

No. 611,130.

Patented Sept. 20, 1898.

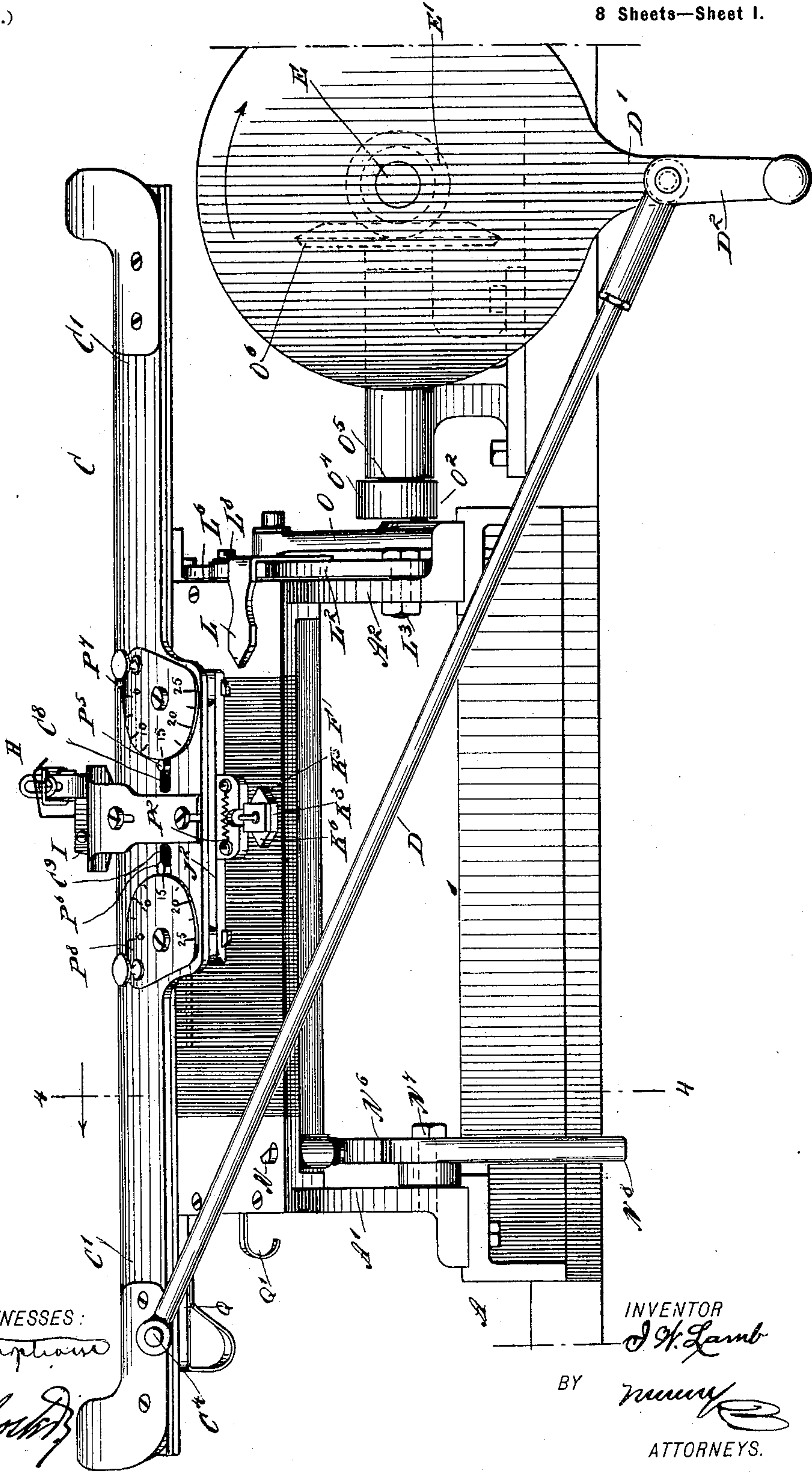
I. W. LAMB.
KNITTING MACHINE.

(Application filed Apr. 1, 1897.)

(No Model.)

8 Sheets—Sheet 1.

Fig. 1



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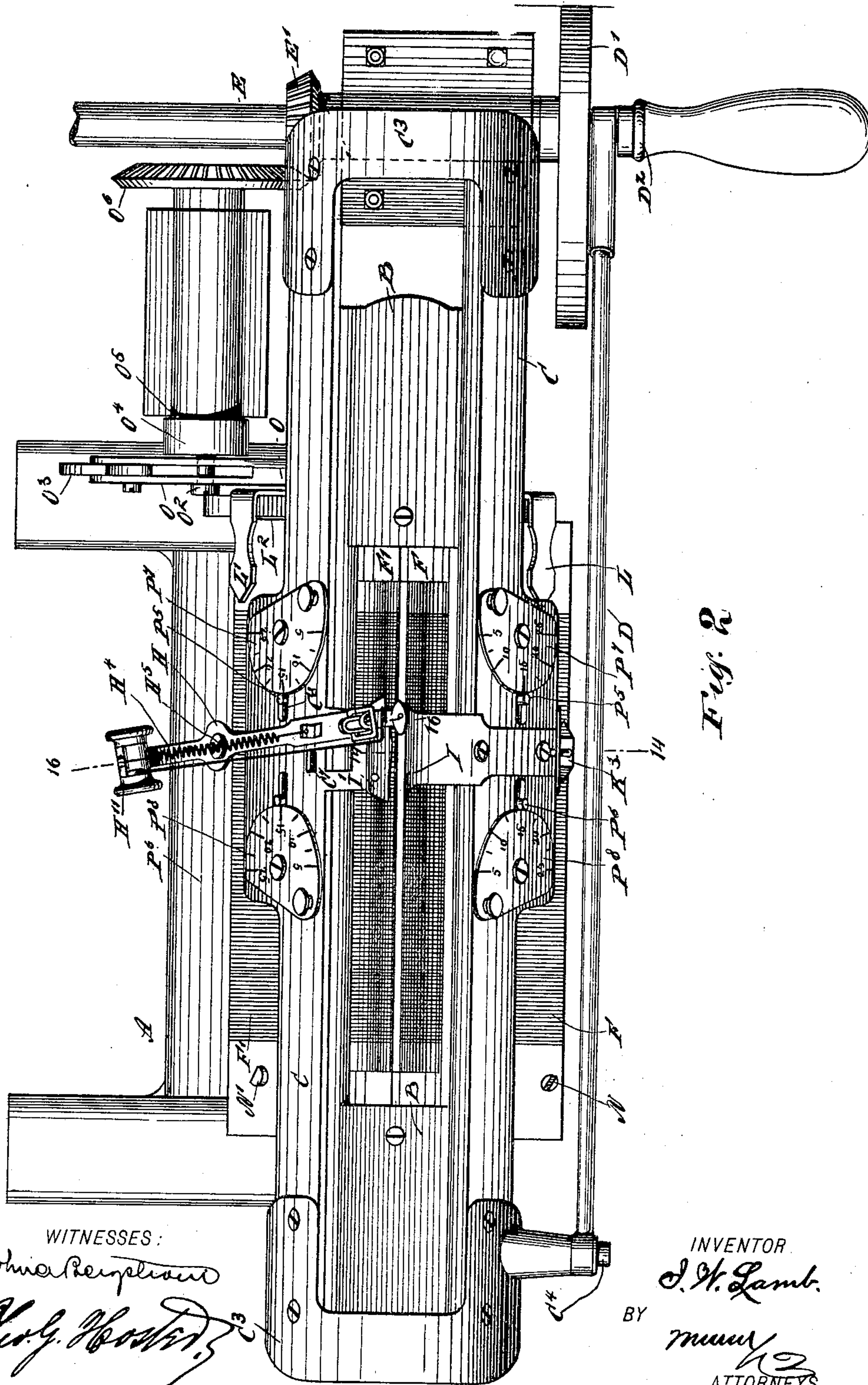
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8 Sheets—Sheet 2.



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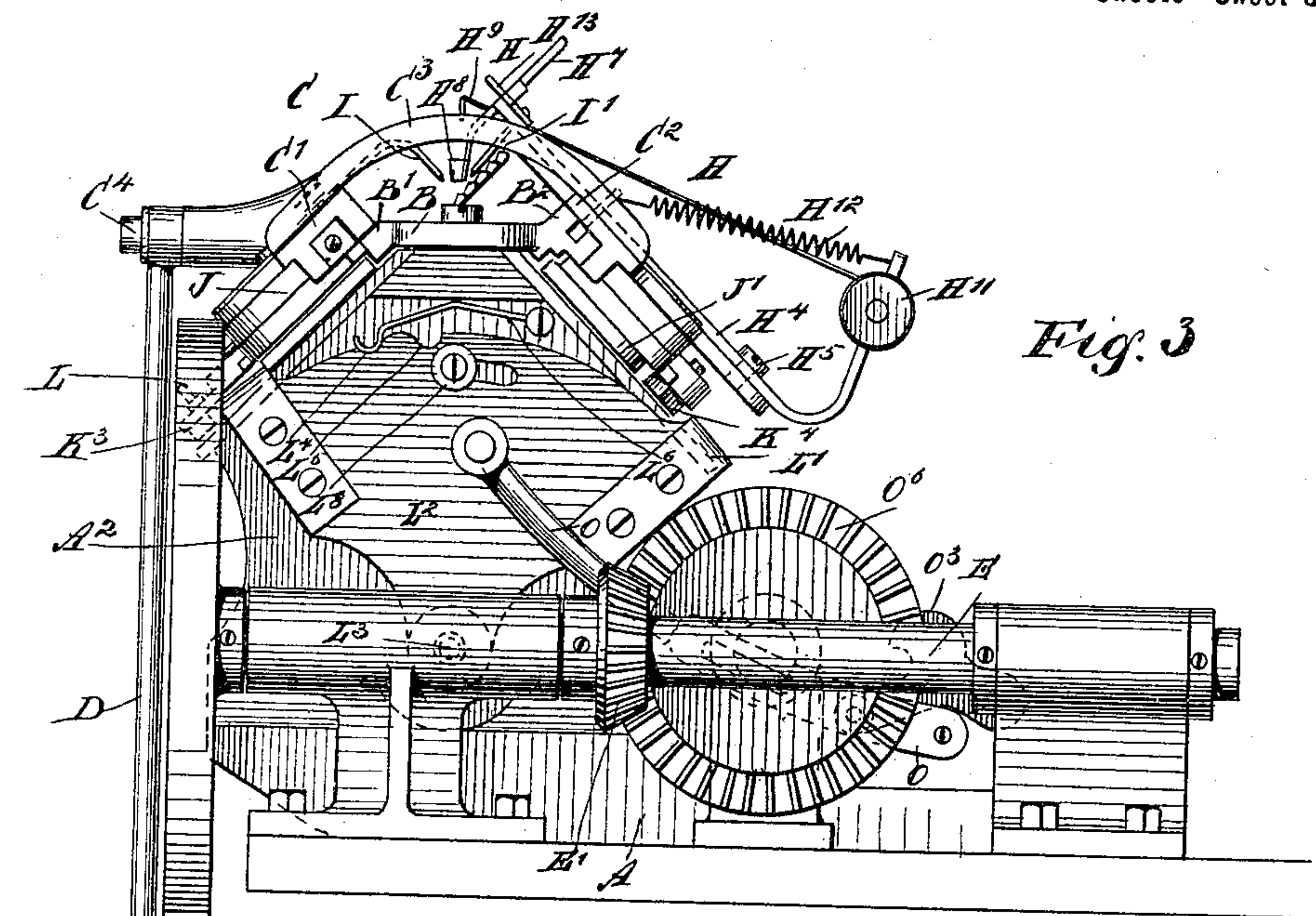


Fig. 3

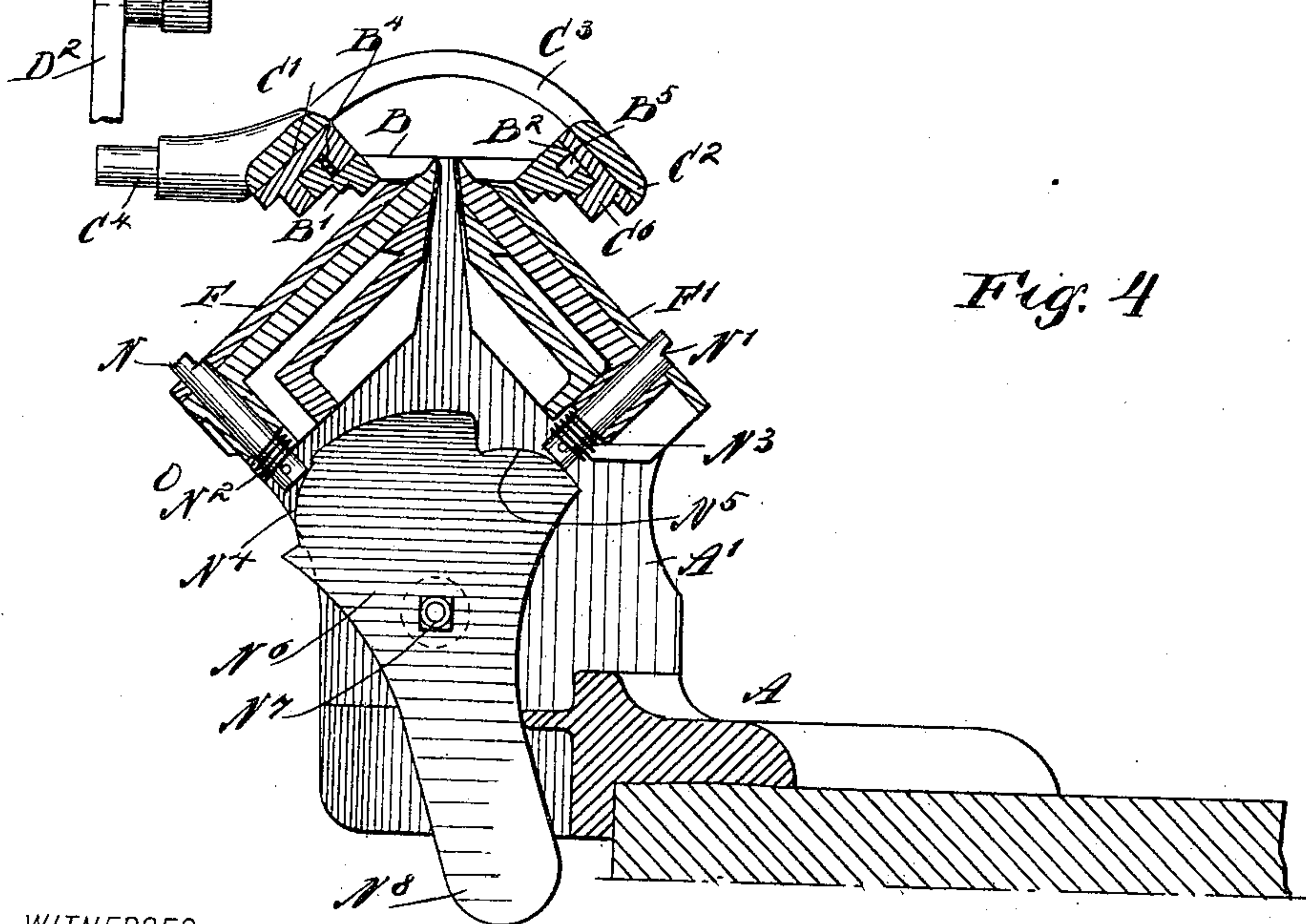


Fig. 4

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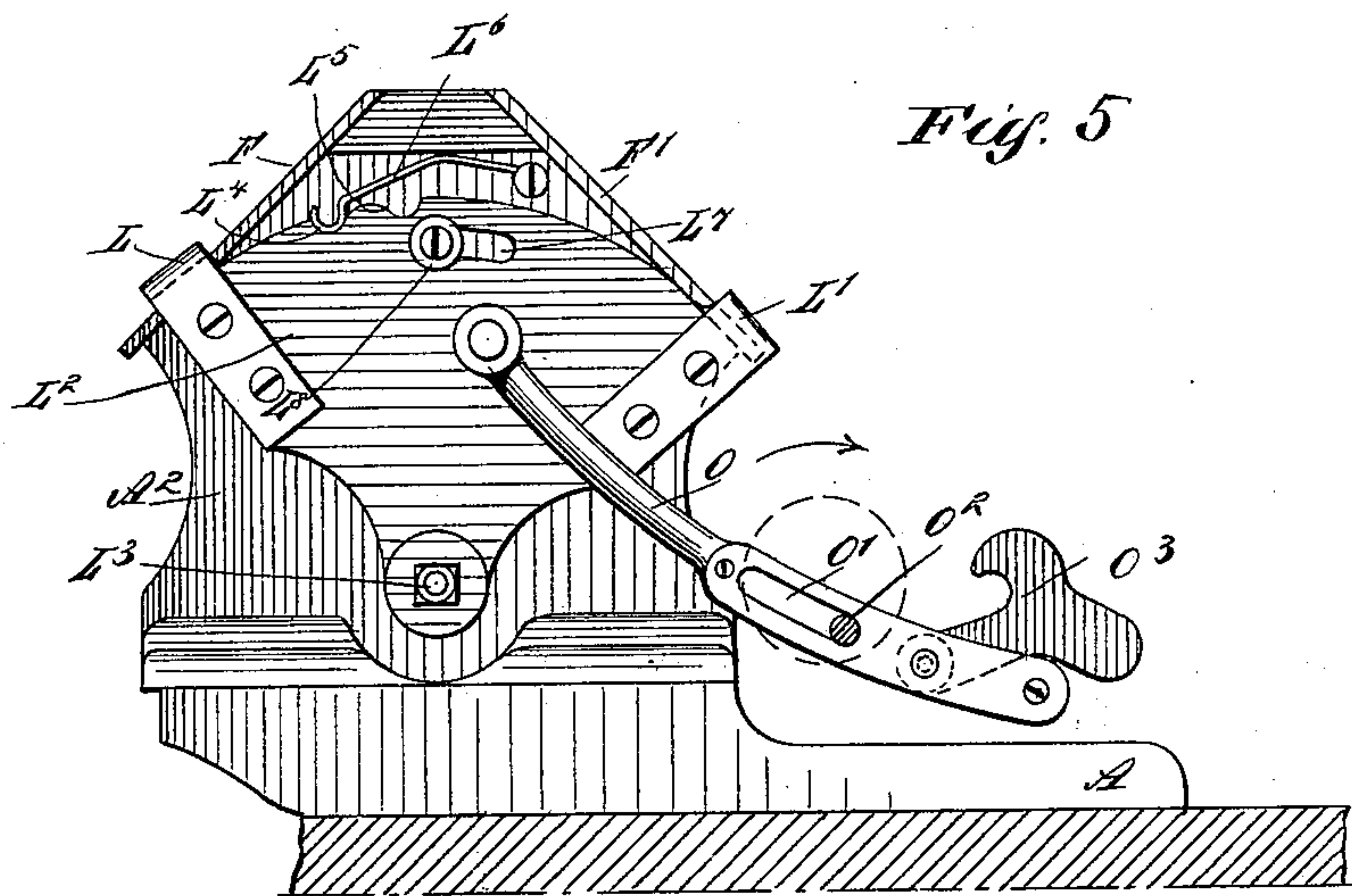


Fig. 5

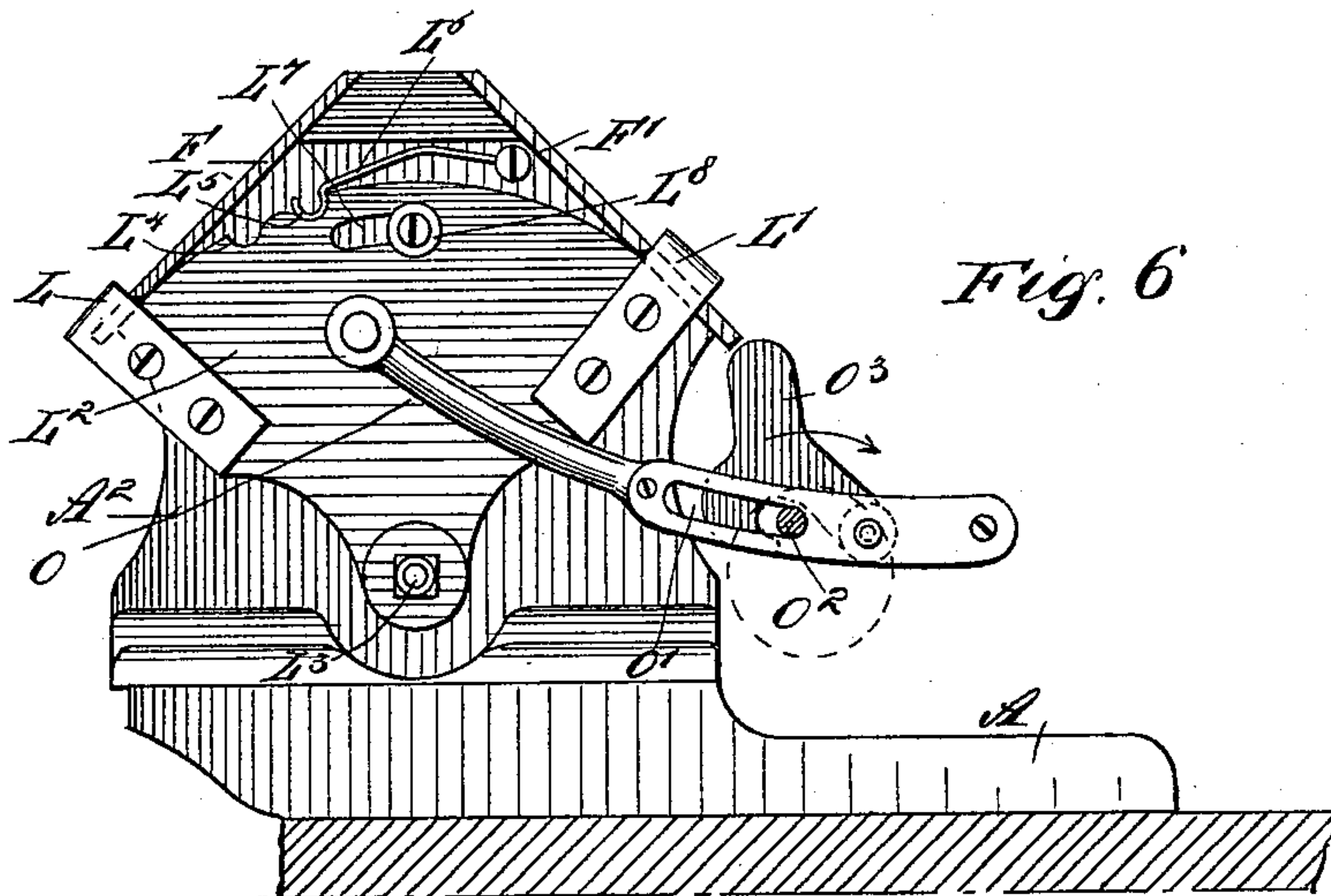


Fig. 6

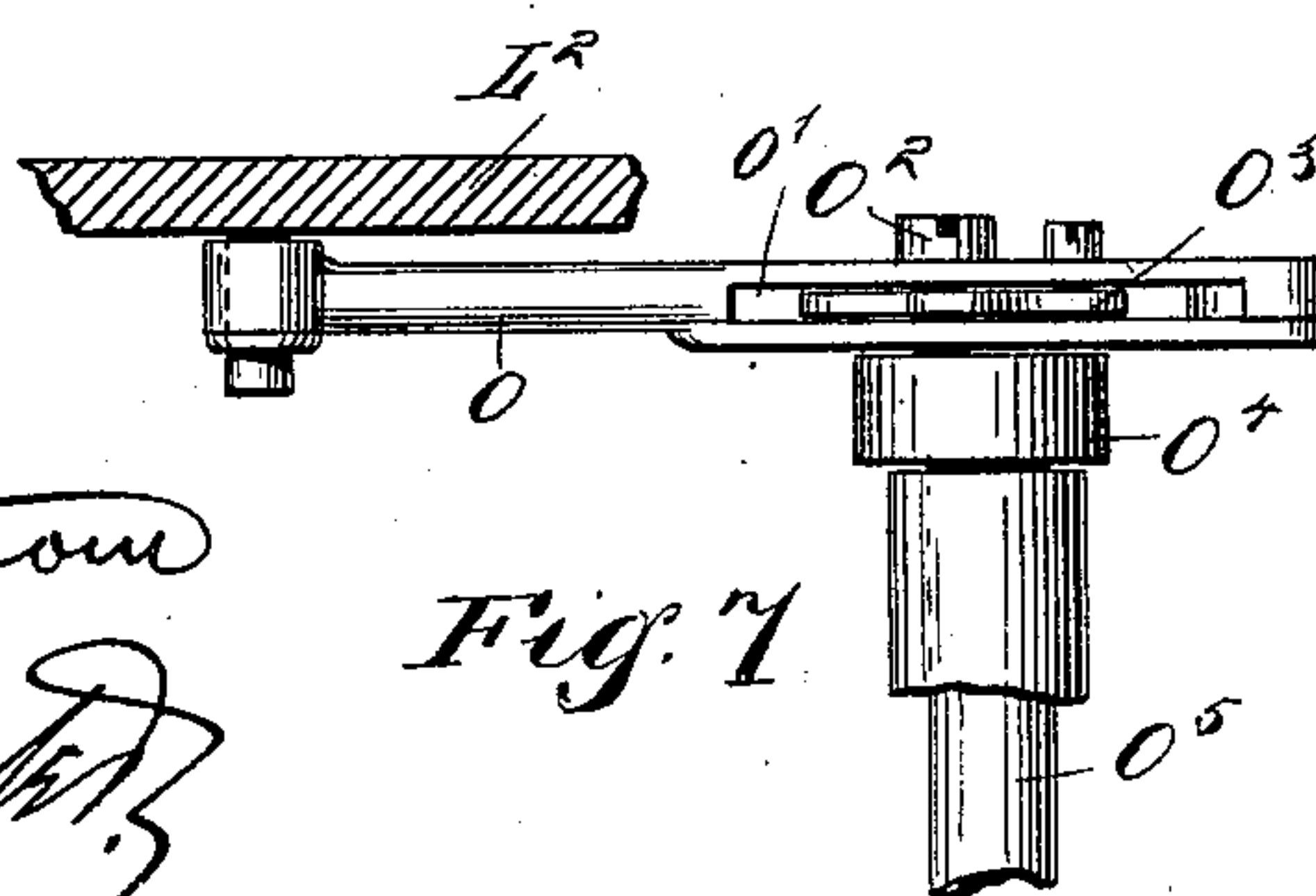


Fig. 7

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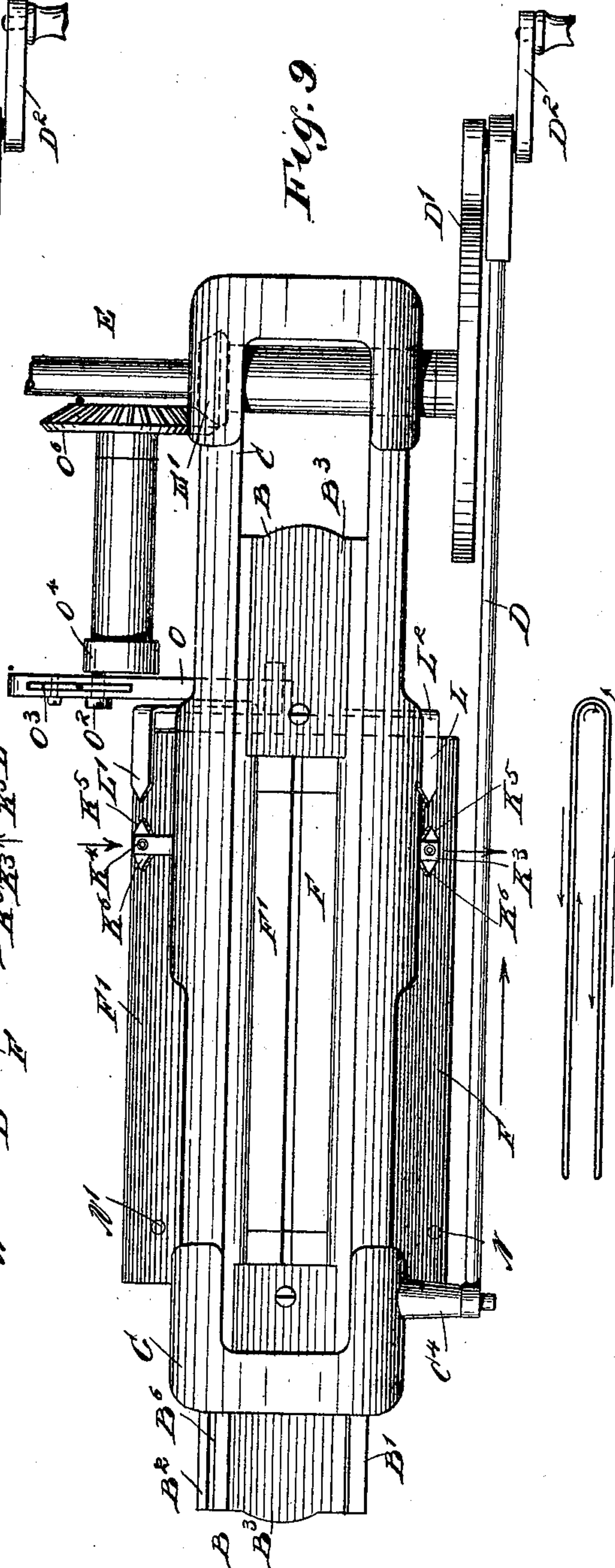
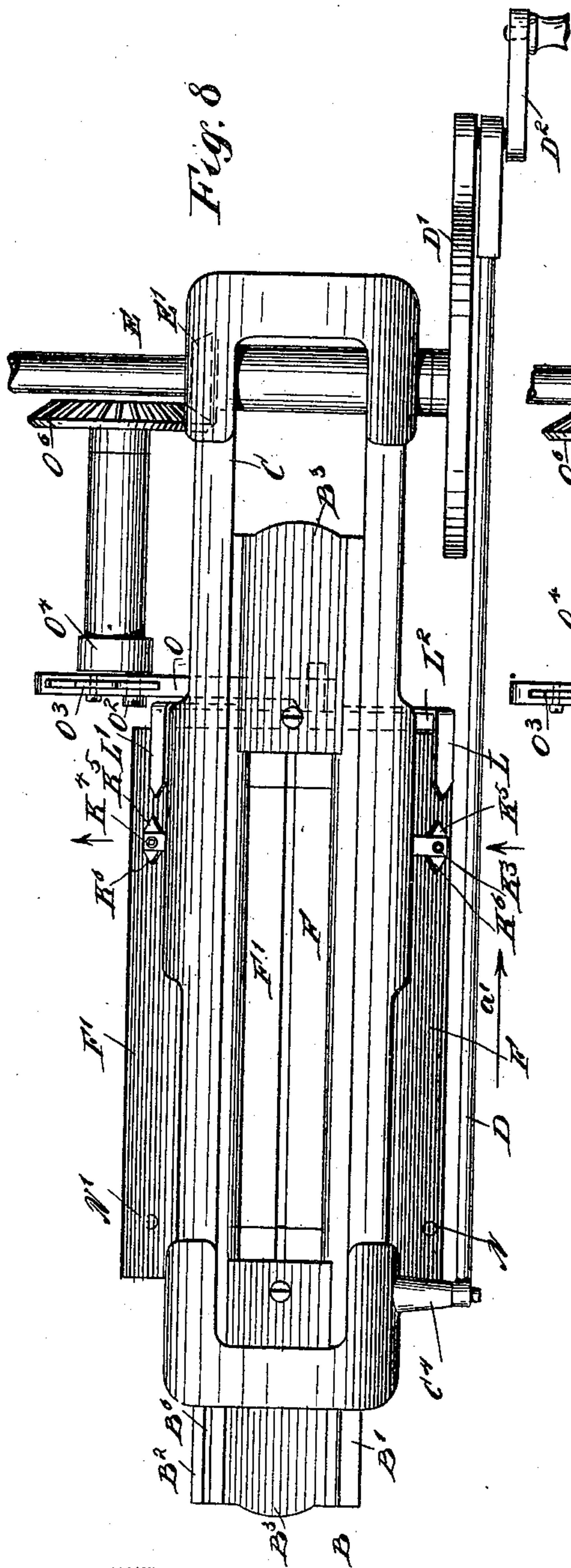
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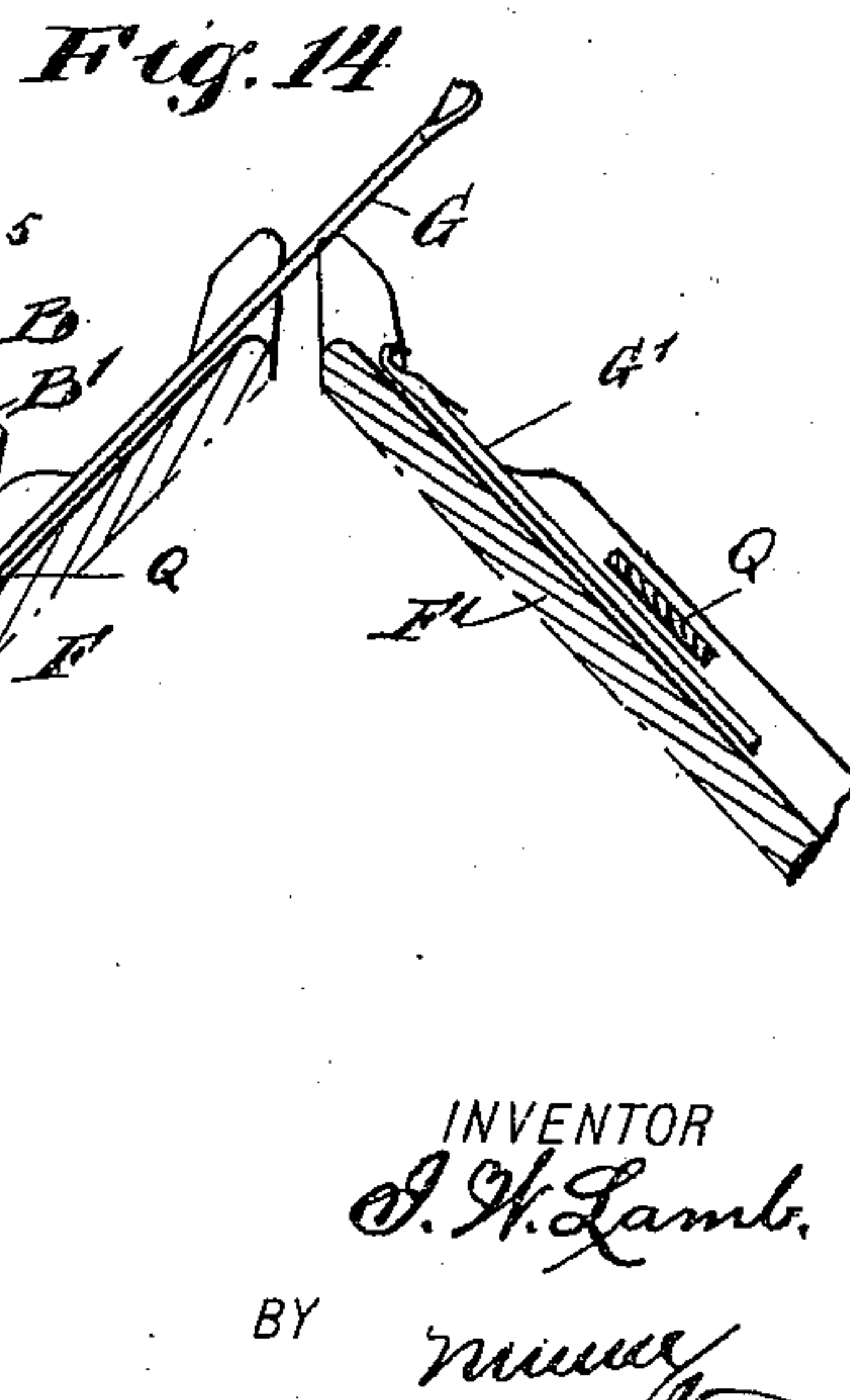
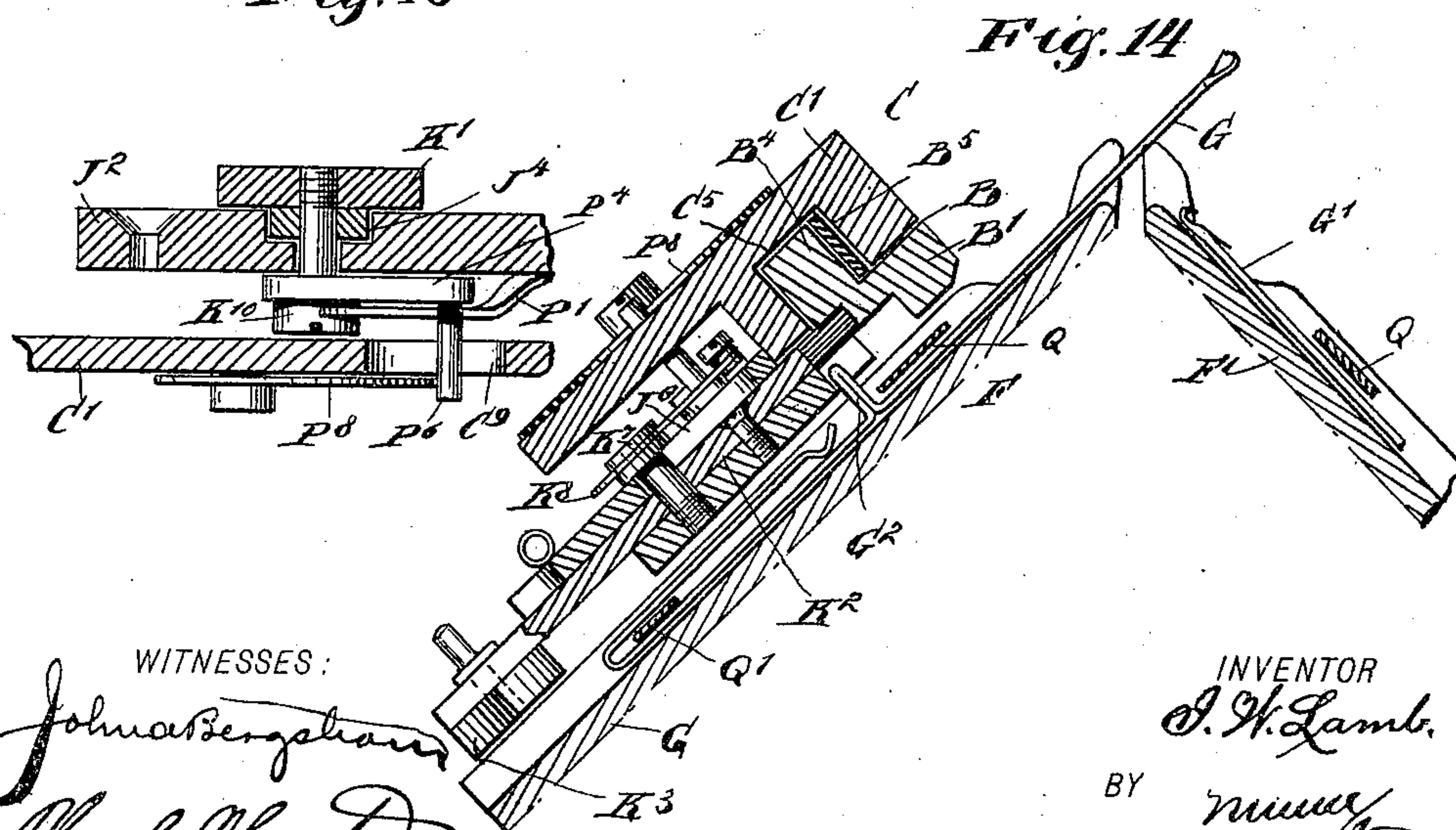
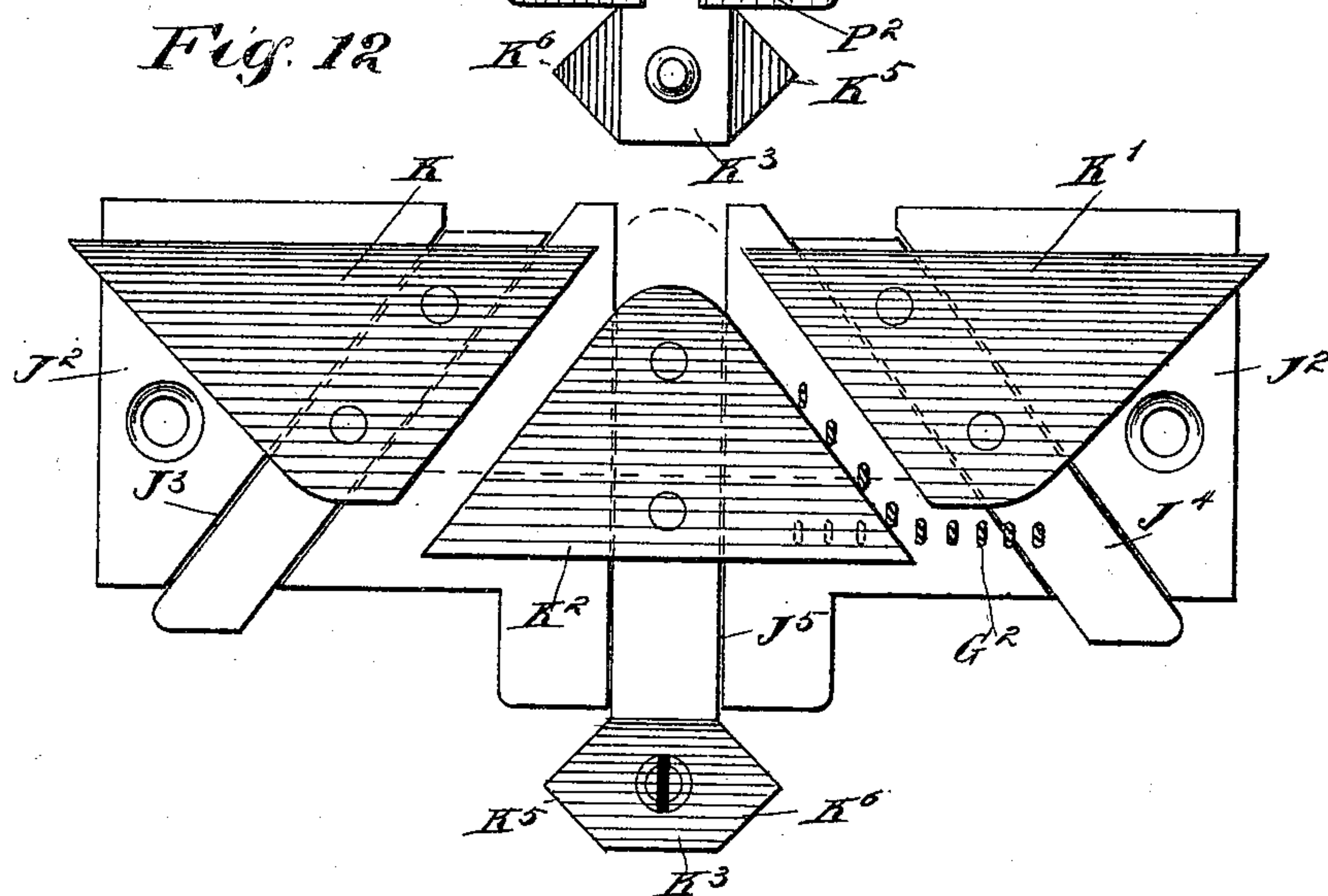
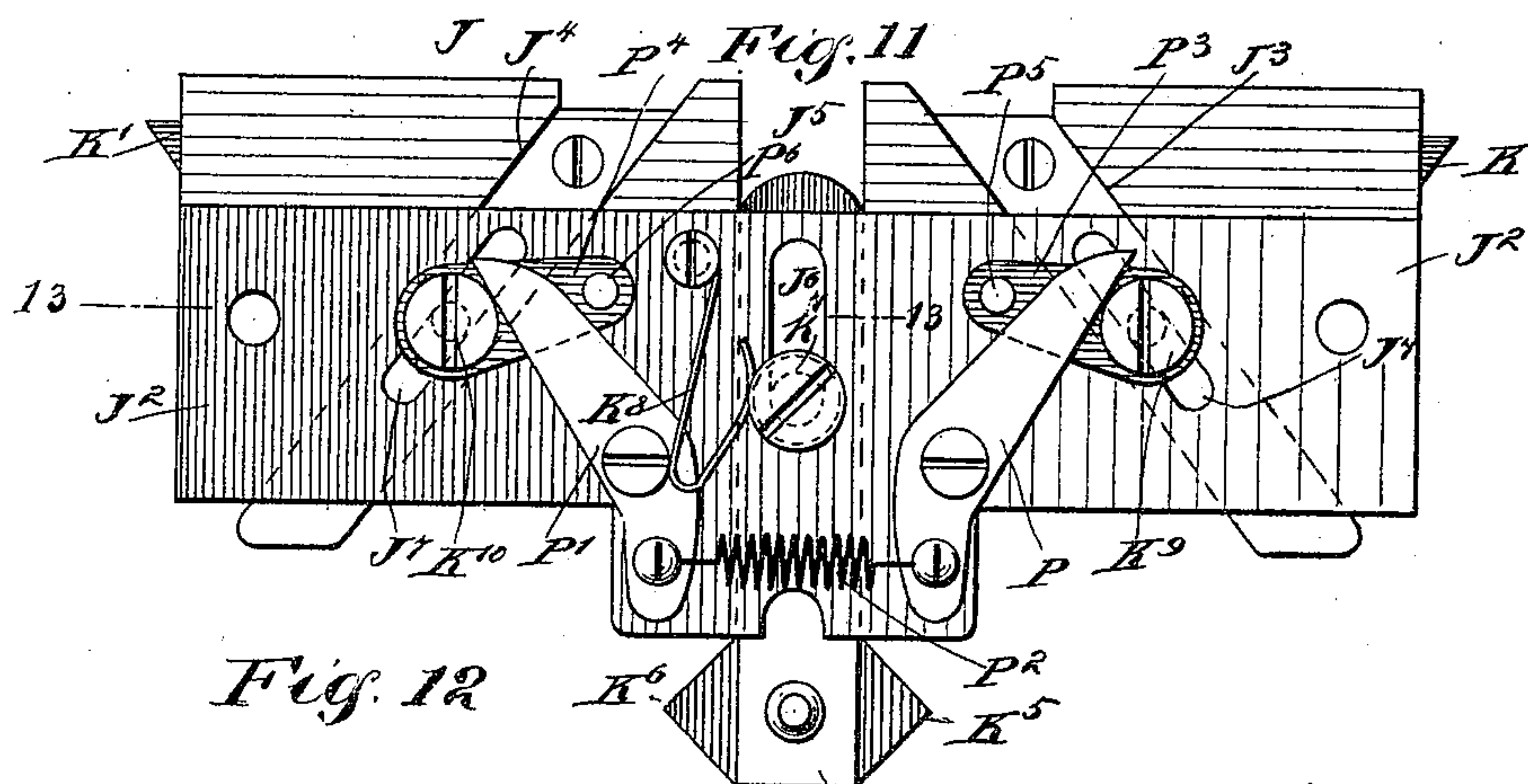
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8 Sheets—Sheet 6.



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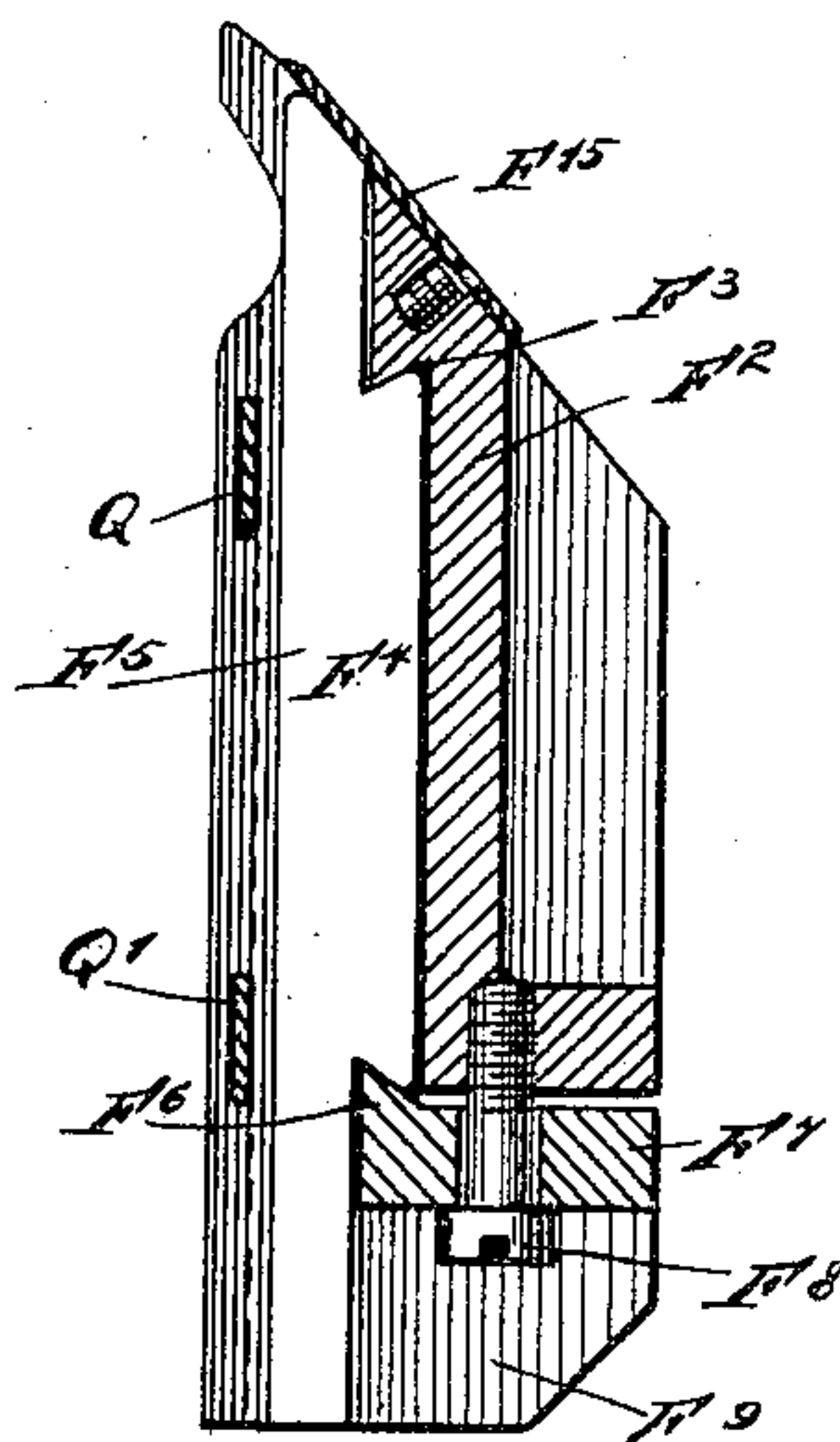
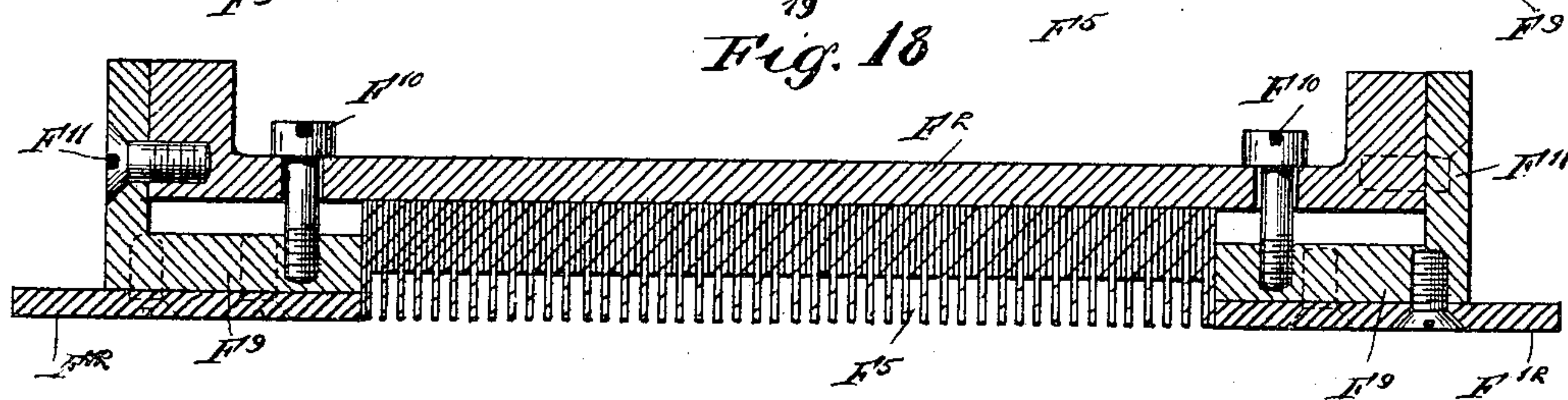
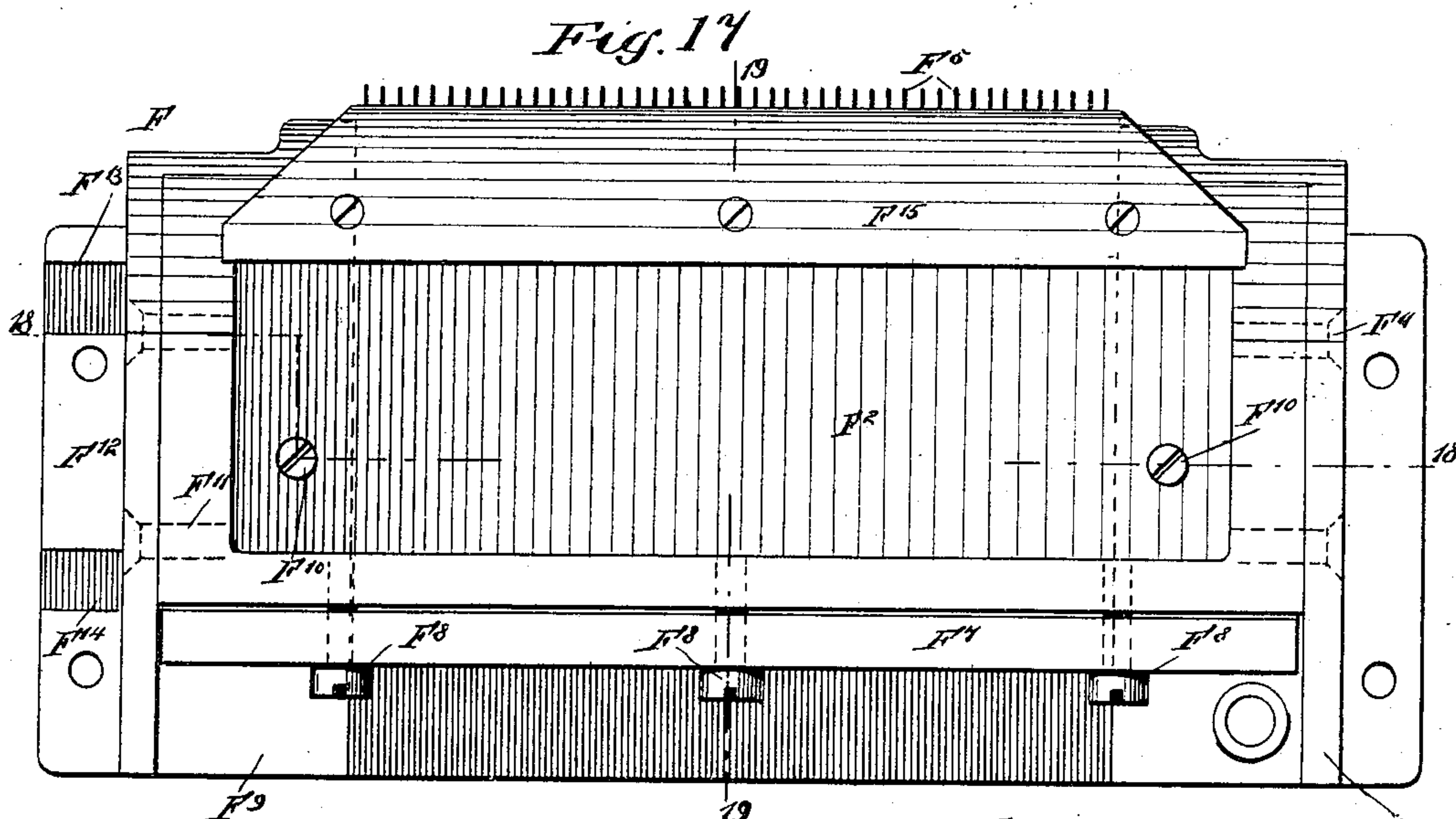
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(No Model.)

8 Sheets—Sheet 8.



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Fig. 19

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UNITED STATES PATENT OFFICE.

ISAAC W. LAMB, OF PERRY, MICHIGAN.

KNITTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 611,130, dated September 20, 1898.

Application filed April 1, 1897. Serial No. 630,200. (No model.)

To all whom it may concern:

Be it known that I, ISAAC W. LAMB, of Perry, in the county of Shiawassee and State of Michigan, have invented a new and Improved Knitting-Machine, of which the following is a full, clear, and exact description.

The invention relates to knitting-machines having two straight rows of needles arranged on opposite sides of the machine; and the object of the invention is to provide a new and improved knitting-machine more especially designed for knitting mittens, gloves, and other articles and arranged in such a manner as to produce tubular fabrics or fabrics open at one end.

The invention consists principally of two rows of needles, a reciprocating carriage, sets of cams on the said carriage for operating the rows of needles, and a manually-operated shifting device adapted to be set in two positions, one for alternately opening and closing the cams for actuating the rows of needles successively during a full stroke of the carriage to form a tubular fabric, and the other position being for opening one set of cams and closing the other set during a full stroke of the carriage and then opening the other set and closing the first set of cams during the next full stroke of the carriage to produce a fabric open at one end.

The invention also consists of certain parts and details and combinations of the same, as will be fully described hereinafter and then pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a side elevation of the improvement. Fig. 2 is a plan view of the same. Fig. 3 is an end elevation of the same. Fig. 4 is a transverse section of the same on the line 4 4 of Fig. 1. Fig. 5 is an end elevation of the revolving frame and the mechanism for operating the same, being in an inactive position. Fig. 6 is a like view of the same with the mechanism in an active position. Fig. 7 is a plan view of the mechanism for actuating the shifting frame, part of the latter being shown in section. Fig. 8 is a plan view of the carriage, the cam-shifting device, and means for operating the same, the needle-plate be-

ing shown in outline only. Fig. 9 is a like view of the same with the cam-shifting device in a different position. Fig. 10 is a diagrammatic view of the line of knitting for forming a fabric open at one end. Fig. 11 is an enlarged side elevation of the cams and the bearing-plates for the same. Fig. 12 is a rear elevation of the same. Fig. 13 is a sectional plan view of the same on the line 13 13 of Fig. 11, also showing part of the carriage and the adjusting device for setting the cams according to the knitting of the loop for the fabric to be formed. Fig. 14 is an enlarged transverse section of the cams, their bearings, needle-plate, and carriage, the section being on the line 14 14 of Fig. 2. Fig. 15 is a plan view of the gib-frame for the carriage to travel on with the needle-plates in outline. Fig. 16 is an enlarged transverse section of the carriage, the yarn-carrier, the gib-frame, and needle-plate, the section being on the line 16 16 of Fig. 2. Fig. 17 is an enlarged side elevation of the needle-plate. Fig. 18 is a sectional plan view of the same on the line 18 18 of Fig. 17, and Fig. 19 is a transverse section of the same on the line 19 19 of Fig. 17.

The knitting-machine is provided with a suitably-constructed main frame A, secured on a bench or other support and provided with standards A' and A², on the top of which is fastened the longitudinally-extending gib-frame B, having two side bars B' and B², on which are mounted to travel the side arms C' and C², respectively, of the carriage C, having its side arms connected with each other at their ends by cross-pieces C³. On the rear or left-hand end of the carriage C is arranged a stud C⁴, pivotally connected by a pitman D with the crank-disk D', secured on the transversely-extending main driving-shaft E, connected with suitable machinery for imparting a rotary motion to the said shaft E, so that the crank-disk D' and pitman D impart a reciprocating motion to the carriage C on the gib-frame B. The crank-disk D' is provided with a handle D² for conveniently turning the said crank-disk by hand to permit the operator to shift the carriage C when starting the machine or in case of a break or the like.

On the standards A' and A² are secured needle-plates F and F', inclined toward each other, as plainly illustrated in the drawings,

the said needle-plates being provided with suitable guideways for the two rows of needles G and G', respectively, to which the yarn or thread is passed from the oscillating yarn-carrier H, extending between the guide-arms I and I', secured to the side arms C' and C², respectively, of the carriage, as plainly illustrated in the drawings. The needles G and G' are actuated, as hereinafter more fully described, by the needle-actuating devices J and J', carried by the side arms C' and C², respectively, of the carriage and moving with the same, each of the said devices being provided with a cam-plate J², secured to the corresponding side arm of the carriage and containing the adjustable side cams K and K' and the middle movable cam K², as shown in Figs. 11, 12, 13, and 14. These cam-plates J² are made about twice the usual thickness, and they have formed on their under sides guideways J³, J⁴, and J⁵, such guideways being about one-half an inch wide and about one-eighth of an inch deep. To each cam is secured a guide of such form as to accurately fit in these guideways on the under side of the cam-plate. The guideways thus form bearings for the guides on the cams and secure said cams accurately in their positions and yet permit of the sliding movements needed. The cams K and K' are held adjustably in angular guideways J³ and J⁴, formed in the plate J², and the cam K² is fitted to slide up and down in the guideway J⁵, formed in the plate J². The cam K² when opened, as shown in Fig. 12, forms, with the side cams K and K', a V-shaped groove for the passage of the projections G² on the needles to shift the same in the usual manner up and down in their guideways in the needle-plates F and F', respectively. When the cam K² is in an uppermost or closed position, the projections G² of the needles are not affected by the cams, and consequently remain in their normal inactive position. The two cams K² for the two needle-actuating devices J and J' are provided at their lower ends with heads K³ and K⁴, respectively, extending below the under sides of the plates J². (See Figs. 3 and 14.) Each head K³ and K⁴ has V-shaped sides K⁵ and K⁶, and the said heads are adapted to be engaged by a shifting device adapted to be moved by the operator into either one of two positions, so that the cams are actuated in such a manner that either a tubular fabric is produced or a fabric open at one end, as hereinafter more fully described. This shifting device is provided with the V-shaped cam-stops L and L', held adjustably over the faces of the needle-plates F and F', respectively, and at the forward end of the machine, and the said device being also provided with two stop-pins N and N', fitted to slide up and down in guideways in the needle-plates F and F' at the rear end of the machine, as plainly illustrated in Figs. 2, 8, and 9. The stop L and pin N operate in conjunction with the sides K⁵ and K⁶, respectively, of the cam-head K³, and the stop L'

and the pin N' operate in conjunction with the sides K⁵ and K⁶ of the head K⁴ to produce a shifting of the cams K² of the two needle-actuating devices J and J' to produce the desired result. This method of shifting the V-cams differs from the old method, and the result is that while in the old method the shifting was effected by an inclined slot in the cam-shifter attached to the cam-plate and the movement of the shifter was in a line parallel with the movement of the carriage and the cam-shifter came squarely against the cam-stop at the end of the bed of the machine and necessitated an exact adjustment of the throw of the carriage the present plan permits the carriage to pass right on any desired distance after the cams have been shifted. The old method caused a heavy blow against the cam-stops in case there was any variation in the stroke of the carriage.

The stops L and L' are secured to or form part of an arm L², pivoted at L³ on the standard A² of the main frame, (see Figs. 1 and 3,) and this arm L² receives an intermittent rocking motion, so as to move the stops L and L' alternately in an upper and lowermost position, as indicated in Figs. 8 and 9. For this purpose the arm L² is pivotally connected with a pitman O, formed near its free end with a slot O', into which projects a crank-pin O², adapted to be locked in place on the rear end of the slot O' by a hook O³, as shown in Figs. 6 and 7. The crank-pin O² is arranged on a crank-disk O⁴ on one end of a shaft O⁵, journaled in suitable bearings and provided with a beveled gear-wheel O⁶, in mesh with a pinion E', secured on the main driving-shaft E. The gearing mentioned is such that the shaft E makes two revolutions to one full revolution of the shaft O⁵, so that when the crank-pin O² is locked by the hook O³ in the slot O' a rocking motion from one side to the other is given to the arm L² during the full revolution of the shaft E—that is, during each full stroke of the carriage C. The stops L and L' thus move alternately into an upper and lowermost position during each full stroke of the carriage.

When tubular work is knitted on the machine, the hook O³ is thrown out of engagement with the pin O² (see Fig. 5) to prevent a rocking of the arm L² and to hold the same in a position at one side with the stop L' in a lowermost position and the stop L in an uppermost position.

The hook O³ is pivoted on the pitman O and when thrown down confines the movement of the crank-pin O² in a small portion of the slot O', so that the revolving crank-disk O⁴ brings the pin O² alternately in contact with the end wall of the slot and the said hook to impart an intermittent rocking motion to the stop-arm L², it being understood that when the crank-pin O² travels through the small portion of the slot O' the arm L² is at a standstill. When the hook O³ is thrown backward, as shown in Fig. 5, the wrist-pin O² pulls the

pitman to a rearward position and then simply travels in the slot, only imparting an up-and-downswinging motion to the pitman, but no movement to the stop-arm L^2 .

5 The arm L^2 is provided on its periphery with two notches L^4 and L^5 , (see Figs. 5 and 6,) adapted to be alternately engaged by the curved free end of a spring L^6 , secured to the standard A^2 , the said spring serving to hold
10 the arm in either of its two positions. The movement of the arm L^2 is further limited by a set-screw L^8 , extending through a segmental slot L^7 , formed in the arm L^2 , the set-screw being attached to the standard A^2 .

15 The pins N and N' (see Fig. 4) are pressed on at their inner ends by springs N^2 and N^3 , respectively, so as to hold the said pins normally in an innermost position—that is, with their outer ends below the top surface of the
20 needle-plates F and F' , respectively, to be completely out of the path of the cam-heads K^3 and K^4 . In order to move the pins N and N' into an outermost active position, as shown in Fig. 4, to bring the outer ends of the pins
25 into the path of the cam-heads K^3 and K^4 , I rest the inner ends of the said pins on cam-surfaces N^4 and N^5 , respectively, formed on a lever N^6 , fulcrumed at N^7 on the standard
30 A' , the said lever being provided with a suitable handle N^8 , adapted to be taken hold of by the operator, so as to impart a swinging motion to the lever to move the cam-surfaces
35 N^4 and N^5 over the inner ends of the pins to push the same into an outermost active position, as shown in Fig. 4. Now when the operator pulls the handle N^8 forward the springs
40 N^2 and N^3 force the pins N and N' inward, the latter traveling with their inner ends on the cam-surfaces N^4 and N^5 into an innermost inactive position.

When it is desired to knit a tubular fabric, the stop-pins N and N' are moved into an outermost active position, as indicated in Fig. 4, while the arm L^2 is held in an inactive rearward fixed position, as shown in Fig. 5, so
45 that on reciprocating the carriage C the cam-head K^3 moves alternately in engagement with the stop L and the pin N and the head K^4 moves alternately in engagement with
50 the stop L' and the pin N' , and the head K^3 , when moving in engagement with the stop L , is pushed downwardly or outwardly, so as to move the middle cam K^2 into an open position, as illustrated in Fig. 12, to actuate
55 the row of needles G , and when the head K^3 on the rear stroke of the carriage C moves in contact with the cam N the head is shifted upward, so as to move the cam K^2 in a closed position to keep the row of needles G dormant
60 during the return stroke of the carriage C from the left to the right. When the head K^4 moves in engagement with the stop L' , the cam K^2 for the needle-actuating device J' is moved into a closed position, so that on the
65 outward stroke of the carriage from the right to the left the row of needles G' remains dormant at the time the row of needles G is ac-

tuated, as above described. When the head K^4 moves in engagement with the pin N' at the time the carriage C reaches the end of its
70 outward stroke, the said head is pushed downward to move the cam K^2 for the needle-actuating device J' into an open position, so that on the return stroke of the carriage from the left to the right the row of needles G' is actu-
75 ated, while the row of needles G remains dormant, as before mentioned. Thus the rows of needles are actuated alternately on the forward and backward strokes of the carriage to produce a tubular fabric in the usual
80 manner.

When it is desired to produce a fabric open at one end, as indicated in Fig. 10, the operator shifts the lever N^6 to permit the springs
85 N^2 and N^3 to push the pins N and N' into a dormant position, so as to be out of the path of the heads K^3 and K^4 . At the same time the operator locks the crank-pin O^2 in position on the pitman O by the hook O^3 , as illustrated in Fig. 6, so that the arm L^2 is inter-
90 mittently rocked transversely, as before described, to move the stops L and L' alternately into an upper and lowermost position. (See Figs. 8 and 9.)

When the several parts are in the position
95 shown in Fig. 8 and the carriage C travels in the direction of the arrow a' , then the head K^3 on reaching the stop L is pushed into an uppermost position, so as to close the cam K^2 for the needle-actuating device J to keep
100 the rows of needles G dormant during the first full stroke (forward or backward) of the carriage C . At the same time the other head K^4 moves in engagement with the stop L' , so as to open the cam K^2 for the needle-actuat-
105 ing device J' , and consequently during the now following first full stroke of the carriage C the cam K^2 for the needle-actuating device J remains closed, while the cam K^2 for the needle-actuating device J' is open, so that
110 the row of needles G' is actuated until the return stroke of the carriage is almost completed, at which time the position of the stops L and L' has been changed to that shown in Fig. 9 by the action of the crank-arm O^4 and pit-
115 man O on the arm L^2 . Now when the carriage C on its return stroke brings the head K^3 in engagement with the stop L the said head is moved downward to move its cam
120 K^2 off the needle-actuating device J into an open position. At the same time the head K^4 is pushed upward by coming in contact with the stop L' to close the cam K^2 of the needle-actuating device J' . Now on the fol-
125 lowing second full stroke of the carriage C the row of needles G is actuated, while the row of needles G' remains dormant, and consequently the fabric produced by the two strokes of the carriage is open at one end, as indicated in Fig. 10, while it is continuous at
130 the other end. The above-described operation is then repeated—that is, the stops L and L' are moved back to their former position, as shown in Fig. 8, to shift the heads K^3 and K^4 cor-

respondingly to render the needles G dormant and the needles G' active during the next third full stroke of the carriage.

Now it is evident that by the arrangement described a fabric may be formed which has a tubular portion and a portion open at one end with selvages at the open ends, or, if desired, a continuous tubular fabric may be knitted or one open at one end.

Details of the preferred specific embodiments of my invention are as follows:

In order to insure a proper fastening of the gib-frame on the main frame, so as to make the gib-frame independent of the needle-plates and to insure a proper sliding of the carriage on the gib-frame without danger of lateral or upward movement, I prefer to form the gib-frame with the side bars B' and B², as previously described, integrally with the transversely-extending end plates B³, secured by screws or other means to the top of the standards A' A², suitable packings being placed between the contacting surfaces, so as to locate the gib-frame properly relative to the needle-plates F F', located directly below the said bars B' B². The bars B' are formed with an upwardly-extending integral gib B⁴, extending the entire length of the gib-frame and provided with a spring B⁵, fastened at its ends to the ends of the gib. (See Fig. 15.) This gib and its spring B⁵ fit into a correspondingly-shaped recess C⁵, formed on the under side of the side C' of the carriage. (See Fig. 16.) The other side C² of the carriage is provided on its under side with a longitudinally-extending rib C⁶, fitting against the lower edge of the side bar B² of the gib-frame, whereby an upward movement of the carriage, as well as a lateral movement of the same, is prevented, and the carriage, owing to the construction of the gib-frame, is always in proper relation to the gib-frame and needle-plates F F'.

In the top surface of the side bar B² is formed a longitudinally-extending groove B⁶, into which fits a spring H', provided at its middle with a projection or lug H², extending through a short longitudinal slot C⁷, formed in the side C², the said lug also engaging a slot H³, formed longitudinally in the lever H⁴ of the yarn-carrier H, the said lever H⁴ being fulcrumed at H⁵ to the side C² of the carriage, as plainly shown in Figs. 2 and 16. Now it will be seen that when the carriage C starts on its backward or forward travel the spring H' will remain stationary for a short time—that is, until the lug H² is engaged and moved forward by the side C² at the other end of the slot C⁷—so as to give a swinging motion to the said lever H⁴ by the lug H², holding the arm stationary while the carriage moves.

On the upper end of the lever H⁴ is held adjustably the shank H⁷, carrying the eye H⁸, extending between the guide-plates I and I' for delivering the yarn to the rows of needles G G', as previously described, to form the knit

fabric. Now it is evident that the eye H⁸ in moving with the oscillating lever H⁴ always stands in proper relation to the guide-plates I I' and the needles on the forward and backward motion of the carriage. The eye H⁹, located directly above the eye H⁸, is held on the usual spring-arm H¹⁰, secured at H¹¹ to the rear end of the lever H⁴, and a spring H¹² connects the lug H² with the rear end of the arm, as illustrated in the drawings, for the purpose of insuring a proper movement of the arm by the action of the spring H'. The yarn passes through the usual guide H¹³ and loop H¹⁴ to the eye H⁹ and eye H⁸, all forming part of the yarn-carrier, to then pass to the needles.

In order to hold the cams K, K', and K² in proper position on the cam-plate J² and to set the said cams for moving the needles longer or shorter distances for longer or shorter loops to be formed in the fabric, I provide the detailed construction shown in Figs. 11, 12, 13, and 14. (See also Figs. 1 and 2.) The middle cam K² is held in place on the plate J² against lateral movement by a screw K⁷, extending with its shank through an elongated slot J⁶, formed in the plate J². A spring K⁸, held on the plate J², presses with its free end against the head of the screw K⁷, so as to hold the cam K² locked in an upper or lower position when the cam is closed or opened, as previously explained. The side cams K' and K² are similarly held on the plate J² against transverse movement by screws K⁹ and K¹⁰, extending through elongated inclined slots J⁷ in the plate J². The heads of the screws K⁹ and K¹⁰ are pressed on by levers P and P', respectively, fulcrumed on the plate J² and connected with each other at their lower ends by a spring P², so as to cause the said levers to exert a downward pressure on the screws K⁹ K¹⁰ and the cams K K'. On the screws K⁹ and K¹⁰ are held the arms P³ and P⁴, extending toward each other on top of the plate J², and the said arm P³ and P⁴ are provided near their free ends with pins P⁵ and P⁶, respectively, extending through elongated longitudinal slots C⁸ C⁹, formed in the sides of the carriage C. The outer ends of the pins P⁵ and P⁶ (see Figs. 1 and 2) are engaged by the peripheral surface of the eccentrically-pivoted disks P⁷ and P⁸, graduated in the usual manner to indicate the length of the loops to be formed on the fabric. Now it will be seen that by turning the disks P⁷ P⁸ a longitudinally-sliding motion is given to the pins P⁵ P⁶, so as to move the cams K K' correspondingly upward or downward to increase or diminish the sliding movement of the needles according to the length of the loop desired on the fabric and as indicated by the graduation on the disks P⁷ and P⁸.

Each of the needle-plates F and F' (see Figs. 17, 18, and 19) is provided with a back plate F², formed on its front face and near the upper end thereof with a beveled shoul-

der or undercut F^3 , adapted to be engaged by the upper ends of a dovetail F^4 , formed on the sections F^5 , made of sheet-steel and placed one alongside the other and shaped so as to form guideways of suitable width and depth for the needles to travel in. The lower ends of the dovetails F^4 are engaged by the beveled shoulder or rib F^6 of a bottom plate F^7 , extending longitudinally on the under side of the back plate F^2 and secured thereto by screws F^8 , as plainly shown in the drawings, so as to permit of drawing the said plate F^7 , with its beveled shoulder F^6 , upward in contact with the lower ends of the dovetails F^4 , so as to securely clamp the needle-plate sections F^5 in position. The end sections F^5 are engaged by the end plates F^9 , made L-shaped and fastened by screws F^{10} and F^{11} to the back plate F^2 , so as to prevent the sections F^5 from being displaced laterally in the dovetail groove formed by the beveled shoulders F^3 and F^6 . On the front faces of the end plates F^9 are secured the attaching-plates F^{12} , projecting beyond the end plates to engage and rest on the standards A' and A^2 , to which the end plates are fastened by suitable screws. The top surfaces of the attaching-plates F^{12} are flush with the top surfaces of the sections F^5 , as plainly indicated in Fig. 18, so that no projection is formed on the face of the needle-plate. Now it will be seen that by the arrangement described any section F^5 can be readily removed and replaced by a new one, if broken or injured, by loosening the bottom plate F^7 an amount sufficient to release the dovetailed portion of the sections and then pushing the section to be removed downward and out of the back plate. A new one is placed in position and the bottom plate F^7 is fastened again in position to complete the needle-plate F or F' . The attaching-plates F^{12} are provided with longitudinally-extending grooves F^{13} and F^{14} for the bars Q and Q' , adapted to pass through corresponding apertures in the high sections F^5 and through the needle-guideways formed by the sections to limit the movement of the needles in the needle-plates, the upper bar Q forming an abutment for the projection G^2 of a needle and the lower bar engaging the loop thereof, as plainly indicated in Fig. 14.

In making the sections F^5 , I make the same of two sets of different heights, of which one set of sections forms the bottoms of the needle guideways or grooves and the other the sides thereof, and the said sections can be readily sorted in pairs and placed in position to give the desired form to the groove in which the needles are to slide. In this way a degree of accuracy can be secured in the width of the needle-grooves to prevent the sticking of the needles in the plates or an uneven movement thereof.

Having thus fully described my invention, I claim as new and desire to secure by Letters Patent—

1. A knitting-machine, having a plurality

of rows of needles, and a carriage, and provided with a set of cam-stops, one for each row of needles, and means for moving the stops in unison, said stops being mounted upon some stationary part independently of the carriage and being so connected that when one is in an upper position the other is in a lower position, and vice versa, in combination with middle cams movably mounted upon the carriage and adapted to be engaged periodically by said cam-stops, substantially as shown and described.

2. A knitting-machine, having a plurality of rows of needles, and a carriage, and provided with an oscillating arm carrying two cam-stops, one for each row of needles, means for moving the said arm, said stops being mounted upon some stationary part independently of the carriage and being so connected that when one is in the upper position the other is in the lower position, and vice versa, in combination with middle cams movably mounted upon the carriage and adapted to be periodically engaged by said cam-stops, the movement of the cam-stops being so arranged that when one stop is in the upper position, it engages the corresponding cam to push it downward, while the other stop, which is in the lower position, simultaneously engages the other cam to push it upward, substantially as shown and described.

3. A knitting-machine having a plurality of rows of needles, provided with a set of cam-stops, one for each row of needles, means for moving the stops in unison so that one of them will be in an upper position while the other is in a lower position, and vice versa, and a detachable connecting medium between the said stops and the means for moving them, whereby the stops may be rendered inactive notwithstanding the movement of said means, substantially as described.

4. A knitting-machine provided with a reciprocating carriage carrying sets of needle-cams provided with V-shaped heads, an intermittently-oscillating arm mounted upon the machine-frame independently of the carriage, cam-stops secured thereon and adapted to be engaged simultaneously by the V-shaped heads of the needle-cams to open one set and close the other and vice versa, and means for holding the arm in its resting positions, substantially as shown and described.

5. A knitting-machine provided with middle cams having diamond-shaped heads, V-shaped cam-stops adapted to act upon both the upper and the lower edges of the said heads, an arm carrying the said stops, a pitman connected with the said arm, a revoluble crank-disk engaging with its crank-pin a slot in the said pitman and a locking-hook for connecting the said crank-pin with the pitman to intermittently move the pitman and the arm by the said crank-disk, substantially as shown and described.

6. A knitting-machine provided with a gill-frame having two side arms, of which one

is formed with a longitudinally-extending groove for receiving the friction-spring, substantially as shown and described.

7. A knitting-machine provided with a gib frame having a longitudinally-extending groove, a carriage fitted to slide thereon and formed with a longitudinally-extending slot, a spring engaging the said groove and provided with a projection extending through the said slot, and a yarn-carrier on the said carriage and engaged by the said projection to shift the position of the yarn-carrier on reciprocating the carriage, substantially as shown and described.

8. A knitting-machine provided with a carriage having cams adapted to shift the needles, and a set of cam-stops movable in unison and mounted directly on the frame of the machine so as not to move with the carriage, said cam-stops being arranged to move alternately into the upper and the lower path of the middle cams, and being so connected that when one cam-stop is in the upper position in which it shifts the corresponding cam downward, the other cam-stop is in the lower position and in readiness to shift the other cam upward, substantially as described.

9. A knitting-machine provided with a carriage having side cams, middle cams movable on the carriage and adapted to shift the needles, projections on the said middle cams, and

a set of cam-stops movable in unison and mounted upon the frame independently of the carriage so as not to travel therewith, said cam-stops being arranged to move alternately into the upper and the lower path of the projections on the middle cams, and being so connected that when one cam-stop is in the upper position in which it shifts the corresponding cam downward, the other cam-stop is in the lower position and in readiness to shift the other cam upward, substantially as described.

10. A knitting-machine provided with a needle-plate comprising sections for forming the needle-guideways, and having registering dovetails, and a frame provided with a back plate formed with a beveled shoulder, a bottom plate adjustably connected with the said back plate and formed with a gib opposite the said shoulder to form with the latter a dovetail groove, for the dovetails of the said sections, end plates removably connected with the said back plate and adapted to engage the outside sections, and an attaching plate secured on the said end plates and projecting beyond the same, substantially as shown and described.

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Witnesses:

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