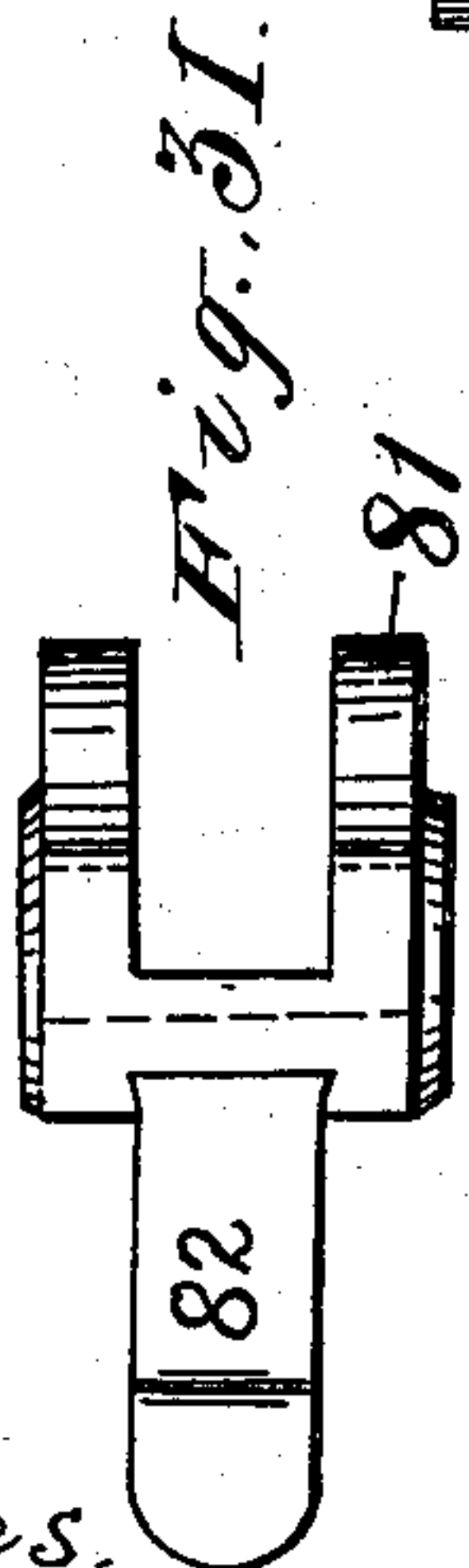
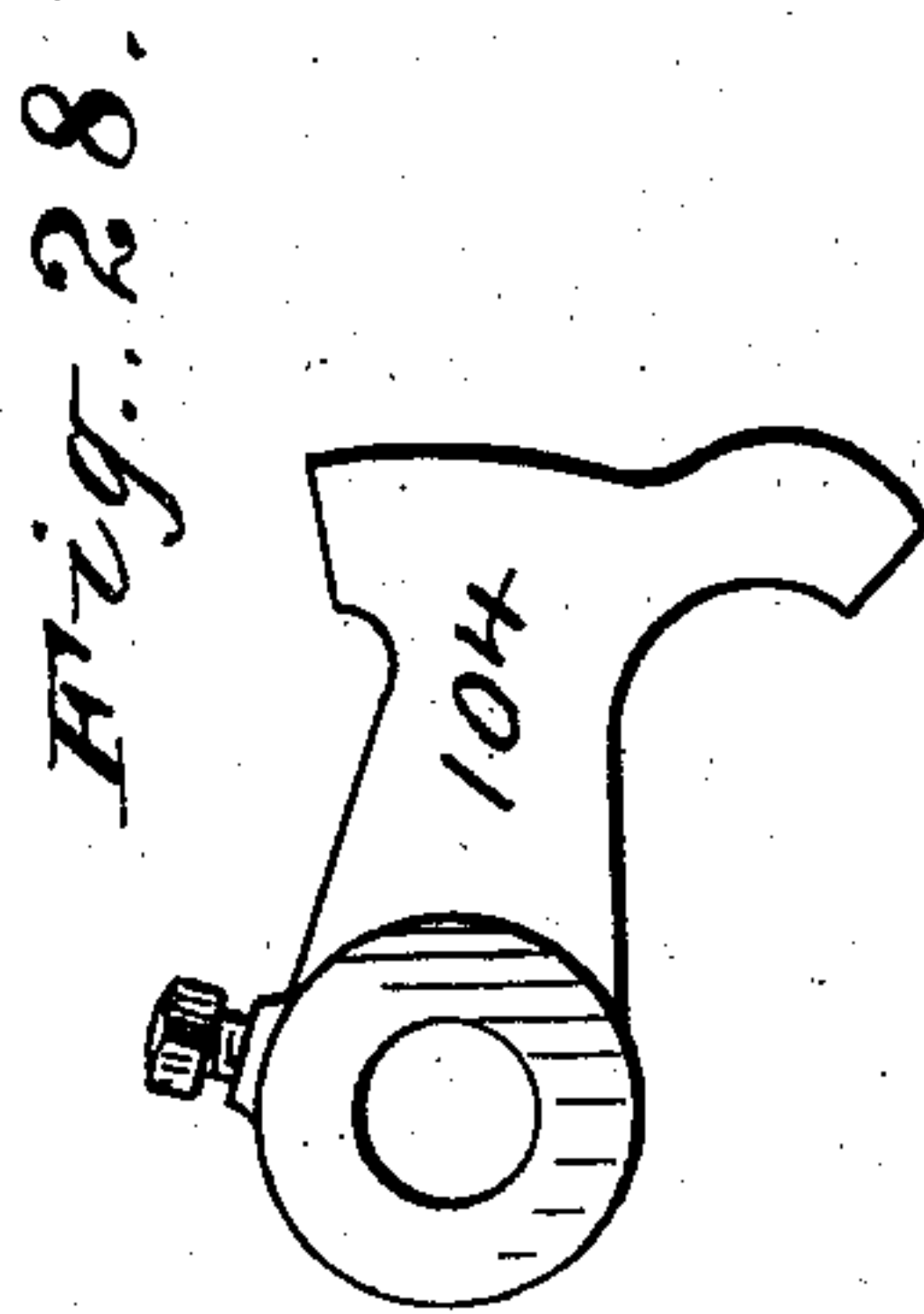
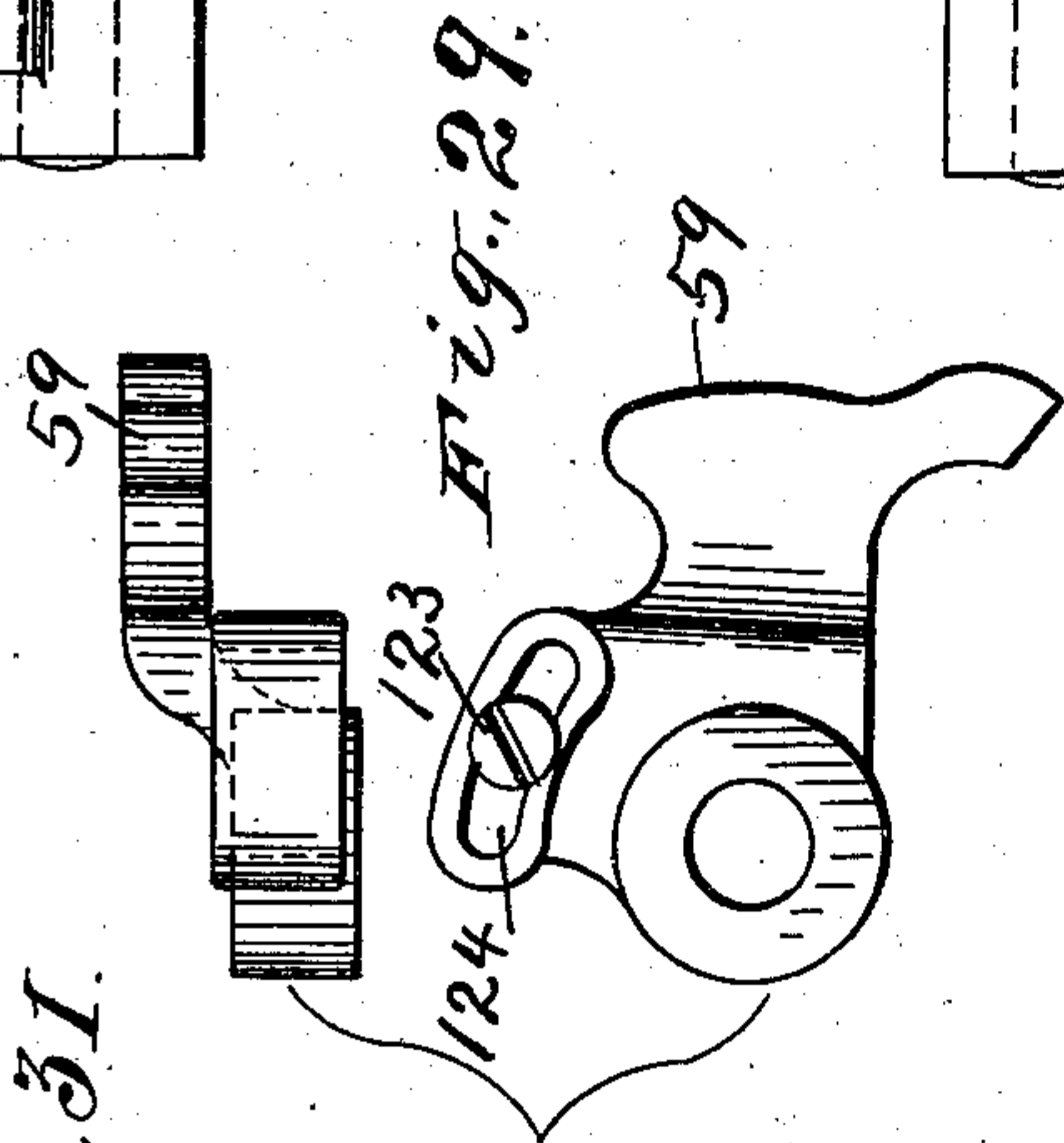
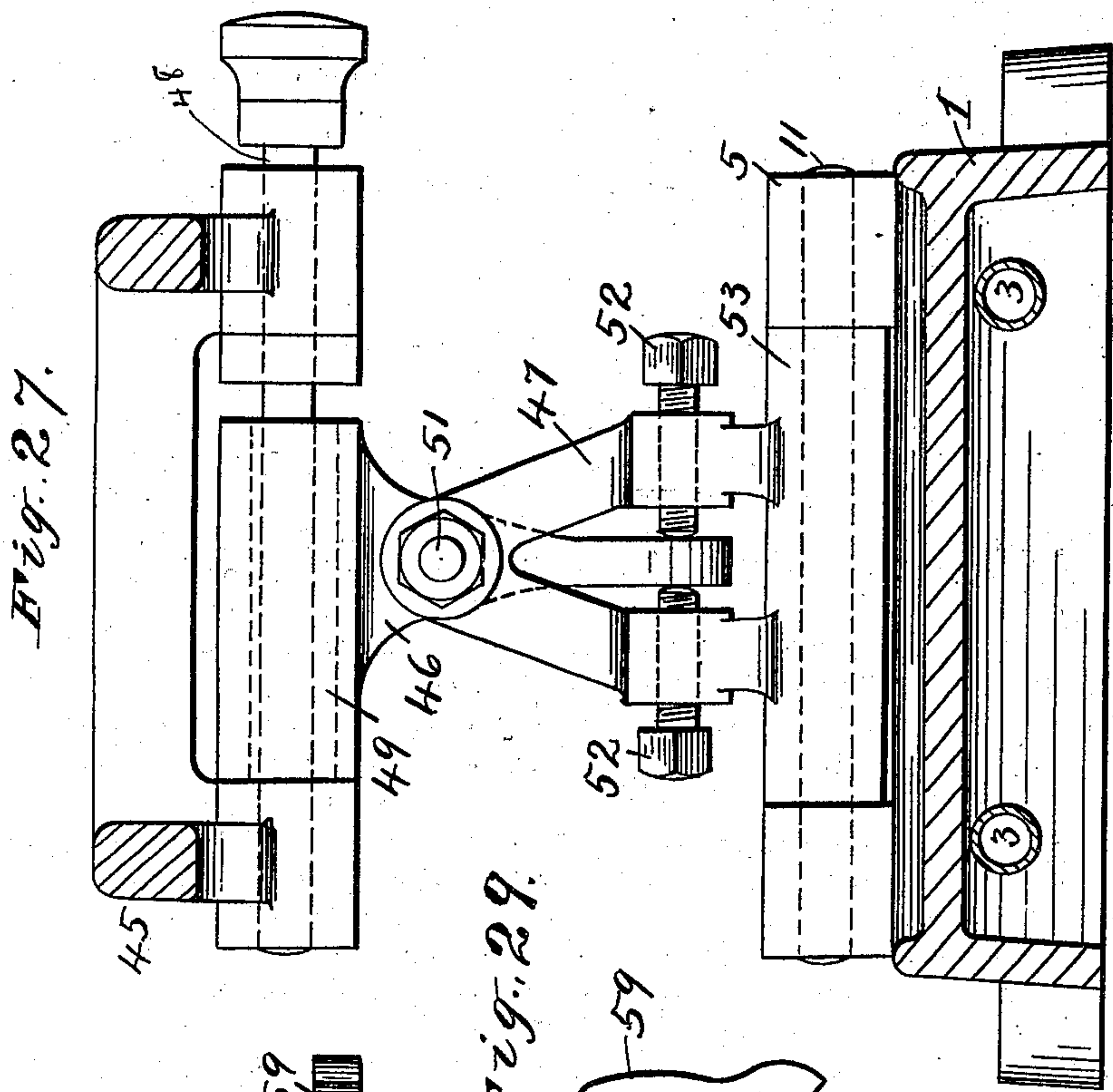


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# UNITED STATES PATENT OFFICE.

QUENTIN W. BOOTH AND IRVING E. BOOTH, OF ROCHESTER, NEW YORK.

## UPPER-FOLDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 695,438, dated March 18, 1902.

Application filed May 12, 1900. Serial No. 16,403. (No model.)

*To all whom it may concern:*

Be it known that we, QUENTIN W. BOOTH and IRVING E. BOOTH, of Rochester, Monroe county, New York, have invented a new and Improved Folding-Machine, of which the following is a specification.

This invention has reference to improvements in folding-machines intended more particularly for folding leather, cloth, and like materials, especially the curved edges of shoe tips, quarters, and the like.

The main features of the invention pertain particularly to the means for forming the fold and compressing it by a pivoted folder operated by a toggle and also to a lip projecting below the pressing-face of the folder. Heretofore difficulty has occurred in preventing the edge which is folded over from adhering to the former and being displaced when the former is withdrawn from the partial fold. The improved device is so constructed and arranged that the edge of the material is restrained by the projecting lip from being displaced by the withdrawal of the former.

A further feature is the means by which parts for folding one shape or curve can be quickly removed from the machine and replaced by others for folding a different shape or curve and also in the improved means for holding the material to the table while the fold is being formed.

The lip referred to for preventing the displacement of the work by the withdrawal of the former may be made of a strip of thin metal secured to the folding edge of the folder or it may be integral with and project below the pressing-face of the folder. By this means the folder as it rises forces the leather upward at right angles and then by a forward movement bends the leather over, with the edge of the former against the turned-up portion, and as the folder continues to move forward the projecting lip rides over and beyond the edge of the hooked portion of the leather, thus preventing it from being drawn forward as the former is withdrawn from between the folded portion of the work, and as the folder is drawn downward it compresses the folded leather, with the inside face of the lip still resting against the free edge of the leather. A groove is formed in the table to receive the lip on the folder, so that the pressure of the

folder will be exerted on the folded edge instead of on the material between the lip and the table.

Other features of the invention consist in the mechanism for performing the results previously described, which will be clearly and fully developed in the general description of the machine.

A machine embodying the present improvements is illustrated in the accompanying drawings, wherein—

Figures 1 to 6, inclusive, are sectional details indicating the various stages of the mechanism during one cycle of the movements of the machine—viz., Fig. 1 showing the position of the parts at rest, Fig. 2 showing the holder down upon the leather or other material, Fig. 3 showing the folder elevated its extreme height and the leather turned up, Fig. 4 showing the folder forced forward its extreme distance and the leather in the form of a hook, Fig. 5 showing the parts in the same position as indicated in Fig. 4, except in the former, which has been removed from under the end of the folder, and Fig. 6 showing the folder down tight against the lapped-over leather and the lip still holding the free edge of the leather. Fig. 7 is a side elevation of the complete machine. Fig. 8 is a plan view of the machine. Fig. 9 is a front elevation of the machine. Fig. 9<sup>a</sup> is a detail cross-section of the guide-block on the swinging head which affords a support for the holder. Fig. 10 is a longitudinal vertical section of the machine with the folder removed and the holder and master-lever in operative position. Fig. 11 is a partial longitudinal section with a portion of the machine in elevation, the holder being removed and the folder being in its final operative position. Fig. 12 is a transverse section on the line 12 12 of Fig. 7. Fig. 13 is a plan in detail of the adjustable table and the folder. Fig. 14 is a sectional plan in detail of the former. Fig. 15 is a bottom view of Fig. 14. Fig. 16 is a section on line 16 16 of Fig. 14, showing the spring-button secured to the former. Fig. 17 represents, respectively, plan and section of the wedge for securing the former to the foot-plate. Fig. 18 is a section in detail on the line 18 18 of Fig. 14. Fig. 19 is a plan in detail of the folder. Fig. 20 is a longitudinal vertical sec-



tion of the folder. Fig. 21 is a sectional detail of the folder in part, showing the parts in a varied position. Fig. 22 is a transverse vertical section of the folder, taken on the line 22 22 of Fig. 20. Fig. 23 is a side elevation in detail of the elastic operating or pendulum lever of the holder-lever. Fig. 24 is a rear view of said lever. Fig. 25 is a plan view of Fig. 26, partly in section. Fig. 26 is a side elevation in detail, with a portion broken away, of the master-arm for operating the pendulum-lever. Fig. 27 is a transverse vertical section of the adjustable compound link for supporting the folder, taken on the line 27 27 of Fig. 7. Fig. 28 is a side elevation of the cam for throwing forward the former. Fig. 29 is a side elevation and plan of an adjustable and similar cam for throwing the folder forward before it has been drawn down on the machine-table by the toggle mechanism. Fig. 30 is a side elevation of the lower portion of the toggle-lever with its operating-arm and the arm for securing the operating-spring thereto. Fig. 31 is a plan of Fig. 30.

The main instrumentalities of the improved folding-machine are the table A, the holder B, the former C, the folder D, the gage E, the lip F, and the stop G.

Figs. 1 to 6, inclusive, illustrate all the folding movements of the instrumentalities which act directly upon the material. In Fig. 1 the material, the edge of which may be previously moistened or covered with cement, lies upon the table A and extends over the top of the lip F and onto the folder D, with its edge resting against the gage E. Immediately above the table A are a holder B and a former C, both movably secured together in a normally elevated position. This entire device has an up-and-down movement to and from the work-table. The first step of the operation is the descent of the holder B against the leather L, so as to firmly hold the leather upon the work-table, as shown in Fig. 2. The folder D is then elevated to its extreme height, thereby turning the end of the leather which was lying over it upward at right angles to the table A, as shown in Fig. 3. During this movement the edge of the former determines the line of the fold, it and the contiguous edges of the folder and of the work-table being shaped to give the desired line of fold. The folder D is then moved forward over the edge of the work-table and former, thus bending the leather over the edge of the former, as shown in Fig. 4. This movement of the folder carries the projecting edge of the lip F forward of the bent edge of the leather, so that the said edge of the leather springs up behind the lip, as shown in Fig. 4. The stop G, which does not move forward with the folder, prevents the leather from springing back to its original position. The former C then withdraws from beneath the bent-over edge of the leather and the folder, as shown in Fig. 5. During this movement the leather is maintained in place by

the holder B, which retains the position holding the leather against the work-table, and by the lip F, which prevents the bent-over edge of the leather from being displaced by the withdrawal of the former. The folder then descends upon the bent-over edge of the leather, thus folding it down flat against the body of the leather, as shown in Fig. 6. To permit the firm pressing down of the leather, a groove *a* is formed in table A immediately below the edge of the lip, so that the leather is not marred thereby. This completes the sequence of the folding operation, and the parts then resume their normal position. (Shown in Fig. 1.) The folded leather is then removed.

In describing the various features of the devices for producing the aforesaid results the frame and its connecting parts will be first described.

The machine has a frame 1 with a vertical extension 2 on its front or operating end. Said extension is hollow and also the frame 1. Extending into and from the rear end of said frame 1 are two steam-pipes 3, (see Figs. 8, 10, and 27,) which extend nearly the full length of said frame and terminate in a box 4, cast integral and flush with the top of said vertical extension immediately beneath the work-table A. The object of the pipes and the steam-box aforesaid is to allow a current of steam to pass from one pipe to the other through said steam-box, and thus heat the work-table, so as to set the moistened leather as it is folded. Any other heating means may be employed. Secured to and preferably integral with said frame are standards 5, 6, 7, and 8 and brackets or lugs 9 for supporting shafts 10 11 12 13 14, which carry the mechanism for operating the machine. Also forming part of and integral with said frame 1 are lugs 15, (see Figs. 7, 8, and 9,) which are provided with a pin 16 for supporting at one end three spiral springs, the opposite ends of said springs being attached to the toggle-and-cam mechanism, to be hereinafter fully set forth. Located on the inside of said frame is a vertical lug 17, which is provided with two set or stop screws 18 for regulating the extreme throw of the levers operated with the cam. (See Figs. 7 and 8.)

The top of the vertical extension 2, previously referred to, supports the work-table A, which is in contact with said steam-box 4, for the purpose as aforesaid. This table is adjustable horizontally, and its inner edge 19 conforms to the contour or shape of the material to be folded. (See Fig. 13.) Removably secured to the work-table A is a face-plate 20, which is preferably made of brass or other non-corrosive material. This plate is secured to the table A by neck-pins 21 and by slotted wedges 22 (see Fig. 11) and can be quickly removed without disturbing other parts of the device. The characteristics of the wedges 22 are illustrated in Fig. 17, which also illustrates similar wedges used in an-



other part of the machine, as hereinafter described. The taper of the wedges need be but slight. It is not necessary to use two separate plates, as one plate or table could be substituted for table A and the face-plate 20; but it is more convenient to shape the thin face-plate to the desired curve or contour than a thick plate, and it is also much cheaper to manufacture. It is very desirable to secure the table A to the vertical extension 2, so that it can be quickly removed. To accomplish this, a hook 23 is provided, (see Figs. 10 and 11,) which is secured by bolts 24 to the work-table. The free end of said hook has a long flat surface 25 (see Fig. 10) and extends inwardly within the vertical extension 2. This hook is forced down by an eccentric 26, which operates through the medium of a roller 27 upon the flat surface 25 of said hook. The eccentric is supported by and secured to a shaft 28, having bearings in the walls of said hollow standard and extends on the outside thereof, with an operating-handle 29 (see Figs. 7 and 9) for locking the table A in any desired horizontal position. The periphery of the eccentric is provided and also protected by said roller 27, which is concentric with said eccentric and which prevents undue wear by the hook 23. The eccentric is of sufficient length to bind the hook in any reasonable adjustment of the table from right to left, and the hook is of sufficient length to permit of an adjustment toward or from the folder and still be secured by the eccentric. These two adjustments permit the table to be set accurately to any position of the folder and are very desirable both in setting up a machine and in changing the forms from one shape to another.

All of the movements of the machine are derived from a master-lever 30, (see Fig. 10,) which is fulcrumed to shaft 10 in lugs 9. Said lever extends rearwardly into the machine and controls all the operating mechanism connected therewith. This lever can be operated by any suitable means, either by power or by a treadle, a connecting-rod or pitman 31 being shown. This pitman is secured in a right-angled bracket 32, integral with said arm. Also secured to said bracket is an adjustable stud 33 for operating and also regulating various movements of the machine through the medium of devices which will be hereinafter fully described. The extreme free end of said master-lever 30 has pivoted thereon by a stud 34 a bell-crank lever 35. (See Figs. 10, 25, and 26.) Turning on a stud 36 on said lever 35 is an elongated friction-roller 37 for operating the pendulum-lever, to be hereinafter fully described. Secured to this bell-crank lever is a spring 38, which is anchored to a lug 39 on said master-lever. In its normal position the bell-crank lever is held against a stop 40, which prevents said bell-crank lever from rotating on its stud 34 on its downward movement when operating the pendulum-lever, previously mentioned. During the up-

ward or return movement of the master-lever the bell-crank lever is tipped downward when passing over the contour of said pendulum-lever, its spring 38 yielding sufficiently for the purpose. The master-lever 30 is provided with a short arm 41, to which is attached a retracting-spring 42, (see Fig. 10,) which has its opposite end secured at 43 to the frame of the machine. This spring elevates the master-lever. Fig. 7 shows the master-lever in the elevated position, and Fig. 10 shows it in its depressed position.

*Folder mechanism.*—The folder D is the forward part of a two-part frame 44 45, the rear or permanent part 45 of which is pivoted to the upper end of a compound link 46 47 by means of shaft 48. The lower end of said link is pivoted to shaft 11, (see Figs. 11 and 27,) which is secured in standards 5, close to the body of frame 1. This compound link is composed of two members—an upper member 46 and a lower member 47. The upper member is provided with a sleeve 49, which envelops an eccentric 50, turning upon said shaft 48. Said upper member is bolted at 51 to the apex of the bifurcated arms constituting the lower member 47 and extends downward between two set-screws 52, secured in said arms. (See Fig. 27.) The lowermost part of said lower member has an elongated sleeve 53, (see Fig. 27,) which turns on said shaft 11. This compound link is adapted to adjust the folder horizontally and parallel with the table A through the medium of the set-screws 52 and prevent the folder from tilting laterally on the bolt 51. Mounted on the rear portion 45 of said folder-frame is a shaft 54 through the medium of hubs 55, (see Fig. 8,) which carries a roller 56, to be hereinafter further described. Mounted on shaft 12 is a rocking lever 57, the upper end of which is provided with an elongated open-mouthed groove 58, in which fits the afore-said roller 56. (See Fig. 11.) The lower portion of said rocking lever 57 is provided with a roller 64, which is held against a cam 59, to be hereinafter described, by a spring 60, secured to an extension of said rocking lever, its opposite end being attached to pin 16, secured to the frame 1. (See Fig. 7.) The permanent part 45 of the folder-frame extends forward from said hubs 55 and terminates at its forward end in a long bearing or sleeve 61, which is centrally located between two lugs 62, forming part of the front or detachable part 44 of the folder-frame. (See Figs. 8, 19, 20, and 22.) The sleeve 61 and lugs 62 are removably secured to a common shaft 63. The folder-frame detachable section 44 is prevented from turning on the shaft 63 by means of a stud 65, secured to rear permanent section 45, and a thumb-nut 66, which enters a slot 67 in a bridge-piece 68, integral with the section 44. (See Figs. 19, 20, and 22.) By this means the parts are held securely together in proper relation to the work-table A. The front detachable section 44



can be readily removed by releasing the thumb-nut 66 and withdrawing the shaft 63 when desired to change the contour of the folder D for various kinds of work. The face or working edge of the folder is made to conform to the contour of the table A and is provided with the lip F, which preferably consists of a thin strip of metal secured to the entire face or edge of the folder D. Said lip F extends somewhat below the pressing-face of the folder, so as to hold the bent-over portion of the leather from slipping from its place when the former C is forced forward. (See Fig. 6.) The strip of metal constituting the lip F could be replaced by a row of pins arranged along the edge of the folder or may be an integral part of the folder. Adjustably secured on top of the folder is the gage E, which is adjusted by slots and clamping-screws 69 for regulating the amount of leather or other material that is to be folded.

Adjacent to the under face of the folder D is the stop G, which has the same contour as the folder D and the table A. This stop G is a plate held in its working position by rods 70, which are secured in lugs 71, integral with said stop. These rods slide in depending lugs 72 73 on the section 44 of the folder-frame, and the stop G is pressed forward by means of springs 74, surrounding said rods 70 and acting against the lugs 73 and adjustable collars 75 on said rods. Other collars 76 on the rear ends of rods 70 limit the forward movement of stop G. By this means the stop can be regulated relative to its coworking parts. As the folder is raised to bend the material the stop G is raised with it; but its lower edge does not rise above the top of the table, so that when the folder is pressed forward the stop is forced against the edge of the table, and thus prevented from moving forward with the folder, the springs 74 being compressed. As the folder is retracted the springs still hold the stop against the edge of the table until the folder is fully retracted, in which position the collars 76 rest against the lugs on the folder-frame, so that the edge of the stop at no time projects beyond the edge of the folder.

The operating mechanism for the folder acts upon the rear permanent section of the folder-frame. Secured to the under side of the forward end of the rear permanent section 45 of the folder-frame are two lugs 77, (see Figs. 20 and 22,) which support a shaft 78, on which is an eccentric 79, upon which swings a link 80, said link forming one member of a toggle, the other member of which consists of an arm 81, which forms the upper part of a bell-crank lever, the lower part 82 of which extends beneath the stud 33 of the master-lever 30. (See Fig. 11.) The toggle members 80 81 are pivotally secured together by a bolt 83. The other member or arm 82 of the bell-crank lever is for operating the folder through the medium of the master-lever previously referred to. The said bell-

crank lever turns on the shaft 13. When said master-lever moves downwardly, the stud 33 encounters arm 82, and the toggle mechanism first straightens and elevates the folder, the folder-frame now swinging vertically upon the shaft 48, the roller 56 being then elevated in the open-mouthed slot 58. When the folder is fully elevated, it is moved forward by means of the cam 59, which is operatively connected with the bell-crank, so as to move therewith, and which acts on the roller 64 of the lever 57, the folder-frame and compound link 46 47 swinging upon the pivotal point 11 on standard 5, to be more fully set forth in connection with the general description of the operation of the machine. To regulate the folder, so as to make it flush when at rest with the table A, an adjustable stop 84 is provided, which is supported in a standard 85, integral with the frame of the machine. The adjustable stop 84 is regulated by means of a set-screw 86. (See Fig. 11.) When the folder has been thus moved forward, the further swing of the bell-crank 81 82 under the action of the master-lever carries the toggles beyond the center line, thus drawing the folder down, as shown in Figs. 6 and 11.

The folder-frame is doubly pivoted, swinging forward and back on the axis 11 and up and down on the axis 48. It is supported at its middle between said axis and the folding edge by the rocking lever 57, which by its slot allows the rise and fall of the folder-frame and by its swing permits the forward and back swing of the folder-frame. Said lever also constitutes the means whereby the forward-and-back movement of the folder-frame is immediately effected. The operating mechanism is operatively connected to the permanent section only of the folder-frame, so that the detachable section of said frame is removable to change the contour of the folding edge without disturbing the connections with the operating mechanism, thus facilitating the interchange, and without disturbing the adjustments. The folder-frame is adjustable up and down by means of the eccentric 79 and may be adjusted horizontally, so as to level the folder, by means of the compound link 46 47. These adjustments, it will be noted, adjust the folder relatively to the work-table and operate upon the permanent section of the folder-frame. The two parts or sections of the folder-frame are pivoted together. In changing the machine to fold different curves it is necessary that the sections should interchange accurately, that they should be held so firmly that they will not be displaced by the pressure the machine exerts on the work, and that they should be easily removed and inserted. As the sleeve 61 fits snugly between the lugs 62 and both lugs and sleeve are fitted to shaft 63, it is obvious that the detachable section 44 is prevented from moving in any direction in relation to the permanent section 45 except to revolve about the shaft. To prevent its revolving, the said



sections 44 and 45 are made to overlap and are then clamped together by the stud 65 and the nut 66. At the points of contact the overlapping portions are dressed off accurately in relation to the bearings for the shaft 63 and to the upper and lower folding-faces and curved folding edge of the detachable section 44. As all the forms are dressed off alike, it is possible to remove one and substitute another and have it line up accurately in every direction with the work-table A and the former C. It is obvious that as the section 44 presses on the work-table the overlapping portions of the two sections are forced tightly together, so that the pressure exerted by the machine forces the sections in place rather than displaces them.

*Holder and former mechanism.*—Pivotaly mounted on shaft 14 (see Fig. 10) and supported by journals 87 is a head 88, (see also Figs. 8 and 12,) which has an up-and-down movement through the medium of a pendulum-lever 89, having an elastic contact with said carrier, which will be hereinafter fully described. Said head 88 is provided with two parallel rods 90 and 91. The rod 90 slides longitudinally in two bearings which form part of the carrier. Surrounding said rod 90 is a spring 92 for pressing said shaft backwardly and in contact with an operating-lever 93. A collar 94 on said rod 90 prevents said rod from being pushed too far rearward. Fast on the front end of rod 90 is secured a cross-head 95, which carries a horizontal bar 96 at right angles to said rod. This bar 96 is firmly secured to the cross-head and supports the holder B and former C by means of lugs 97, which are adjustably fastened to opposite ends of said bar 96 through the medium of depending integral hangers 98, integral with a horizontal foot-plate 99, all of the above constituting a former-carrier. The foot-plate 99 of said former-carrier has removably secured thereon the former C, which is secured to said foot-plate in three places at each end with an ordinary spring-acting glove-fastening device 100 (see Figs. 14, 15, and 16) and centrally by a neck-pin 101 and a slotted wedge 102, (see Figs. 14 and 18,) similar to those employed for securing plate 20 to table A. The former-carrier and its supporting mechanism are moved longitudinally in the head 88 by the lever 93, previously mentioned, pivoted on the shaft 12. The lower end of this lever is provided with a roller 103, upon which acts a cam 104, said cam being adjustably secured to the shaft 13 by a set-screw, so as to move when the bell-crank lever 81 82 moves.

Extending from the lever 93 is a depending extension 105, to which is attached a spring 106, (see Figs. 9, 10, and 12,) secured at its opposite end to the frame 1 by pin 16, previously referred to. Said spring holds the roller 103 against the face of the cam 104 and also retracts lever 93. The uppermost end of le-

ver 93 is adjacent to rod 90, so that when cam 104 operates said lever through its roller 103 the upper end of lever 93 moves the rod 90 forward, thus carrying forward cross-head 95 and the former-carrier, and consequently the former C is withdrawn from the folded material before the folder descends upon said fold, as shown in Fig. 5.

The holder B is mounted on the clamp-plate 107, which is located immediately above the former C and is held stationary by pins 108, whose lower tapered ends fit in sockets in the plate 107 and whose upper ends are fastened by set-screws (see Fig. 9) in a bar 109, secured to a fixed block 110, secured to the rod 91, (see Fig. 10,) held immovably in the head 88 by a set-screw. (See Fig. 7.) The rod 109 is preferably made in two parts placed end to end in the block 110, so that they are independently adjustable, as clearly shown in Fig. 9<sup>a</sup>. This block 110 has a smooth upper surface upon which the cross-head 95 slides. The contacting faces of said cross-head and guide-block being of some length and always in close contact prevent the rod 90 from turning. The clamp-plate 107 lies upon the upper side of the former C. As shown, the holder B consists of a number of screws 111, which pass through slots 112 in the former C (see Figs. 15 and 18) and screw into the clamp-plate 107. The heads of the screws constitute the holder B, which securely holds the leather on work-table A when the former-carrier is depressed. The means for operating said head 88 is through the medium of the pendulum-lever 89, pivoted to shaft 14. (See Fig. 10.) The upper end of lever 89 has a socket 113, in which is located a rubber buffer 114, which contacts a lug 115, integral with head 88. (See Figs. 23 and 24.) This socket 113 is screw-threaded and receives a threaded plug 116 to adjust the buffer. The head 88 is normally held in a raised position by a spring 117, which is secured to an arm 118, extending rearwardly from said head, (see Fig. 10,) the opposite end of said spring being secured to a lug attached to the frame of the machine. This spring, acting through the buffer 114, also tends to hold the pendulum-lever 89 against its roller 37 on the bell-crank lever 35. (See Figs. 13, 25, and 26.) The upward motion of the head 88 is regulated by a set-screw 119, Fig. 10, secured in an extension 120 (see Figs. 12 and 24) of the lever 89, which encounters the standard 8 of the frame. (See Figs. 7 and 12.) The lower portion of lever 89 has a cam-face 121 for the engagement of roller 37. The continuation of said face is an arc 122 of a circle of the same radius as that of the master-arm 30, so that when the roller passes along said arc no movement is imparted to the lever 89. The normal position of rest of the master-lever and the bell-crank lever 35, with its accompanying roller 37, is shown in Fig. 7, with the roller on the cam-



face 121, and as said master-lever descends said roller presses against said cam-face 121 and swings the pendulum-lever 89 rearwardly, and consequently the rubber buffer 114 pushes against the lug 115 forming part of head 88, thereby swinging said head, with its accompanying former C and holder B, downwardly until the holder clamps the material on the work-table. While the lever is in this position it is important that the holder B should remain stationary while the folder D is operating, and, accordingly, as the master-lever continues to descend its accompanying roller 37 runs against the face of the arc 122, (this arc being a dwell,) and hence the lever 89 and head 88 remain stationary. When the master-lever 30 is approaching the limit of the downward movement, the cam 104 encounters roller 103, which forces the bottom of lever 93 outwardly and throws the top of lever 93 against the end of the rod 90 and moves forward and operates the former-carrier, and consequently the former is moved forward free from the fold of the leather, as previously stated in describing Fig. 5.

As previously stated, the toggle mechanism is composed of an ordinary link 80 and a member 81, which forms a portion of the bell-crank lever. Member 81 is keyed to the shaft 13. The details of the bell-crank mechanism are shown in Figs. 28, 29, 30, and 31. Adjustably secured on said shaft is the cam 59 through the medium of a bolt 123 passing through a slot 124 in said cam and engaging a screw-threaded hole 125 in the member 81 of said bell-crank lever. The object of said slot is to adjust said cam 59, and thus regulate timing of the forward movement of the folder, which is effected through the medium of its rocking lever 57. Immediately alongside of said cam 59 the cam 104 is secured to said shaft 13 by a set-screw for operating the former. (See Fig. 28.) Various parts of the device are adjusted by eccentrics, and the corresponding shafts are pivoted with hand-knobs 126 for this purpose. Two of these knobs are shown in Fig. 8. One knob is on the shaft 78, which by means of eccentric 79 (see Figs. 20 and 22) adjusts the connection between the toggle mechanism and the folder so that the height of the folder can be adjusted in relation to the work-table to accommodate it to materials of different thicknesses. The second knob is on the shaft 48, which (see Figs. 8, 11, and 27) adjusts the length of the compound link supporting the rear end of the folder so that the folder may always rest squarely upon the material irrespective of its thickness.

It is to be understood that where the term "pivoted compound link" is employed throughout this description and the appended claims the same is to be interpreted as referring to a connection having the characteristics of the parts to which said term applies

as distinguished from other connectors which might be styled a "compound link."

Operation: The improved leather-folding machine is operated by means of the master-lever 30 through the medium of the treadle-rod 31. The first effect of the downward movement of the master-lever is to swing the lever 89 (see Fig. 10) by roll 37 and cam 121, thereby bringing the holder B against the material. The stud 33 on the master-lever then encounters the bell-crank-lever member 82, thereby rocking said bell-crank and straightening the toggle 80 81, thereby elevating the folder D. When the toggle has thus elevated the folder, as indicated in Fig. 11, it will be observed that the shaft 54, with its accompanying roller 56, is raised in the open-mouthed slot 58, but still remains in said slot. During the movement the folder-frame swings on shaft 48. As the master-lever operates said toggle the rocking lever 57 does not move, owing to the dwell on the operating-cam 59; but as soon as said folder has been fully raised then the rise on the cam 59 moves a roller 58 by the continued descent of the master-lever, and thus the rocking lever 57 is moved, as indicated in Fig. 11, thus moving the folder-frame forward, it then swinging on the pivot 11. As said folder is moved to the left it bends the leather over, as indicated in Fig. 4, and the lip F passes beyond the edge of the leather. After the folder has thus moved forward cam 104 (see Fig. 10) swings lever 93, thus shoving forward the former-carrier, and hence moving the former C forward, as shown in Fig. 5. After the former has thus moved the master-lever in the further descent throws the toggle connection slightly beyond its line of centers, thus shortening the distance between the centers of shafts 13 and 78, respectively, (see Fig. 11,) and this drawing together of said shafts draws down the folder from its elevated position, as indicated in Fig. 4, to the position indicated in Fig. 6, and thereby the folded edge of the leather is firmly compressed over the body of the leather. When the foot is removed from the treadle, the springs restore all parts to their original position of rest.

The yielding buffer 114 answers two purposes—viz., it not only forces the head down until the holder B clamps the work, but the resilience of the buffer affords a yielding pressure upon the work which accommodates the holder to materials of different thicknesses.

The upper face of the work-table and the upper and pressing faces of the folder are approximately radial from the center of the shaft 48, so that when the folder is in the position shown in Fig. 1 its upper face is flush and straight with the upper face of the work-table, and when in the position shown in Fig. 6 its pressing-face is parallel with the face of the work-table.

In the subjoined claims words indicating direction are not words of limitation, but are



employed relatively only, since it is not essential that the machine be organized so that the work-table should be horizontal.

We claim—

5 1. A folding-machine having, in combination, a folder-frame and a pivoted compound link to which said frame is pivoted, said link being composed of two adjustable members pivoted together on an axis arranged cross-  
10 wise of the pivotal connection between said frame and link.

2. A machine of the character described having, in combination, a work-table, an approximately horizontally-disposed head, folding devices carried by the head, an approximately vertically-disposed lever, and a yielding buffer interposed between the upper end of the lever and the head, substantially as described.

20 3. A folding-machine having a rigid base provided with a permanent groove in its surface, and a folder having a projecting lip adapted to register with said groove, substantially as described.

25 4. A folding-machine having, in combination, a table, a folder having a lip thereon adjacent to said table, means for operating said folder in an upward, forward and downward direction; a former and a holder, said former  
30 not contacting with the material on said table, and means for moving said former outwardly while said holder is stationary.

5. In combination with a table, a folder, and means for pivotally supporting the folder  
35 at a point approximately in the plane of the table, the upper and lower working faces of said folder occupying planes approximately radial to its pivot.

6. In combination with a grooved support,  
40 a former, a folder, and a projection carried by the folder at its working edge and projecting below its under surface to cooperate with the groove in the support to prevent the material being operated upon from being displaced by the withdrawal of the former.

7. A folder, and a toggle adapted when moved in one direction to both raise and lower the folder, in combination with a lever and a cam to move said folder horizontally.

50 8. A work-table, a pivoted folder having its under working face approximately radial from the center about which it pivots, in combination with a link supporting said pivot, said link being made in two parts pivoted together, whereby the axis about which the  
55 folder pivots can be adjusted so that the under surface of the folder will press squarely on the work-table.

9. The combination of a pivoted folder  
60 whose pressing-face is approximately radial from the axis about which it pivots and a toggle for raising the folder to bend the material and to depress it to press the edge of the material after being folded, upon the movement of said toggle in one direction.

10. A folding-machine having, in combina-

tion, a table, a pivoted folder whose under or pressing surface is approximately radial from the axis about which it pivots, a stop  
70 slidable over said pressing-surface and adapted to contact against the edge of the table, and means for operating said folder and stop, substantially as described.

11. A folding-machine having, in combination, a frame, an adjustable table mounted  
75 on said frame, a pivoted compound link, a folder cooperating with said table, said folder pivotally secured to said link, a head pivotally mounted above said table and having a presser thereon, and connected mechanisms  
80 for moving said folder, lever, and head.

12. A folding-machine having, in combination, a frame, an adjustable table mounted on said frame, a hook on said table, a shaft or stud mounted independently of the hook,  
85 and an eccentric turning on said shaft or stud and acting on said hook for securing said table.

13. A folding-machine having, in combination, a table; a former; a pivoted folder; means for imparting to the folder a vertical  
90 movement to bend the work, a horizontal movement to fold it over the former, and a downward movement to press it on the table; and a stop beneath the folder to hold the material against the former before the work is  
95 pressed and to prevent it from straightening while being pressed.

14. A folding-machine having a base provided with a permanent groove, and a folder having a projecting lip adapted to register  
100 with said groove, substantially as described.

15. A folding-machine having, in combination, a folder, a swinging head, a rod slidably supported by said head, a lever acting on said rod, a cross-head carried by said rod  
105 and adapted to slide therewith, a foot-plate fixedly secured to said cross-head, a former fixed to said foot-plate, a holder supported by said foot-plate, connections between said holder and head which restrain said holder  
110 from sliding with said foot-plate, and connected mechanisms for operating said folder, swinging said head, and moving said lever.

16. A folding-machine having, in combination, a work-table; a folder; a movable head;  
115 a former-carrier carried by and movable on said head; a holder movable with said head but not partaking of the independent movement of said former-carrier; devices connecting said holder with said former-carrier and  
120 head, said devices comprising a clamp-plate secured to the holder by connections extending through slots in the former, a guide-block secured to the head, and pins connecting said guide-block and clamp-plate, and connected  
125 mechanisms operating said folder, head, and former-carrier.

17. A folding-machine having, in combination, a work-table, a folder, a head carrying a former and holder, a pivoted master-lever,  
130 means for operating said master-lever, a toggle connected to said folder and operated by



said master-lever for elevating and drawing down the same, and a lever which operates the former and holder-head, said lever being acted upon by said master-lever.

5 18. A folding-machine having, in combination, a work-table, a folder, a head, a former and holder carried by the head, said former being movable on said head, independent operators acting upon said head and former respectively, a master-lever which acts successively first upon the head-operator, and afterward upon the former-operator, and means operatively associated with the master-lever for automatically releasing the head.

15 19. A folder made of two parts pivoted together and overlapping, and means engaging said overlapping portions to rigidly secure the same together.

20 20. A work-table, in combination with a folder having a stop, means for forcing the stop toward the work-table, and means on the folder for limiting the movement of said stop toward said table, substantially as described.

25 21. A former, and a clamp-plate resting on its upper face and slidingly connected therewith, in combination with a plurality of depending rods for holding the clamp-plate stationary while the former is being withdrawn, a holder beneath the former, and connections between the holder and clamp-plate which are remote from the working edge of said former.

35 22. A work-table, in combination with a folder having a gage upon its upper surface to gage the depth of the fold, a stop on its under working surface, and means which normally hold the stop even with the edge of the folder.

40 23. A work-table, in combination with a folder having a stop on its under surface arranged to normally lie flush with the edge of the folder and be forced backward by coming in contact with a portion of the table when the folder is operated, and automatic means for retaining the stop in its normal position.

45 24. In a folding-machine, a folder, a stop on its under working surface, means on the folder for normally retaining the edge of the stop flush with the edge thereof, and means for elevating said folder and stop and for projecting the folder beyond the edge of the stop, substantially as described.

55 25. The combination of a work-table, a folder, means for raising said folder above and projecting it over the face of the work-table, and an eccentric for adjusting the height to which said folder is raised relatively to the work-table.

60 26. The combination of a work-table, a pivoted folder, and an eccentric connection at the folder-pivot for adjusting the height of said folder relatively to said work-table.

65 27. A folding-machine having, in combination, a folder-frame composed of two sections detachably connected together, and held against independent movement when in op-

eration and operating mechanism operatively connected with the permanent one of said sections.

28. A folding-machine having, in combination, a folder-frame composed of two sections pivotally and detachably connected, a thumb-screw for holding the two sections together against independent movement, and operating mechanism operatively connected with the permanent one of said sections. 70

29. In combination with a table, a folder, and means for pivotally supporting the folder at a point approximately in the plane of the table, the working face of said folder occupying a plane approximately radial to its pivot, substantially as described. 80

30. A folder, a toggle to raise and lower the same, and means to advance the folder between its elevation and depression by the toggle, substantially as described. 85

31. A pivoted folder, a toggle to raise and lower the same, and means to advance and retract the folder between its elevation and depression by the toggle, substantially as described. 90

32. A folder, a toggle to raise and lower the same, and means to advance and retract the folder between its elevation and depression by the toggle, substantially as described. 95

33. A folder, and work-table, in combination, with means for adjusting said folder horizontally to the plane of the work-table, so as to level said folder relatively to said table.

34. A head, a slotted former, a clamp-plate resting on the upper face of and adapted to slide on the former, and means whereby both the former and clamp-plate are simultaneously raised and lowered, in combination with projecting portions carried by the clamp-plate and passing through the slots in the former, substantially as described. 100

35. A head, a slotted former, a clamp-plate resting on the upper face of and sliding on the former, and means whereby both the former and clamp-plate are simultaneously raised and lowered in relation to the work-table, in combination with screws or pins secured in the clamp-plate passing loosely through said slots, and projecting below the under face of the former. 105

36. A pivoted folder, a toggle to raise and lower it, and means to advance the folder between its elevation and depression by the toggle, in combination with an eccentric connection to adjust the length of the toggle. 120

37. In a folding-machine, a work-table, a folder, a movable stop associated with the under surface of the folder, a former, the edge of said folder being even with the edge of said table and said stop being even with the edge of said folder, and means on the folder for normally limiting the outward movement of the stop, substantially as described. 125

38. A folding-machine having in combination a folder-frame and a pivoted compound link to which said frame is pivotally connect- 130



ed, said link comprising two members pivoted together on an axis arranged crosswise of the pivotal connection between said frame and link.

5 39. A folding-machine having in combination, a work-table, a folder, a head, a former carried by the head, a lever, actuating means at one end of the lever, and a yielding buffer interposed between the opposite end of the  
10 lever and the head, substantially as described.

40. A folding-machine having, in combination, a work-table, a folder, a head, a former carried by the head, an approximately vertically disposed lever for moving said head,  
15 cam mechanism at the lower end of the lever for actuating the same, and a yieldable buffer interposed between the upper end of the lever and the head, substantially as described.

41. A folder and work-table, in combination, with means for adjusting said folder laterally so as to level the same relative to  
20 said table, substantially as described.

42. A folder and work-table, in combination, with means for adjusting said folder comprising a compound link pivotally connected thereto, said link comprising two piv-  
25 oted members 46 and 47, and screws 52 ad-

justable in the member 47 and abutting opposite surfaces of the member 46, substantially as described.

43. A folding mechanism having, in combination, a frame, a table mounted on said frame, a hook on said table, a shaft or stud mounted independently of the hook, and an eccentric  
30 on said shaft or stud acting on the upper surface of said hook for securing said table. 35

44. A folding mechanism having, in combination, a frame, a table mounted on said frame, a hook carried by the table, and an eccentric mounted independently of the hook adapted  
40 to engage the same for securing said table. 40

45. A folding mechanism having, in combination, a frame, a table mounted on said frame, a hook carried by the table, and means mounted independently of the hook adapted to en-  
45 gage the same for securing said table. 45

In witness whereof we have hereunto signed our names in the presence of two subscribing witnesses.

QUENTIN W. BOOTH.  
IRVING E. BOOTH.

Witnesses:

JOHN T. WOOD,  
G. A. SPERRY.