

No. 628,627.

Patented July 11, 1899.

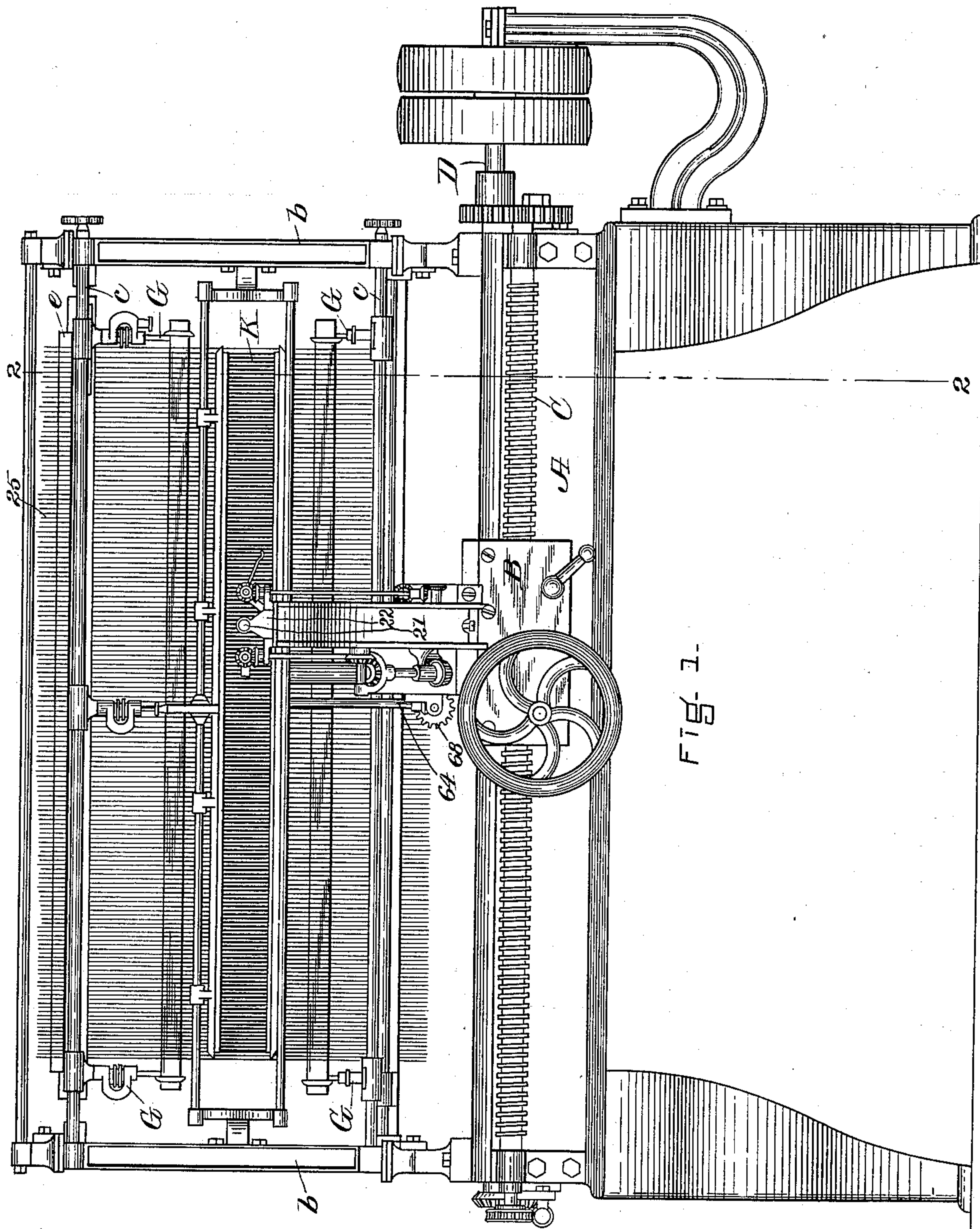
R. H. INGERSOLL.

MACHINE FOR DRAWING IN WARP THREADS.

(Application filed Dec. 10, 1898.)

(No Model.)

10 Sheets—Sheet 1.



WITNESSES.

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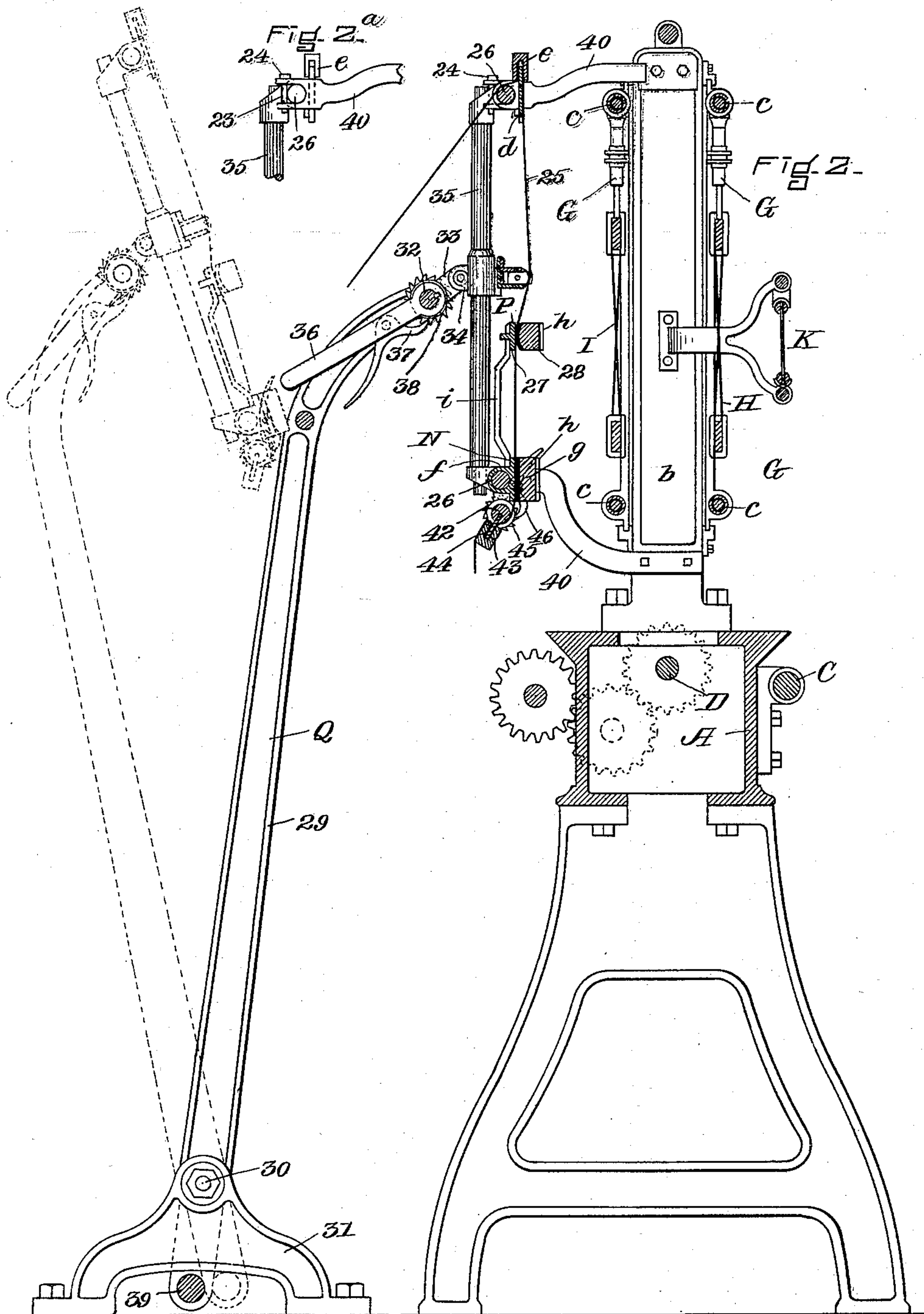
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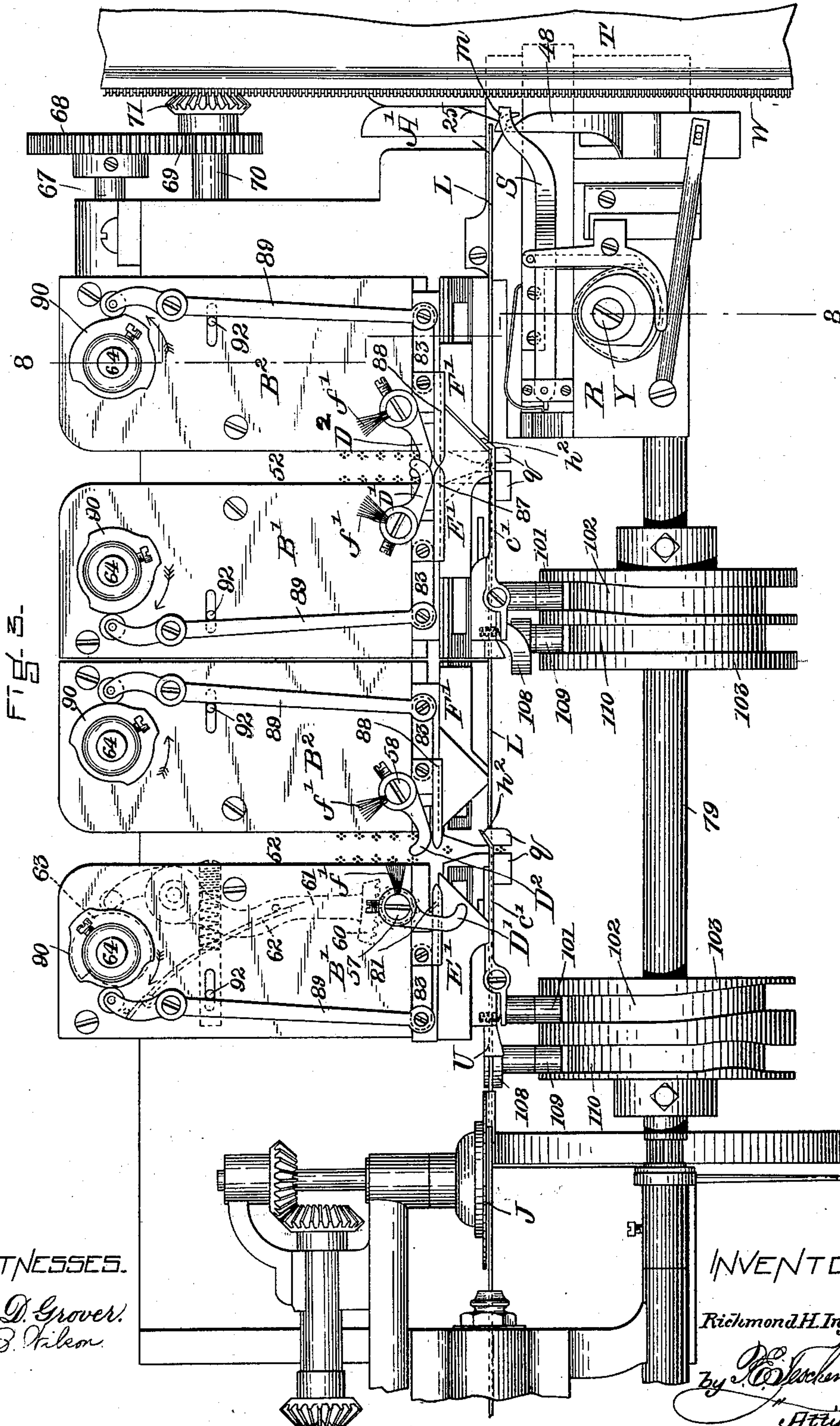
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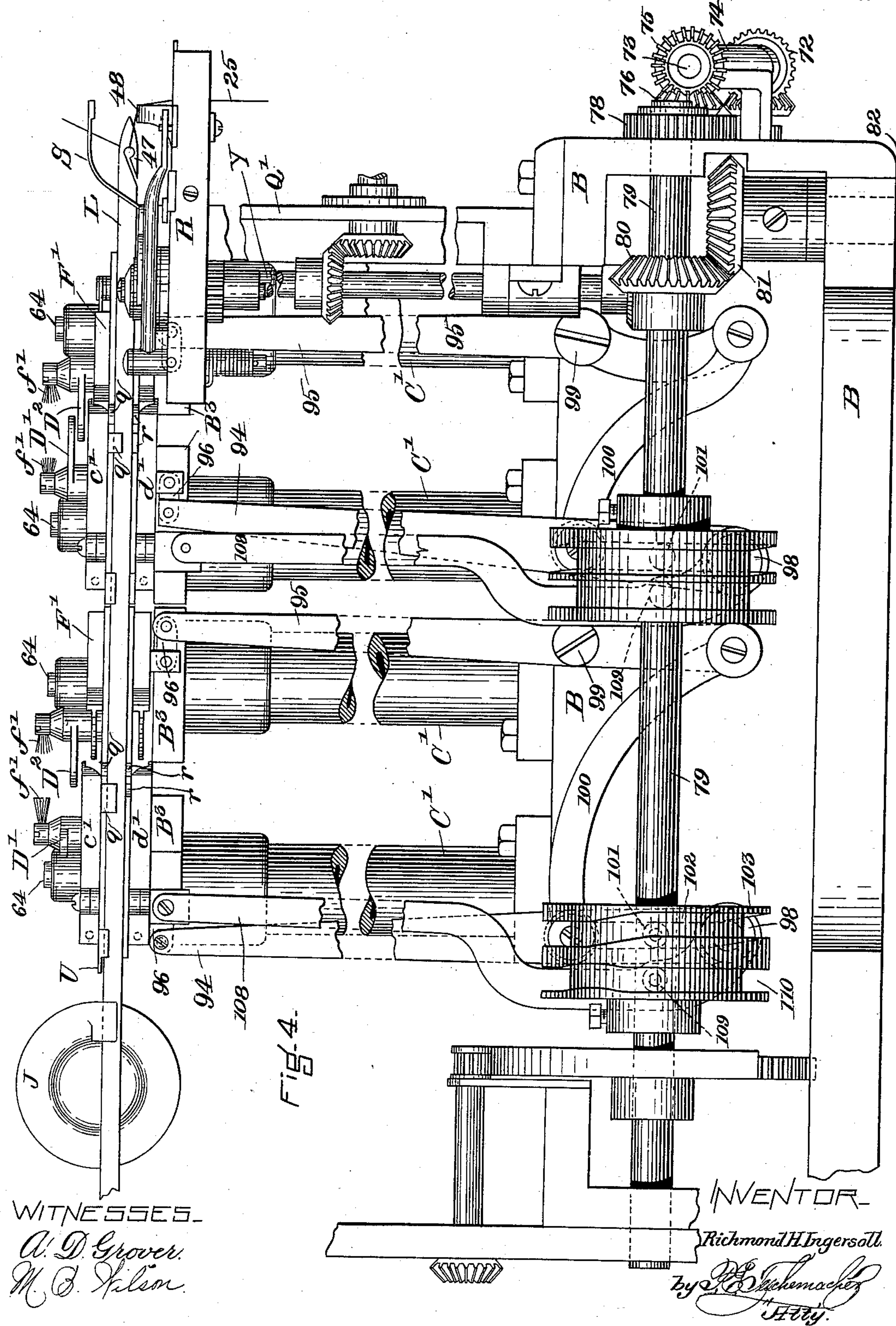
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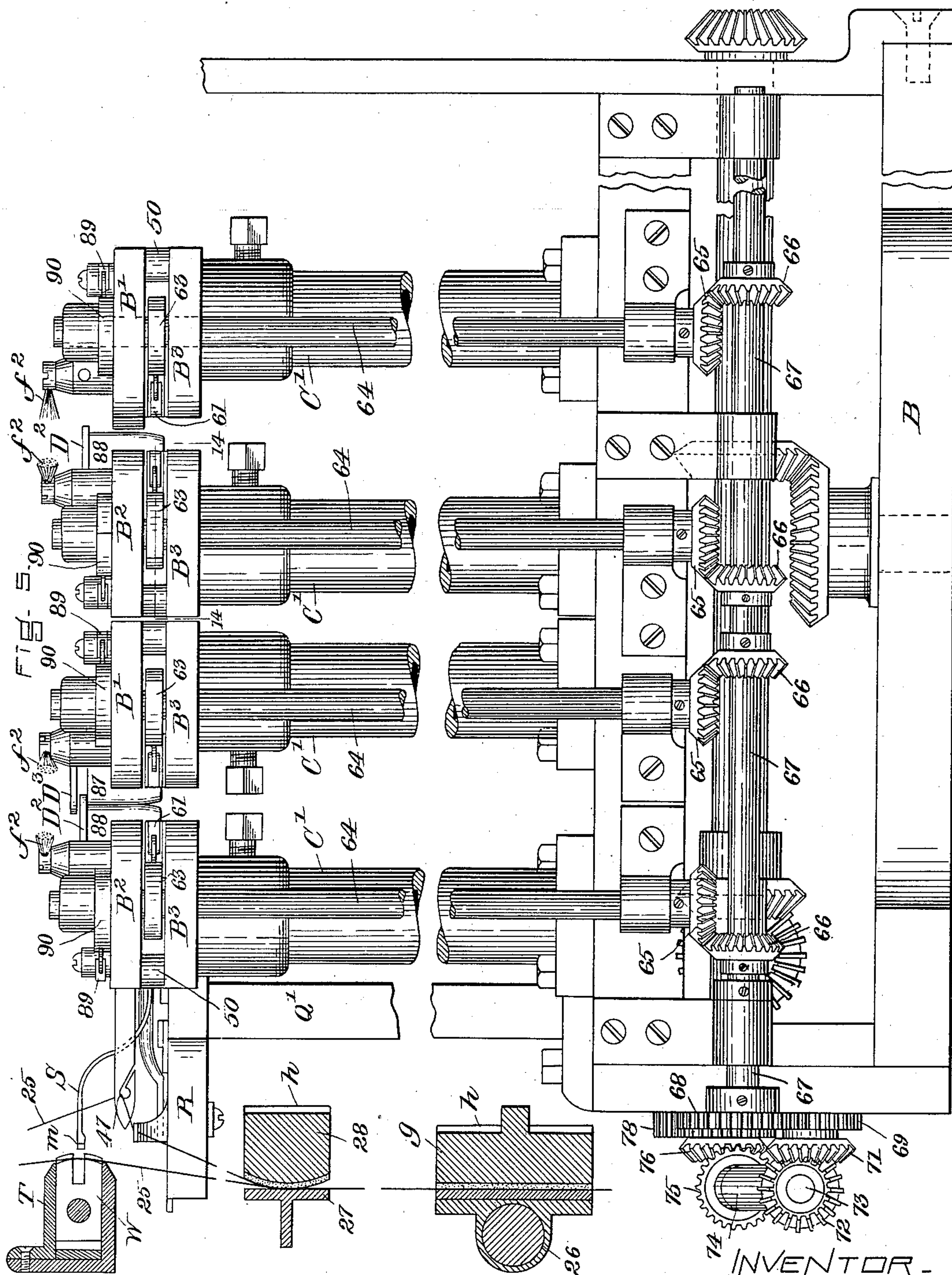
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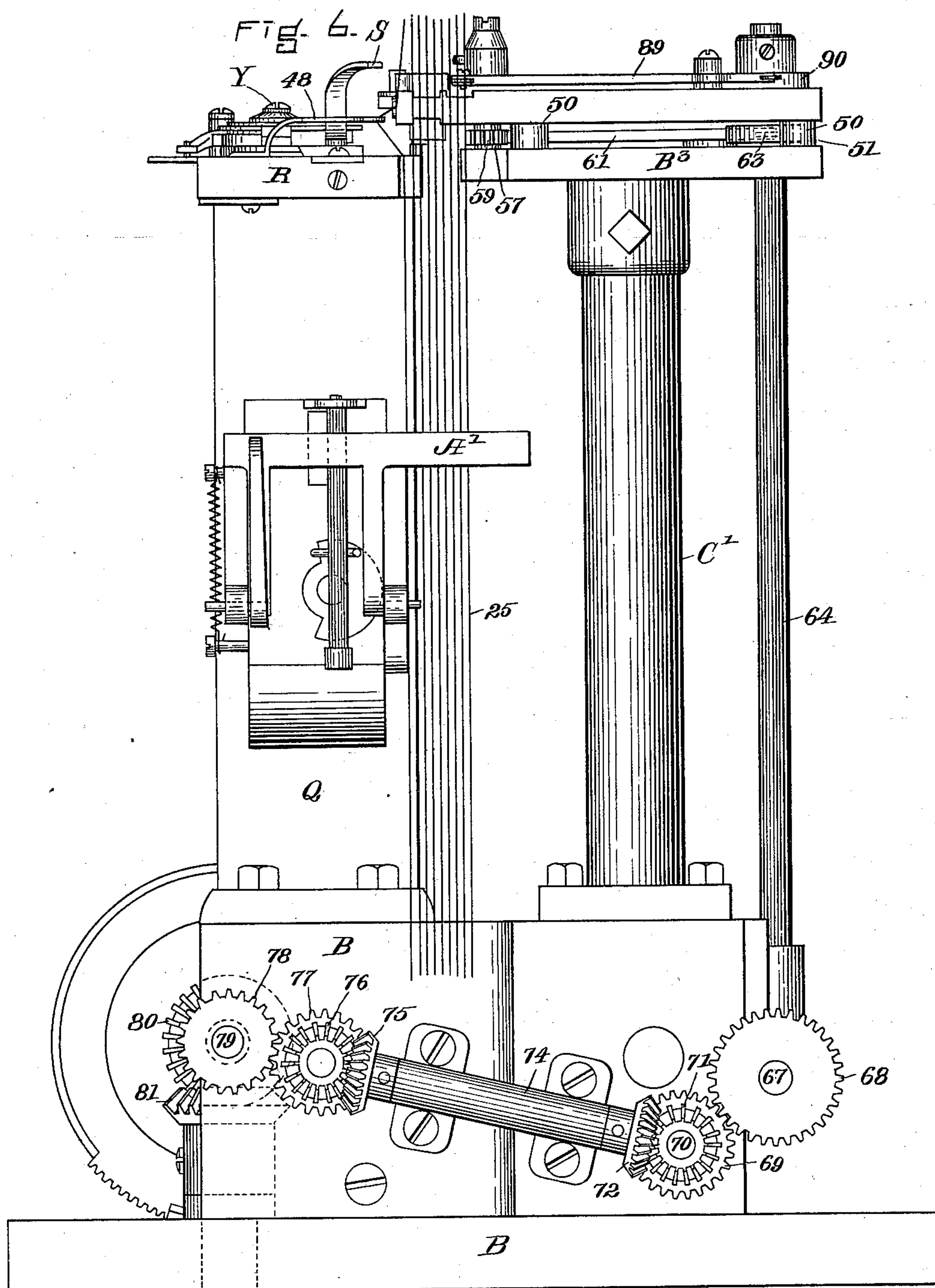
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10 Sheets—Sheet 6.



WITNESSES.

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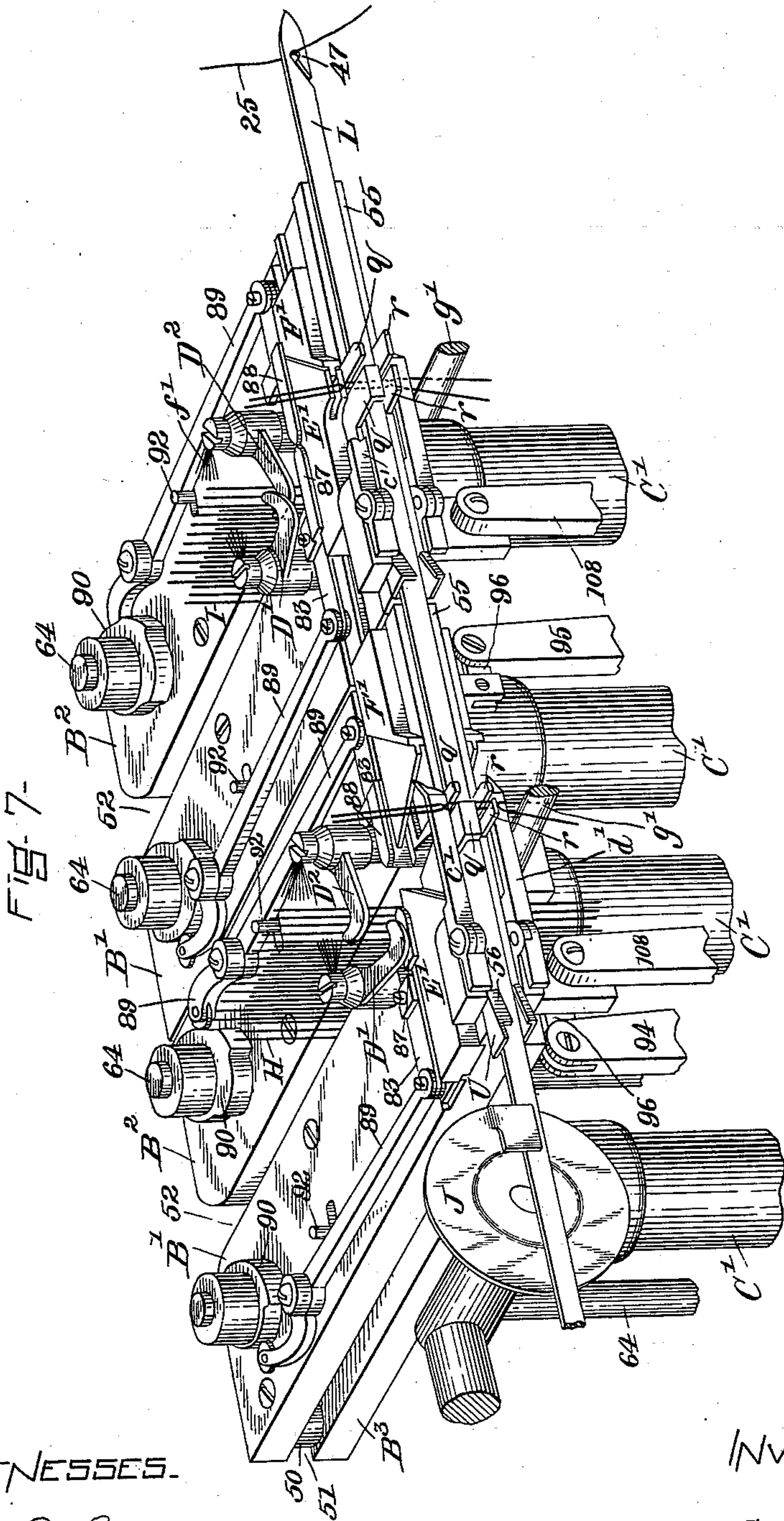
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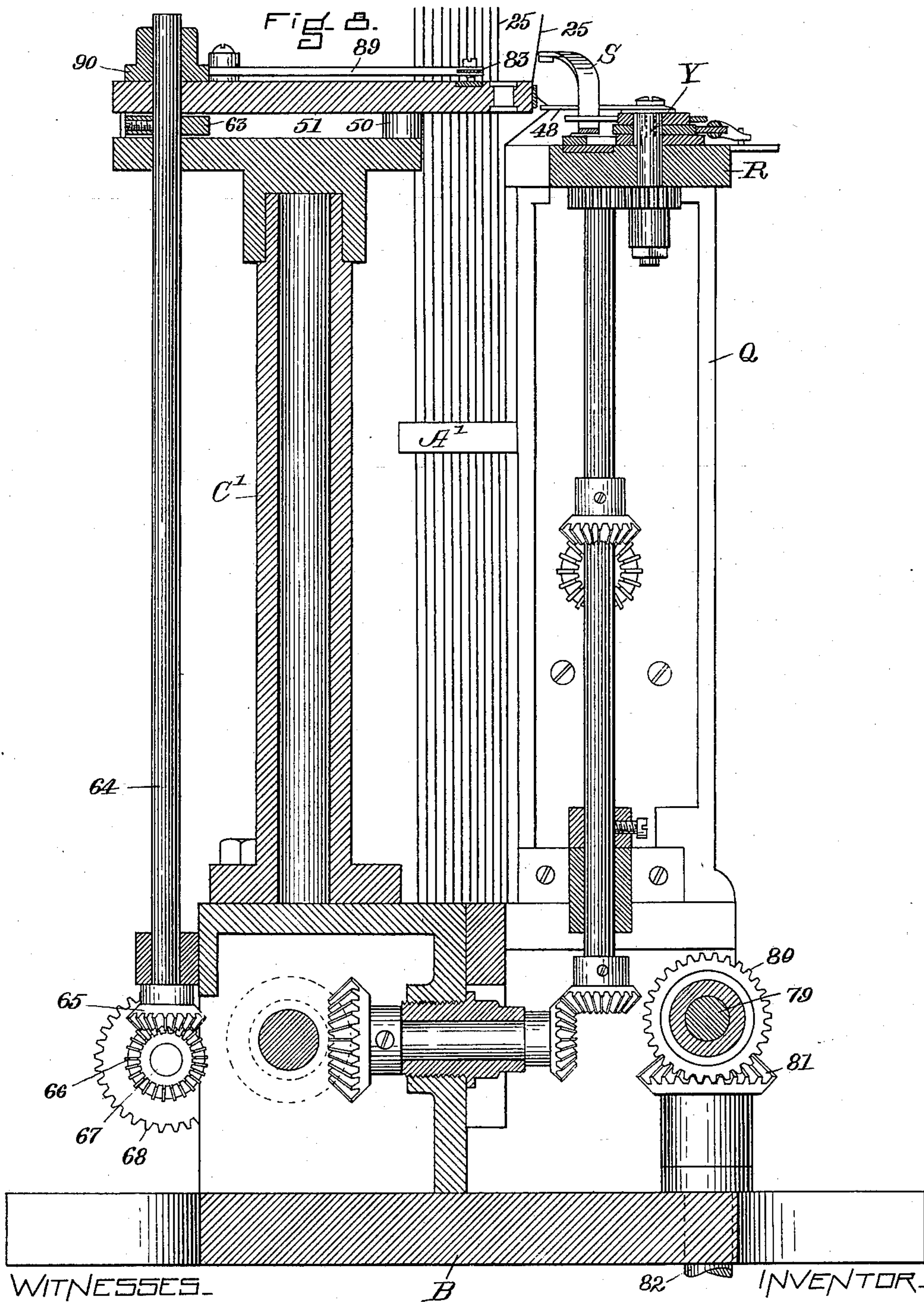
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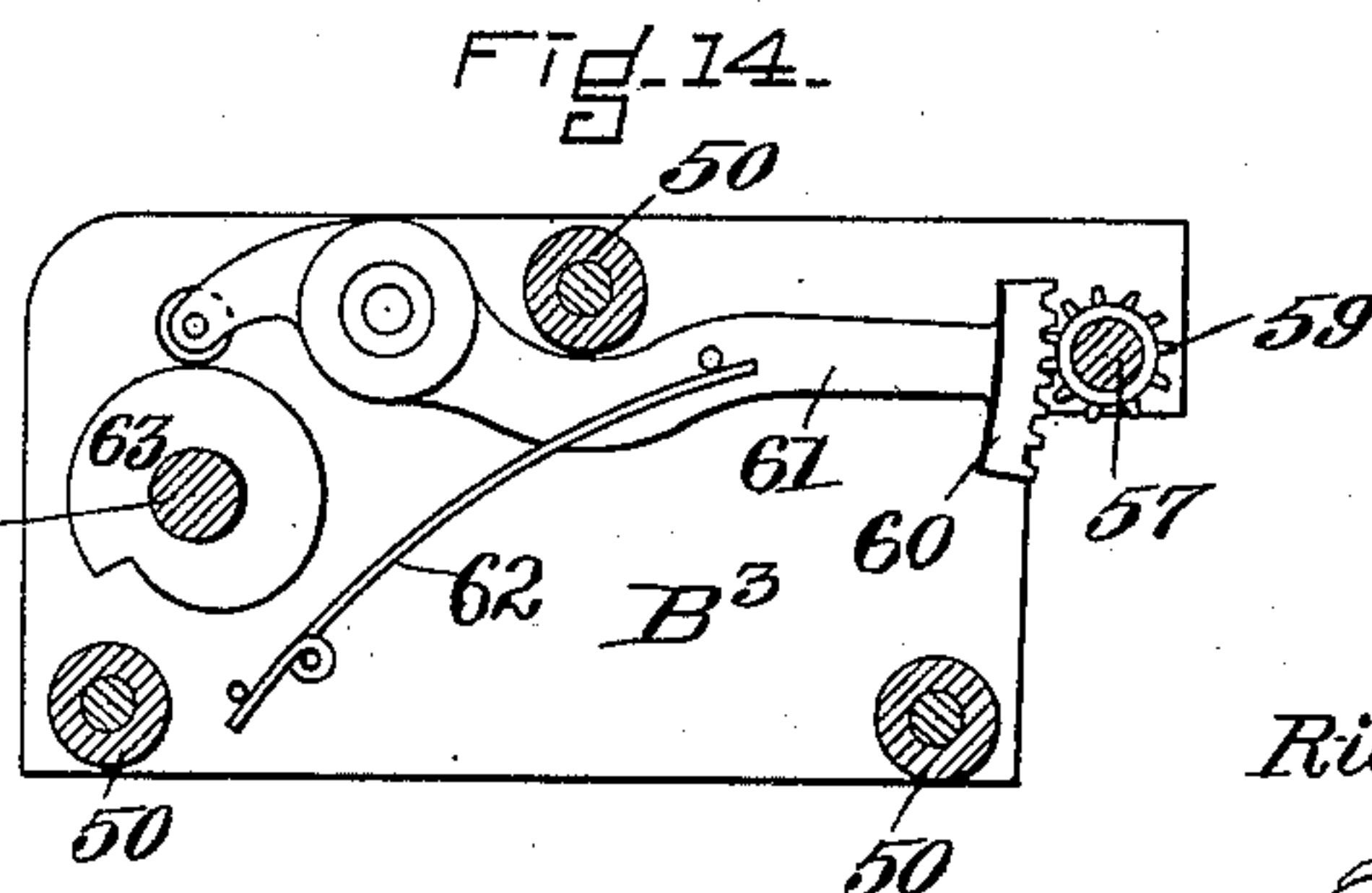
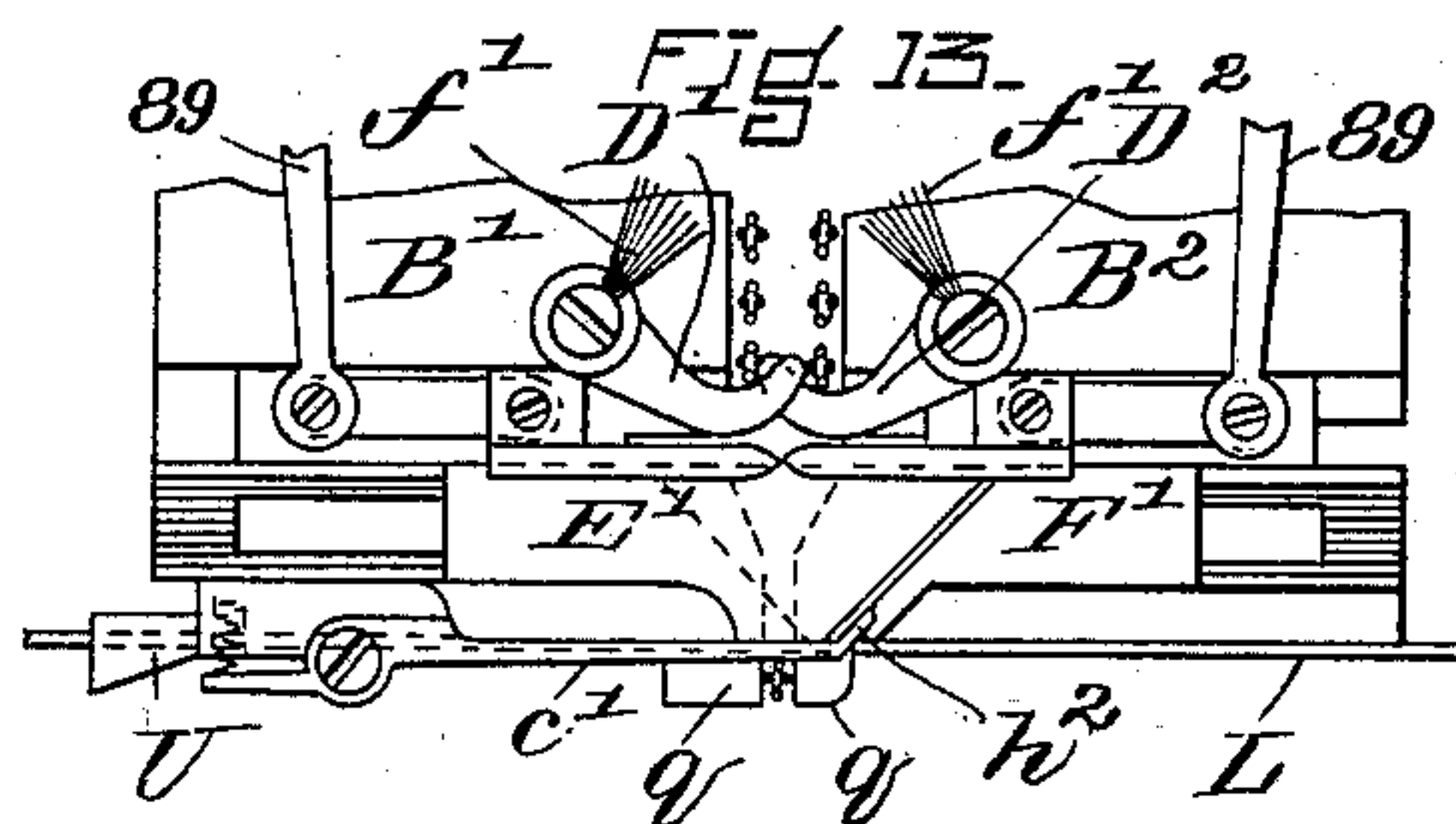
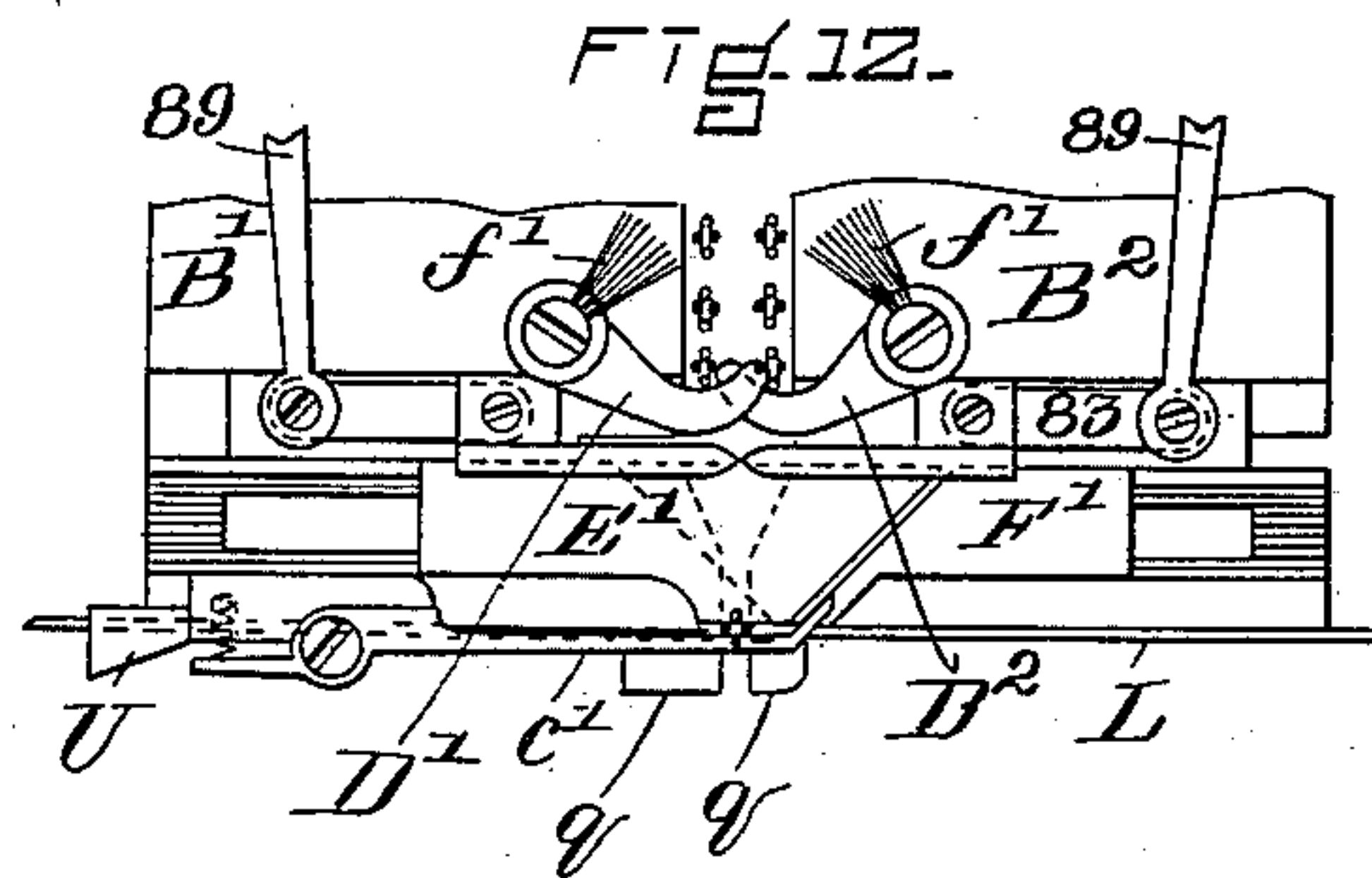
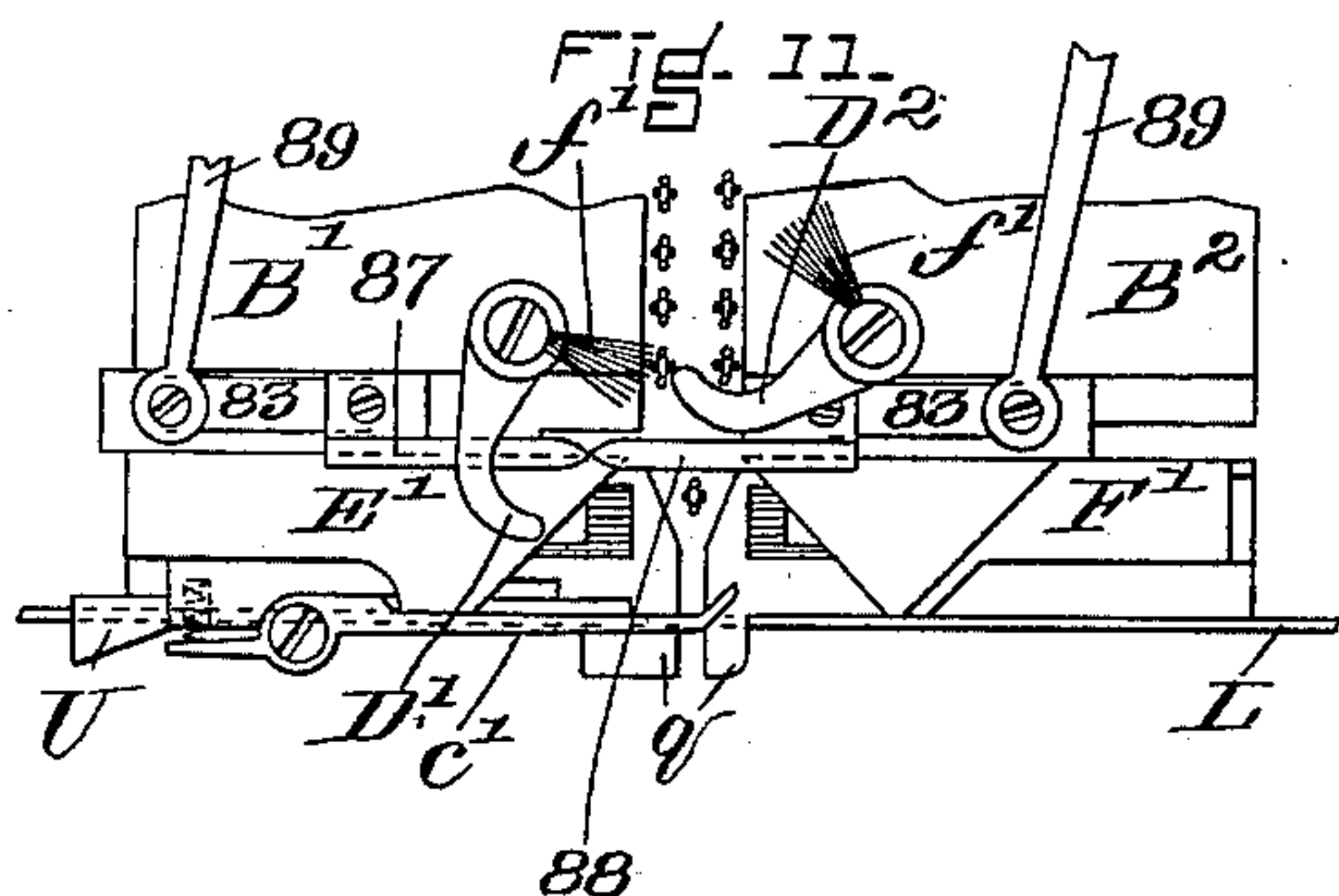
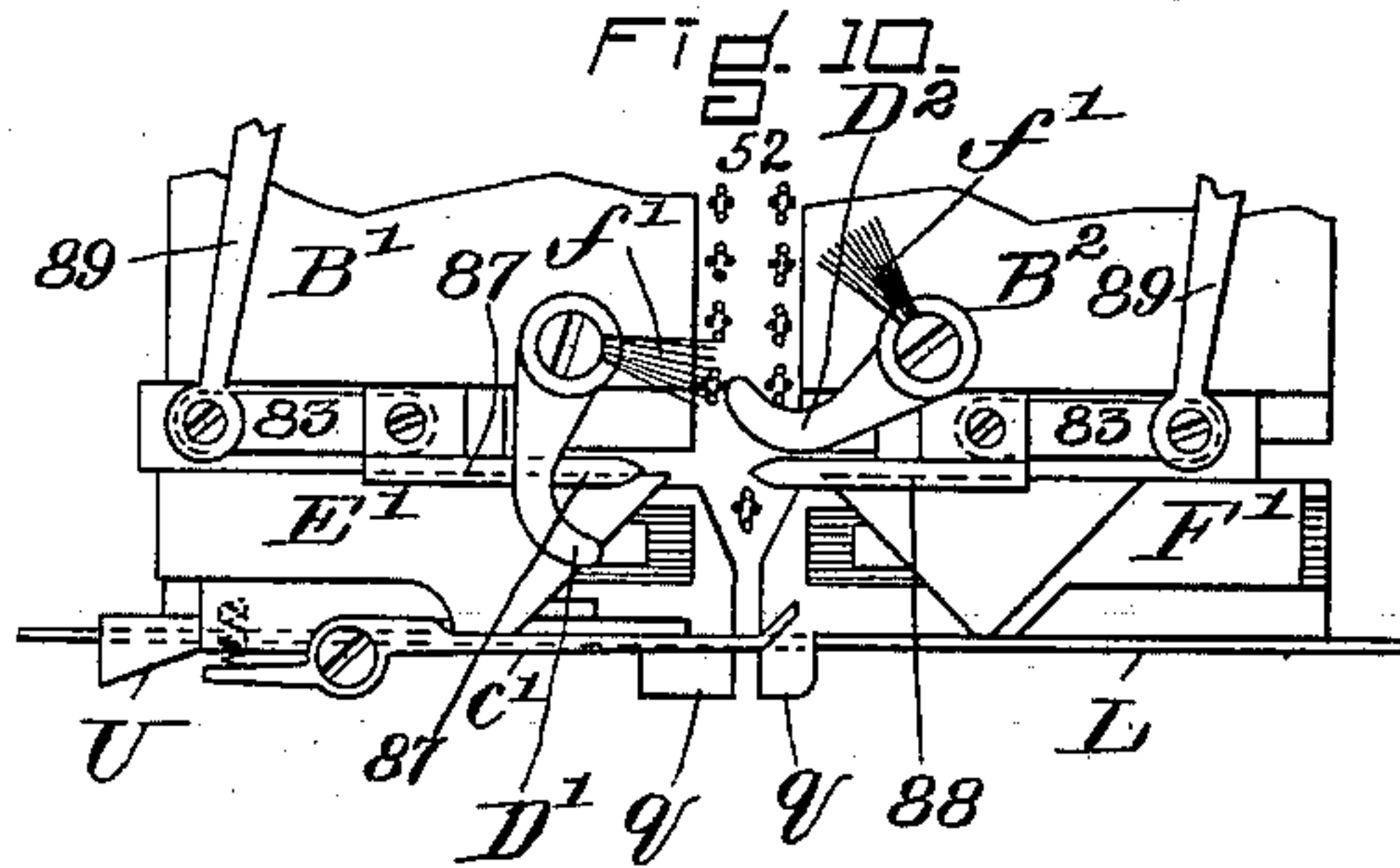
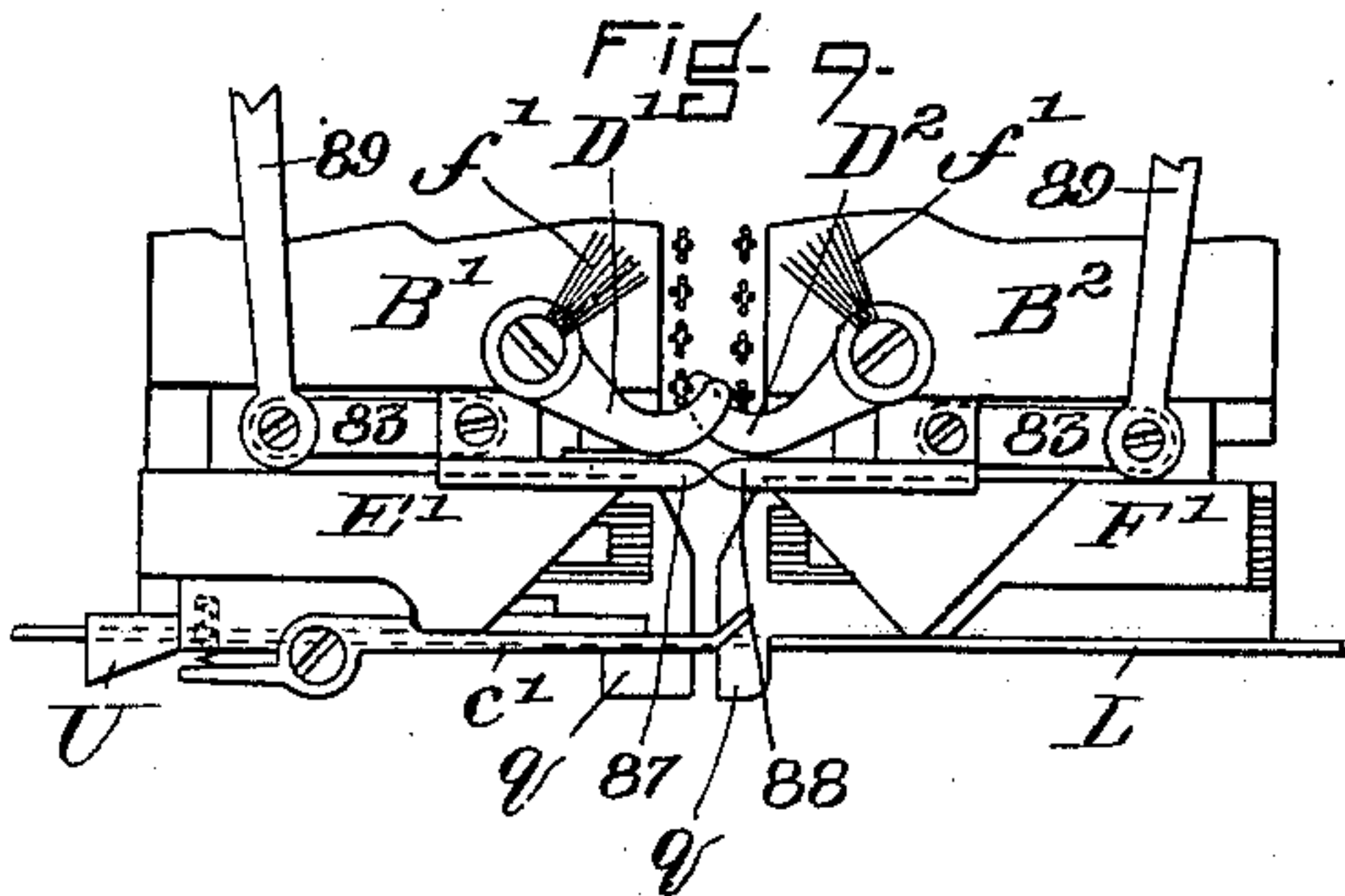
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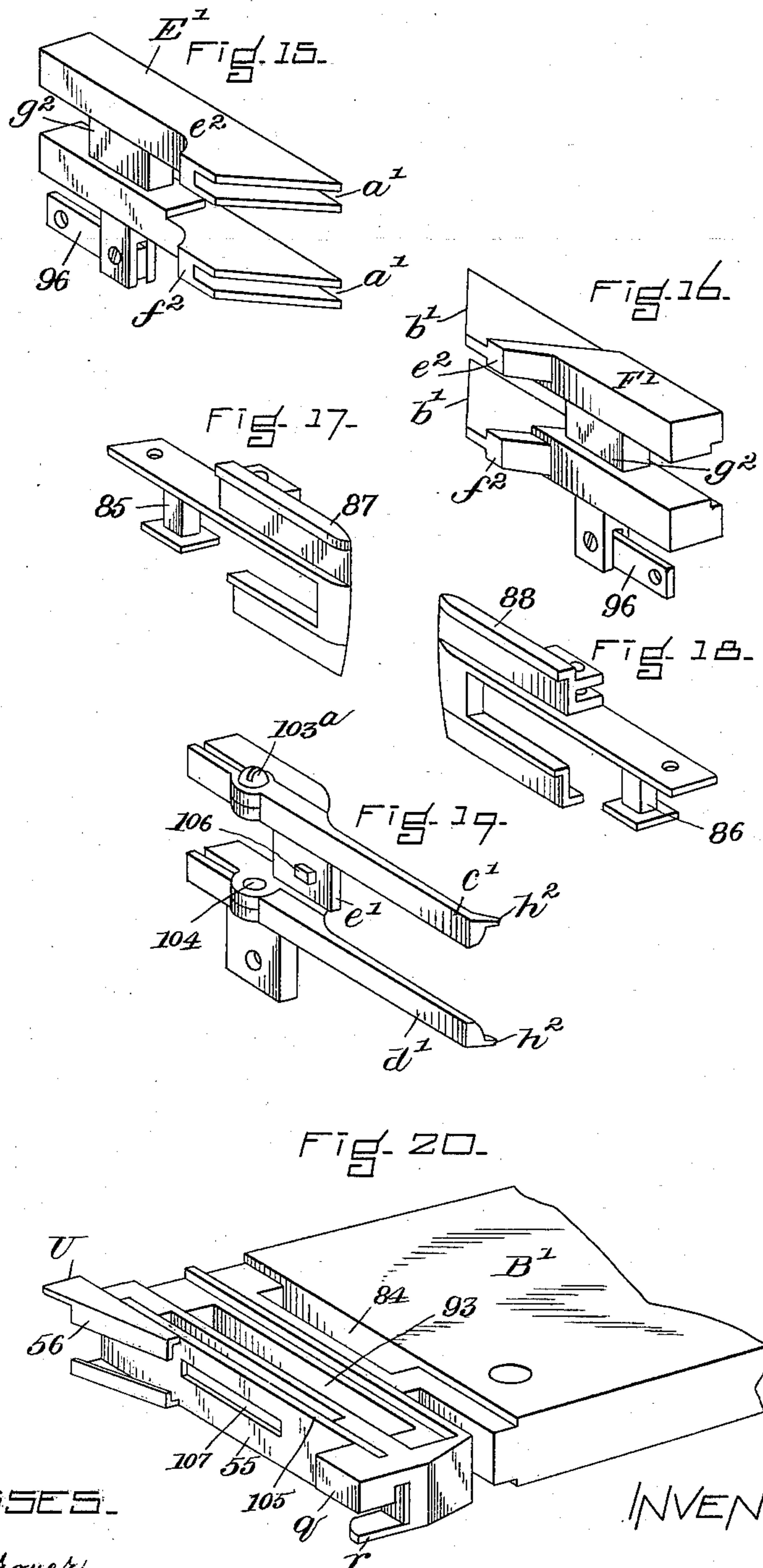
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UNITED STATES PATENT OFFICE.

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MACHINE FOR DRAWING IN WARP-THREADS.

SPECIFICATION forming part of Letters Patent No. 628,627, dated July 11, 1899.

Application filed December 10, 1898. Serial No. 698,911. (No model.)

To all whom it may concern:

Be it known that I, RICHMOND H. INGERSOLL, a citizen of the United States, residing at Biddeford, in the county of York and State of Maine, have invented certain Improvements in Machines for Drawing in Warp-Threads, of which the following is a specification.

My invention relates to machines for drawing in warp-threads, and particularly to a machine of this character for which Letters Patent of the United States Nos. 461,613, 468,914, and 590,008 were issued to me, respectively, on the 20th day of October, 1891, the 16th day of February, 1892, and the 14th day of September, 1897; and my invention consists in certain improvements in the mechanism for separating and holding the heddle-cords with their eyes in the path of the reciprocating needle, whereby it is simplified and rendered more accurate in its operation.

My invention also consists in supporting the warp-holding frame in such manner as to permit it to be swung outward from the machine, whereby more convenient access may be had to the warp-threads than has hitherto been possible; and my invention furthermore consists in certain other novel devices and combinations of parts, as hereinafter particularly set forth and specifically claimed.

In the accompanying drawings, Figure 1 is a front elevation of a machine for drawing in warp-threads embodying my improvements, the warp-threads being shown broken off above the clamp. Fig. 2 is a transverse vertical section on the line 2 2 of Fig. 1. Fig. 2^a is a detail to be referred to. Fig. 3 is a plan of the heddle-cord-separating mechanism. Fig. 4 is an end elevation of the same, the central portion being broken away. Fig. 5 is an elevation of the opposite end of the same similarly broken away. Fig. 6 is a rear elevation of the same. Fig. 7 is a perspective view of the same, one of the upper fingers *c'* at the right-hand side being broken away to show the parts behind the same and the supporting-standards and operating-levers being broken away below the platforms. Fig. 8 is a vertical section on the line 8 8 of Fig. 3. Fig. 9 is a detail plan of a portion of one of

the heddle-cord-separating devices, the hold-back-fingers being shown in the position which they occupy when holding back both series of heddle-cords. Fig. 10 is a similar plan showing the heddle-cord-separating devices with the heddle-cord in the second position. Fig. 11 is a similar plan showing the heddle-cord in the third position. Fig. 12 is a similar plan showing the heddle-cord in the fourth position. Fig. 13 is a similar plan showing the heddle-cord in the fifth position. Fig. 14 is a horizontal section on the line 14 14 of Fig. 5, showing the mechanism for operating the holdback-fingers. Figs. 15 and 16 are perspective views of the wedge-shaped slides which act on the eyes of the heddle-cords to force them outward between the holding-jaws. Figs. 17 and 18 are perspective views of the sliding "knives" which cut out or separate each heddle-eye from those in the rear. Fig. 19 is a perspective view of the fingers which finally act upon the heddle-cord to force it out from the separating mechanism. Fig. 20 is a perspective view of the front end of one of the tables which supports the heddle-cord-separating mechanism.

The framework of the machine may be of any suitable construction and in the present instance consists of a bed A, which is supported on suitable legs and is provided with guides to which is adapted a traversing carriage or slide B, which is fed from right to left by means of a feed-screw C, driven from the main or driving shaft D of the machine through the medium of suitable gearing and other connections. (Not shown.) The shaft D is provided with the ordinary fast and loose pulleys, as shown in Fig. 1.

Between vertical end pieces or standards *b b*, rising from the bed A, are secured four horizontal tubular rods *c*, upon which slide the hangers G, which support the heddles H I, the upper and lower bars of which fit within rectangular eyes or yokes at the ends of said hangers.

J, Fig. 7, represents the reed-dent-separating device, and K, Fig. 1, the reed, which is supported in a suitable frame secured to the standards *b b*, and L is the warp-drawing needle, which is a flat steel bar pointed and

barbed at its front end, said needle being reciprocated in a tubular casing 21, mounted on a box or casing 22, secured to the front of the carriage B and being reciprocated by suitable mechanism, all of the above-described parts being constructed and operating in the manner fully described in my aforesaid Letters Patent No. 461,613.

The warp-threads 25 are wound upon an ordinary warp-beam journaled in bearings upon a suitable stand on the floor, (not shown,) and said warp-threads pass over an upper rod 26 and a long guide-bar *d*, forming the upper portion of the warp-holding frame. Over this guide-bar is pressed an inverted-U or trough shaped spring-metal clamp *e*, Figs. 1 and 2, the warp-threads being confined between the bar *d* and the clamp *e*. The lower clamping-bar N of the warp-holding frame is supported by a lower rod 26, and said clamping device consists of a long flat bar *f* and a removable clamping-bar *g*, the latter being held tightly in place against the face of the flat bar *f* by removable spring-metal clamps *h*, the warp-threads being confined between the two bars, and the inner side of the bar *g*, which presses against the warp-threads, being covered with felt, cloth, or other suitable material to allow each thread to be easily and independently withdrawn by the needle L without disturbing any of the adjacent threads, this clamping device being substantially like that shown and described in my aforesaid Letters Patent No. 461,613.

In addition to the two clamping bars or devices above described, which form the upper and lower portions of the warp-holding frame, an intermediate or supplementary clamping bar or device P is employed, composed of two bars 27 28, constructed and held together in the same manner as the bars of the lower clamping device N, the inner side of the bar 28 being covered with felt or cloth. This clamping device P is supported at a suitable distance above the lower clamping device and is rigidly connected therewith by means of a series of vertical connecting-bars *i*, extending from one to the other, as shown in Fig. 2, whereby when the lower clamping device N is adjusted longitudinally by means provided for the purpose the intermediate clamping device P will be simultaneously moved in the same direction, thus keeping the warp-threads in their proper position, this device being fully shown and described in my aforesaid Patents Nos. 468,914 and 590,008.

The above-described warp-holding frame instead of being supported by brackets projecting from the framework of the machine, as in my aforesaid two patents, is supported by a swinging frame Q, composed of two arms 29, each pivoted at 30 to a base-piece 31, bolted to the floor, as shown in Fig. 2. Between the upper curved ends of the arms 29 is journaled a long horizontal rock-shaft 32, to the ends of which are securely fastened two short arms 33, which are bolted to two lugs 34, projecting

from the two upright rods 35, which connect the upper and lower horizontal bars of the warp-holding frame and form the end pieces of said frame. To one end of the shaft 32 is secured a lever 36, by which it may be turned in its bearings to incline the warp-holding frame at any desired angle when swung outward with the frame Q, as shown dotted in Fig. 2, and to one of the arms 29 is pivoted a pawl 37, which engages a ratchet-wheel 38, fast on one end of the shaft 32, whereby the warp-holding frame is held in position when inclined by means of the lever 36. The outward swing of the frame Q is limited by a horizontal rod 39, extending between and connecting the lower ends of the arms 29, said rod 39 contacting with the under sides of the base-pieces 31, which form stops therefor, as shown in Fig. 2. When the warp-holding frame is swung inward into its proper operative position, it abuts against brackets 40, projecting from the framework A, the lever 36 enabling the frame to be brought into an exact vertical position, so as to abut squarely against both the upper and lower brackets, as shown in Fig. 2. By thus making the warp-holding frame separate from the framework A and mounting it on a swinging support, so that it can be thrown back to afford convenient access to its inner side, much trouble and inconvenience is avoided, as the operator can stand between the warp-holding frame and the machine, where he can easily and conveniently manipulate the warp-threads for the purpose of arranging the same, if necessary, or reach any of the parts of said frame which may require his attention. When the frame is thrown forward to its operative position, the opposite ends of the horizontal bars 26, forming the top and bottom of the frame, enter open slots 23 at the outer ends of the brackets 40, where they are held by pins 24, passed down through holes in the forked ends of the said brackets.

In suitable bearings at the bottom of the warp-holding frame is journaled a long horizontal shaft 42, from which projects radially a long rib or thin bar 43, over which is pressed a U-shaped clamp 44, and between this bar and clamp the warp-threads after passing under the shaft 42 are confined, as shown in Fig. 2. To the shaft 42 is secured a ratchet-wheel 45, with which engages a holding-pawl 46, pivoted to the adjacent frame. If now in primarily adjusting the warp-threads in the frame it should be desired to draw them down slightly to stretch them into a straight even position, the shaft 42 is partially rotated in the proper direction by means of a hand-wheel thereon, the pawl preventing any backward rotation of the shaft, and after the threads have been properly arranged and before the machine is set in operation the clamp 44 is removed from the bar 43, thus releasing the ends of the threads and allowing them to hang down freely below the warp-holding frame.

The mechanism by which the warp-threads 25 are successively selected and carried one at a time against the barbed needle L into a position to insure their being caught by its 5 hook 47 as the needle is retracted, so as to be drawn thereby through the eye of the heddle and between the dents of the reed, is shown at the right-hand end of Fig. 3.

Q' is a standard which is bolted to the carriage B, Fig. 4, and carries at its upper end a table or platform R, Fig. 3, upon which is mounted a swinging curved arm S, carrying at its outer end the selecting-hook *m*, by means of which the warp-threads are successively presented to the reciprocating warp-drawing needle L in a manner to insure each one being caught thereby in its turn.

T represents a long bar having beveled edges, against which the warp-threads are 20 tightly pressed when stretched between the upper and lower clamping devices of the warp-holding frame, and W is the thread-separating comb having shallow vertical grooves for receiving the warp-threads. A hook 48 co- 25 operates with the selecting-hook *m*, and both of these hooks are operated by suitable cams on a vertical shaft Y. This thread-selecting mechanism is substantially the same as that shown, described, and claimed in my afore- 30 said Letters Patent No. 590,008, and as it forms no part of my present invention will not be further referred to.

A' represents the horizontal vertically-reciprocating nippers which operate to take up 35 the slack in the warp-threads as they are presented to the selecting mechanism. These nippers are substantially similar in construction and mode of operation to those shown and described in my aforesaid Patents Nos. 40 461,613 and 468,914, and as they form no part of my present invention they will not be herein further described.

The mechanism for separating the heddle-cords and holding them with their eyes in the 45 path of the reciprocating needle L in such manner that the passage of the latter through the heddle-eyes will be insured will now be described, said mechanism forming the principal feature of my present invention and being shown particularly in Figs. 3 to 20, inclu- 50 sive. The operation to be effected is the same as in the machine described in my Patent No. 461,613, before referred to—that is to say, the needle passes first through the reed K, then 55 through an eye of the heddle H, then between two eyes of the heddle I, Fig. 7, and after receiving a warp-thread 25 draws it between two eyes of the heddle I, through an eye of the heddle H, and through the reed; but on 60 the next stroke the needle passes between two eyes of the heddle H and through an eye of the heddle I, and receiving another warp-thread 25 draws it through an eye of the heddle I, between two eyes of the heddle H, 65 through the reed, and so on until all of the warp-threads have been drawn through the heddle-eyes and the reed. The number of

threads which pass through each space between the dents of the reed corresponds to the number of heddles being threaded in the ma- 70 chine.

The eyes of each heddle are selected and separated one by one in proper order and held in position for the passage of the hooked needle L in the following manner, and as the 75 eye-separating mechanism for the heddle H is precisely like that for the heddle I, the two mechanisms being so connected with the power that the heddles are acted upon alternately, I will describe only the device for act- 80 ing on one heddle, which will apply equally to the device for acting on the other heddle.

B' B² are two plates or platforms, which are supported by tables B³, from which they are separated by short posts 50, leaving a space 85 51 between them, said tables B³ being mounted on posts or standards C', rising from the carriage B. Between the plates B' B² and also between the tables B³ thereunder is a narrow space or channel 52, through which 90 the heddle-cords pass as the carriage B, with the plates B' B² and tables B³, is traversed from one end of the machine to the other, this space being narrowed down toward the rear end, as seen in Figs. 3, 7, and 10, to a width 95 just sufficient to allow the passage of one of the eyes of the heddle-cords when said eye is turned edgewise, so as to face toward the front of the machine. At the rear end of each of the plates B' B² are two small projecting plates 100 *q r*, forming jaws flush, respectively, with its upper and lower surfaces, the space between the upper and lower jaws being just sufficient to hold a heddle-eye with its upper and lower knots fitting close up under the lower plates 105 *r* and down upon the upper plates *q*, as shown in Fig. 7, the distance between the two jaws of a pair being sufficient to allow the passage of a heddle-eye turned edgewise, so as to present a single thickness of the cord only, and 110 with its face presented toward the front of the machine and directly in the path of the reciprocating needle L, which as it advances is held closely up against the vertical end faces 55 of the platforms B' B². At the cor- 115 ner of the platform B' which is nearest to the front of the machine is placed a guide U, Fig. 7, through which the needle passes, said guide being provided with a downwardly-extending and inwardly-inclined flange 56, which serves 120 to catch the point of the needle in case it should have become accidentally sprung outward and carry it snugly against the end face of the platform.

D' D² are two holdback-fingers, which are 125 secured to the upper ends of two vertical oscillating shafts 57 58 and lie one immediately over the other, the finger D' overlapping the finger D², as shown. These fingers have a swinging movement in a horizontal plane and 130 serve to alternately hold back and release the front and back rows of cords of the heddle. Each of the shafts of the holdback-fingers is supported in bearings in one of the

platforms B' or B^2 and the table B^3 directly thereunder and has secured to it a pinion 59, located within the space 51. With this pinion 59 meshes a curved rack 60 at the end of a spring-pressed vibrating lever 61, as shown in Fig. 14 and dotted in Fig. 3, said lever being provided with a cam-roll and being actuated against the resistance of a spring 62 by a cam 63, fast on the upper end of a vertical shaft 64, at the lower end of which is a bevel-gear 65, Fig. 5, which meshes with a bevel-gear 66 on a horizontal shaft 67, carrying at one end a gear 68, which meshes with a gear 69, rotating on a stud 70, Fig. 6, and having fastened to it a bevel-gear 71, meshing with a bevel-gear 72 on the end of an inclined shaft 73, Figs. 4 and 5, supported in a long bearing 74 and carrying at its opposite end a bevel-gear 75, meshing with a bevel-gear 76, rotating on a stud and having fastened to it a gear 77, meshing with a gear 78 on a long horizontal shaft 79, Figs. 4 and 6, which carries a bevel-gear 80, meshing with and driven by a bevel-gear 81 on the upper end of a short vertical shaft 82, which receives motion from the driving-shaft of the machine through intermediate connections. (Not shown.)

The holdback-fingers D' D^2 , which operate alternately, enter between the front and back rows of cords of the heddle, and while one finger is holding back the cords on one side the other finger is thrown outward by the action of the spring 62 on the lever 61, thus releasing the cords on that side of the heddle, when the cords of the first eye will separate from the rest, the remaining cords on that side being prevented from following by reason of the crossing of the front and back cords beneath the eyes. The holdback-fingers as they are swung inward lap each other, which enables them to be made of such length that their rounded hook-shaped ends will extend beyond a line or plane passing centrally between the front and back rows of heddle-cords, thus increasing their range of motion, which, together with the width and shape of the outer ends or points of the fingers, cause the front and back rows of cords to be so widely separated thereby that while one finger is holding back the cords on one side the other finger as it swings inward, which takes place before the first-named finger is released, cannot by any possibility catch any of the cords on the opposite side of the heddle. The above-described holdback-fingers are substantially the same in construction and mode of operation as those shown and described in my aforesaid Patent No. 461,613, the mechanism by which they are operated merely differing in some minor details.

In each of the two adjacent platforms B' B^2 is formed a vertical slot 84, Fig. 20, and in said slots are fitted two slides 85 86, Figs. 17 and 18, to which are secured a pair of pointed "cut-out" plates or knives 87 88, one on each side of the channel 52, each slide being re-

ciprocated by means of a lever 89, connected thereto by means of a link 83 and carrying at the end of its short arm a cam-roll, which is acted upon by a cam 90 at the upper end of one of the vertical shafts 64 to move the lever in one direction, the return movement being effected by a spring-pressed pin 92 bearing against said lever, as shown, whereby the knives 87 88 are withdrawn to permit a single heddle-cord to pass into the narrow portion of the channel 52, as shown in Figs. 7 and 10, and then moved to bring the knife 88 across the channel 52 into the position shown in Fig. 11 to cut out the heddle-cord which has just passed and effectually isolate it from the others, thereby preventing any possibility of more than one cord at a time passing into the narrow portion of the said channel. On the next movement of the slides 85 86 the knife 87 is carried across the channel 52 into a position the reverse of that shown in Fig. 11, and so on alternately.

E' F' , Figs. 15 and 16, are a pair of double-wedge-shaped slides, which are guided in slots 93, Fig. 20, in the platforms B' B^2 and are reciprocated simultaneously in opposite directions by means of levers 94 95, connected thereto by links 96, as shown in Figs. 4 and 7. These levers 94 95, which are fulcrumed, respectively, at 98 99, are coupled together by a curved connecting-rod 100, Fig. 4, and the lever 94 is provided with a cam-roll 101, which fits within a cam-groove 102 in the face of a cam-wheel 103, fast on the shaft 79, which receives its motion from the driving-shaft, as previously described. Each of the slides E' F' is composed of two members e^2 f^2 , spaced apart by means of a block or piece g^2 , to which they are attached, said block g^2 fitting within the slot 93 and having pivoted to its lower end the connecting-link 96.

One side or face of each member of the slides E' F' is beveled or inclined, and the upper and lower inclined portions of the slide E' are each mortised out, as shown at a' , to receive corresponding tongues b' , forming the upper and lower inclined portions of the slide F' , whereby as the two slides are closed together the heddle-cord will be caught between them and, resting against their inclined sides, will be forced outward to carry the heddle-eye between the jaws q r and the heddle-cords of said eye against the inner sides of a pair of spring-pressed fingers c' d' , pivoted at 103^a 104 to a slide e' , fitting within a slot 105, Fig. 20, in the platform B' , said slide having a projection 106, Fig. 19, fitting within a guide-slot 107. (Shown in Fig. 20.) The slide e' , with its fingers c' d' , is reciprocated to cause said fingers to pass over the heddle-cord in one direction after the heddle-eye has been threaded and on the return movement to the right force said heddle-eye out of the path of the jaws q r , as shown in Fig. 13, by means of a lever 108, fulcrumed at 98 and carrying a cam-roll 109, which fits within a cam-groove

110 in the face of the cam-wheel 103 on the shaft 79, whereby the required movements are imparted to the fingers $c' d'$, the outer end of each of which is beveled or inclined inward and provided with a sharp point h^2 , adapted to pass behind the heddle-cord and force it outward, as shown in Fig. 13 and at the left-hand side of Fig. 7.

To the upper end of each of the stems of the holdback-fingers $D' D^2$ is secured a small brush f' , which when the holdback-finger is swung outward to release the heddle-cords moves in the arc of a circle and brushes or switches them over into place in case they should stick or have become accidentally obstructed in any way, so as not to move freely into place when released by the holdback-finger.

The operation of the above-described mechanism is as follows: The parts being in the position shown in Fig. 9, which shows the heddle-cords of the heddle H in the first position, and the line of heddle-cords being held out of the way by the finger D^2 the finger D' is thrown back into the position shown in Fig. 10 and the cut-out knife 87 is simultaneously withdrawn. This releases the front row of heddle-cords, when the foremost eye of this row will separate from the rest and pass through the space between the pointed ends of the cut-out knives into the position shown in Fig. 10, which I term the "second" position. The cut-out knife 88 now moves to the left into the third position, (shown in Fig. 11,) isolating the foremost heddle-eye, and thus preventing any possible return of the cord, the movement of the brush f' , connected with the holdback-finger D' , having brushed the cords over into place, as shown in Fig. 11, in case they should have failed to move. A flattened thin-edged bar g' , Fig. 7, is introduced longitudinally between the cords of the heddles and is suspended in any suitable manner—for instance, by means of wires—at such height as to bring it directly under the eyes of the heddle at a short distance therefrom, the friction of the heddle-cords against this bar, in connection with the crossing of the front and rear cords, causing the cords of the foremost eye in the line to be separated from the following ones on their release by the holdback-finger and preventing the cords of two or more eyes from passing at the same time through the space between the cut-out knives. The slides $E' F'$ now close together, causing the tongues b' to enter the mortises c' , when the cooperating inclined or beveled sides of said slides, acting on the heddle-cord above and below the heddle-eye, will force or wedge the same outward into the position shown in Fig. 12 and at the right-hand side of Fig. 7, which I term the "fourth" position, and during this movement of the slides the cut-out knives and the holdback-finger D' return to their original first positions, as shown in Fig. 12. The heddle-eye is now squarely between the jaws $q r$, in which position it is

firmly held by the two fingers $c' d'$, which press the heddle-cord against the opposite edges of the slides $E' F'$. The needle L now passes through the heddle-eye, receives a warp-thread, and draws it back through the said eye, immediately after which the fingers $c' d'$ move to the left, causing their inwardly-inclined ends to pass over the heddle-eye. The fingers then instantly move forward to the position shown in Fig. 13, causing their pointed ends h^2 to pass behind or on the inner side of the heddle-cord and force the heddle-eye outward and beyond the path of the needle L into the fifth or last position (shown in Fig. 13 and at the left-hand end of Fig. 7,) the heddle-eye passing entirely out of the jaws $q r$ as the platforms $B' B^2$ are moved along with the traversing carriage B. The slides $E' F'$ now separate and return to their original first position. (Shown in Fig. 9.) The holdback-finger D' , which acts on the front row of cords of the heddle I and the heddle-cord-separating mechanism cooperating therewith, is then operated in the same manner as above described, after which the operation of the holdback and separating mechanism of the heddle H is repeated; but this time the finger D^2 is thrown outward to release the back series or row of cords of the heddle H, after which the separated cut-out knives are moved to the right to close the channel 52, the subsequent movement of the slides $E' F'$ and fingers $c' d'$ being the same as previously described. When the machine is arranged for threading two heddles, as in the present instance, the eyes of the rear heddle are all held out of the path of the needle while a single eye of the front heddle is being threaded, and the eyes of the front heddle are then held out of the way while an eye of the rear heddle is being threaded, these alternate actions being continued until all the eyes of both heddles are threaded. As soon as an eye of the front row or series of cords of the heddle H has been carried into position between the jaws $q r$ and while the needle is passing through said eye the front row or series of cords of the other heddle I is released by the outward movement of its holdback-finger D' and the cords of the foremost eye of this series are permitted to pass forward into the narrow portion of the channel 52, and by the time that the eye of the heddle H has been threaded and pushed outward by the fingers $c' d'$ the eye of the heddle I has arrived into the proper position between the jaws of its separating device for the passage of the needle therethrough, and while an eye of the heddle I is being threaded the separating device of the heddle H remains stationary, with both holdback-fingers $D' D^2$ carried inward to hold back both series of cords, and as soon as the thread has been drawn through the eye of the heddle I and said eye has been pushed outward by the fingers $c' d'$ and while the needle is being drawn back to carry the said thread through the reed the holdback-

finger D² of the heddle H releases the back series of cords of said heddle, the cords of the foremost eye of which are then carried forward, as previously described, and while this is taking place the separating device of the heddle I remains stationary, with its hold-back-fingers D' D² holding back both series of cords of said heddle I, and in this manner the two separating devices operate alternately, a front eye of the heddle H being first acted on and threaded, then a front eye of the heddle I, then a back eye of the heddle H, and, finally, a back eye of the heddle I, these operations being repeated until the eyes of all the cords have been threaded.

The reed-dent separator J is driven from the shaft 79 by means of suitable connections (not shown) and operates in the same manner as described in my aforesaid Patent No. 461,613, said separator making a single revolution immediately after the needle has drawn the required number of warp-threads through a single space between the dents of the reed.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a warp-drawing-in machine, the combination with a heddle-supporting device, the traversing carriage and the platforms supported by and moving with said traversing carriage, and having a space or channel between them and a pair of eye-holding jaws at the end of said channel, of the reciprocating cut-out knives or plates sliding in ways on opposite sides of the channel and adapted to pass across the same to isolate a single heddle-eye when released, a pair of reciprocating wedge-shaped slides arranged on opposite sides of said channel, and having their outer faces beveled in opposite directions, said slides when closing together, engaging the heddle-eye and forcing it outward into the path of the reciprocating warp-drawing needle, and means for holding the heddle-eye between the eye-holding jaws while being threaded, substantially as described.

2. A heddle-cord separating and holding device comprising a pair of alternately-operating holdback-fingers arranged on opposite sides of the space or channel for the passage of the heddle-cords, a pair of reciprocating cut-out knives or plates for isolating each heddle-eye when released by its holdback-finger, jaws for holding the heddle-eye in the path of the reciprocating needle, a pair of reciprocating wedge-shaped slides adapted when closing together, to engage the heddle-eye between them and carry it outward into the path of the needle, and reciprocating fingers adapted to hold the heddle-eye in the path of the needle while being threaded and subsequently pass behind the threaded heddle-eye to carry it out of the path of the needle and hold it at the end of the jaws while the wedge-shaped slides are being withdrawn, and means for actuating the holdback-fingers, cut-out

knives, slides and fingers, substantially as described.

3. In a warp-drawing-in machine, the combination with a heddle-supporting device, the traversing carriage and a reciprocating warp-drawing needle mounted upon said traversing carriage, of two platforms connected to and moving with said carriage, and having a space or channel between them for the passage of the heddle-cords, eye-holding jaws projecting from said platforms at the end of said space or channel, the alternately-operating holdback-fingers, the reciprocating cut-out knives adapted to pass across the said channel to isolate a single heddle-eye when released by its holdback-finger, the wedge-shaped slides moving simultaneously in opposite directions and adapted, when closing together, to engage the heddle-eye between them and force it outward into the path of the needle, and the reciprocating fingers adapted to hold the heddle-eye in the path of the needle while being threaded and subsequently pass behind the said eye when threaded to carry it out of the path of the needle and hold it at the end of the jaws while the wedge-shaped slides are being drawn back, and means for actuating the cut-out knives, slides and fingers, substantially as described.

4. In a warp-drawing-in machine, the combination with the platforms having a space or channel between them and the horizontally-swinging holdback-fingers, of the reciprocating cut-out knives or plates arranged on opposite sides of said channel and adapted to alternately open and close the same to isolate each heddle-eye as it is released by its holdback-finger, and means for reciprocating said cut-out knives, substantially as described.

5. In a warp-drawing-in machine, the combination with the platforms having a space or channel between them and eye-holding jaws at the end of said channel, of the reciprocating wedge-shaped slides arranged on opposite sides of said channel and moving simultaneously toward and from each other, said slides, when closing together, engaging the heddle-eye between their angular faces, and forcing it outward between the eye-holding jaws into the path of the reciprocating needle, substantially as described.

6. In a warp-drawing-in machine, the combination with the platforms having a space or channel between them and eye-holding jaws at the end of said channel, of the reciprocating wedge-shaped slides arranged on opposite sides of said channel and moving simultaneously toward and from each other, said slides, when closing together, engaging the heddle-eye between their angular faces, and forcing it outward between the eye-holding jaws into the path of the reciprocating needle, and the reciprocating fingers adapted to hold the heddle-eye in the eye-holding jaws against the said wedge-shaped slides during

the passage of the warp-drawing needle and subsequently recede, and on their return movement pass behind the heddle-eye to carry the same out of the path of the needle and hold it at the end of the jaws during the withdrawal of the wedge-shaped slides, substantially as described.

7. In a warp-drawing-in machine, the combination with the platforms having a space or channel between them and eye-holding jaws at the end of said space, of the reciprocating wedge-shaped slides arranged on opposite sides of said channel, the front angular ends of the slide on one side of the channel being mortised, and the front ends of the opposite slide having tongues adapted to enter said mortises as the slides are closing together, substantially as described.

8. In a warp-drawing-in machine, the combination with the platform having a slot, of the double-wedge-shaped reciprocating slides E', F', each composed of two members spaced apart, and secured to a block sliding in the slot of the said platform, the two members of the slide on one side being mortised or grooved horizontally, and the two members of the opposite slide having tongues adapted to enter said mortises or grooves as the ends of the slides are closing together, substantially as described.

9. In a warp-drawing-in machine, a detachable warp-holding frame mounted on an independent swinging support, whereby it may be swung outward from the main portion of the machine, substantially as described.

10. In a warp-drawing-in machine, a detachable warp-holding frame mounted upon an independent swinging support and jointed thereto, whereby it may be inclined at an angle to said support, means for holding the frame in its inclined position, and a fastening device for securing said warp-holding

frame to the main frame when swung up into place against the same, substantially as described.

11. In a warp-drawing-in machine, a detachable warp-holding frame mounted upon a swinging support and jointed thereto, whereby it may be inclined at an angle when swung outward away from the machine, a lever for inclining said warp-holding frame, and means for holding said frame when inclined, substantially as described.

12. In a warp-drawing-in machine, the swinging supporting-frame Q pivoted at its lower end and provided at its upper end with a horizontal rock-shaft having arms secured thereto, the warp-holding frame secured to said arms, a lever secured to the rock-shaft, whereby the warp-holding frame may be inclined at an angle, a ratchet-wheel fast on the rock-shaft, and a retaining-pawl engaging said ratchet-wheel to hold the frame in position when inclined, substantially as described.

13. In a warp-drawing-in machine, the combination with the warp-holding frame and its clamping devices, of a warp-straightening device consisting of a horizontal shaft journaled in the lower portion of the frame, and having a longitudinal rib or strip projecting radially therefrom, a U-shaped clamp fitting over said rib to hold the warp-threads thereon, a ratchet-wheel fast on said shaft and a retaining-pawl engaging said ratchet-wheel to hold the shaft in place when turned to draw down the warp-threads, substantially as described.

Witness my hand this 8th day of December, A. D. 1898.

RICHMOND H. INGERSOLL.

In presence of—

P. E. TESCHEMACHER,
M. B. WILSON.