

(No Model.)

7 Sheets—Sheet 1.

J. A. WILSON & R. HUTCHINSON.
STRAIGHT KNITTING MACHINE.

No. 516,144.

Patented Mar. 6, 1894.

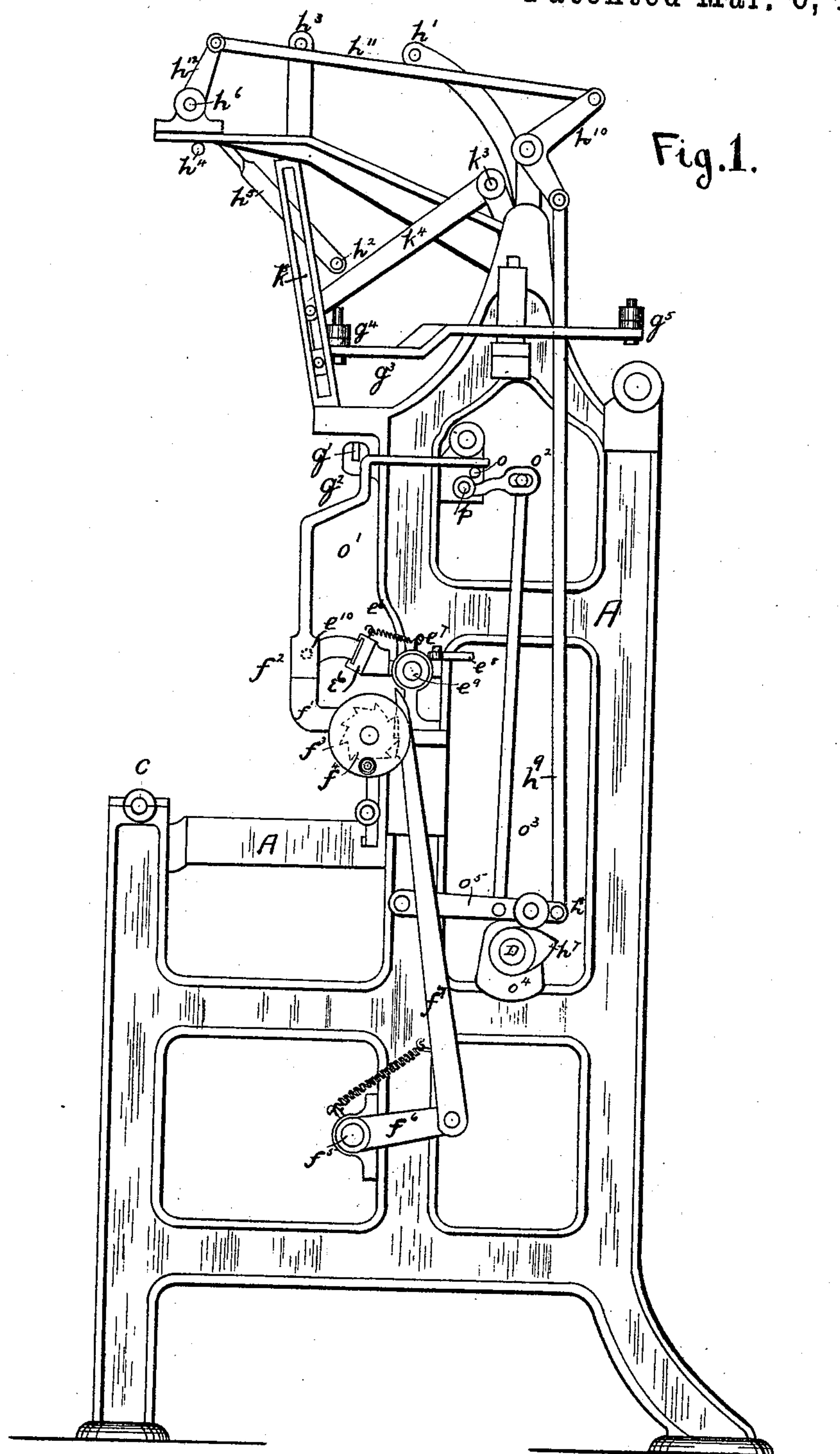


Fig. 1.

Witnesses
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Rowland Hutchinson
By James H. Lancaster Atty.

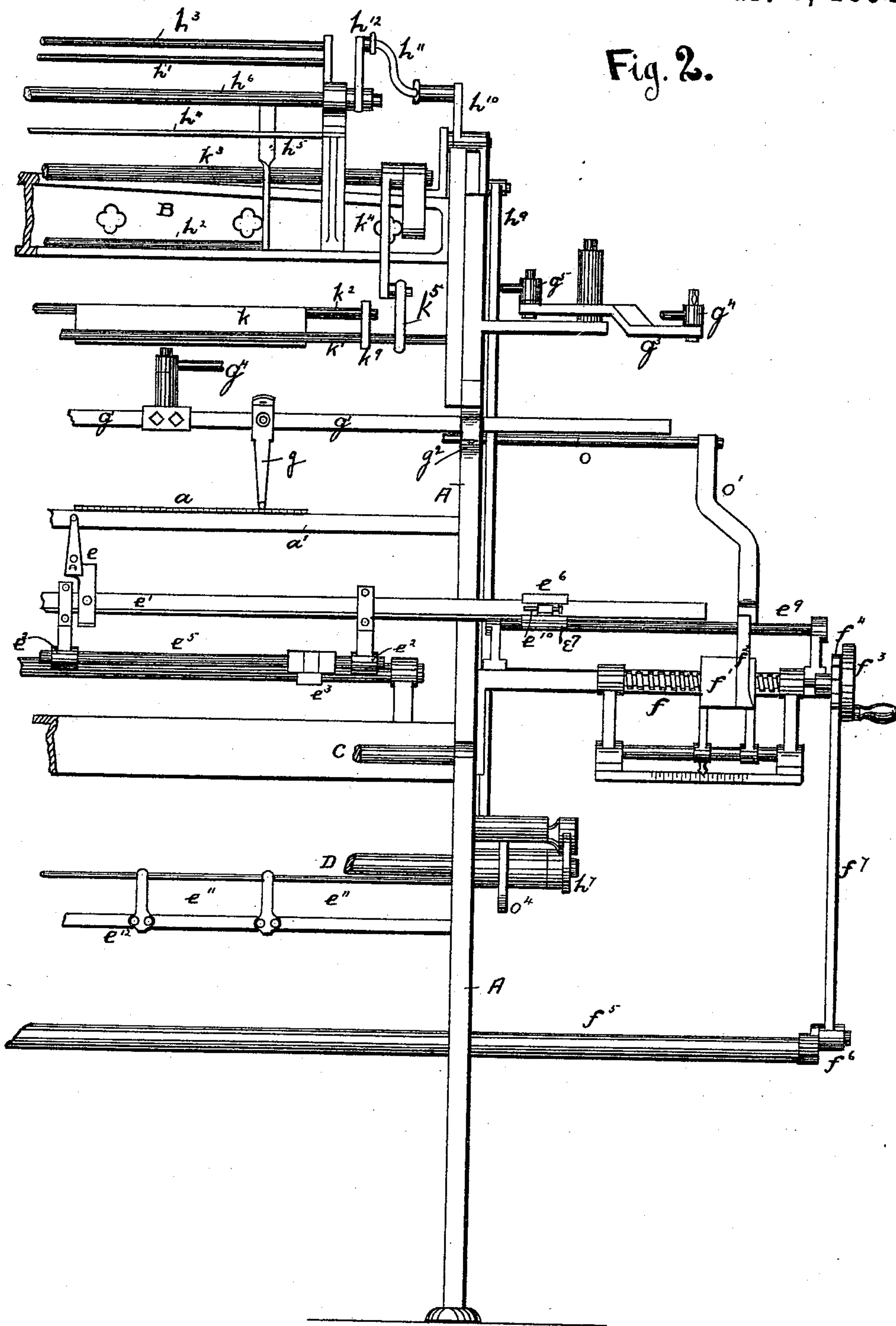
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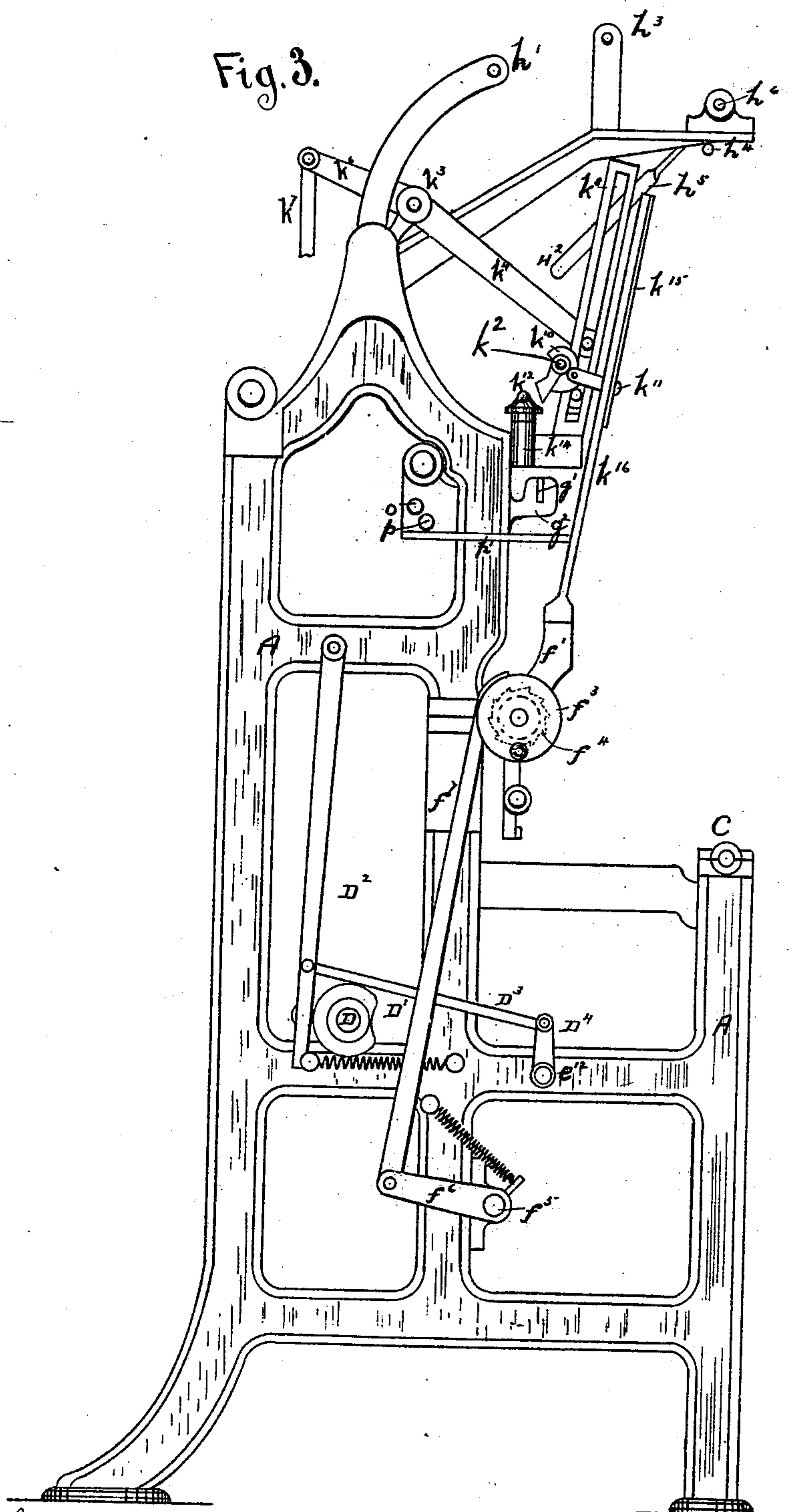
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Fig. 3.



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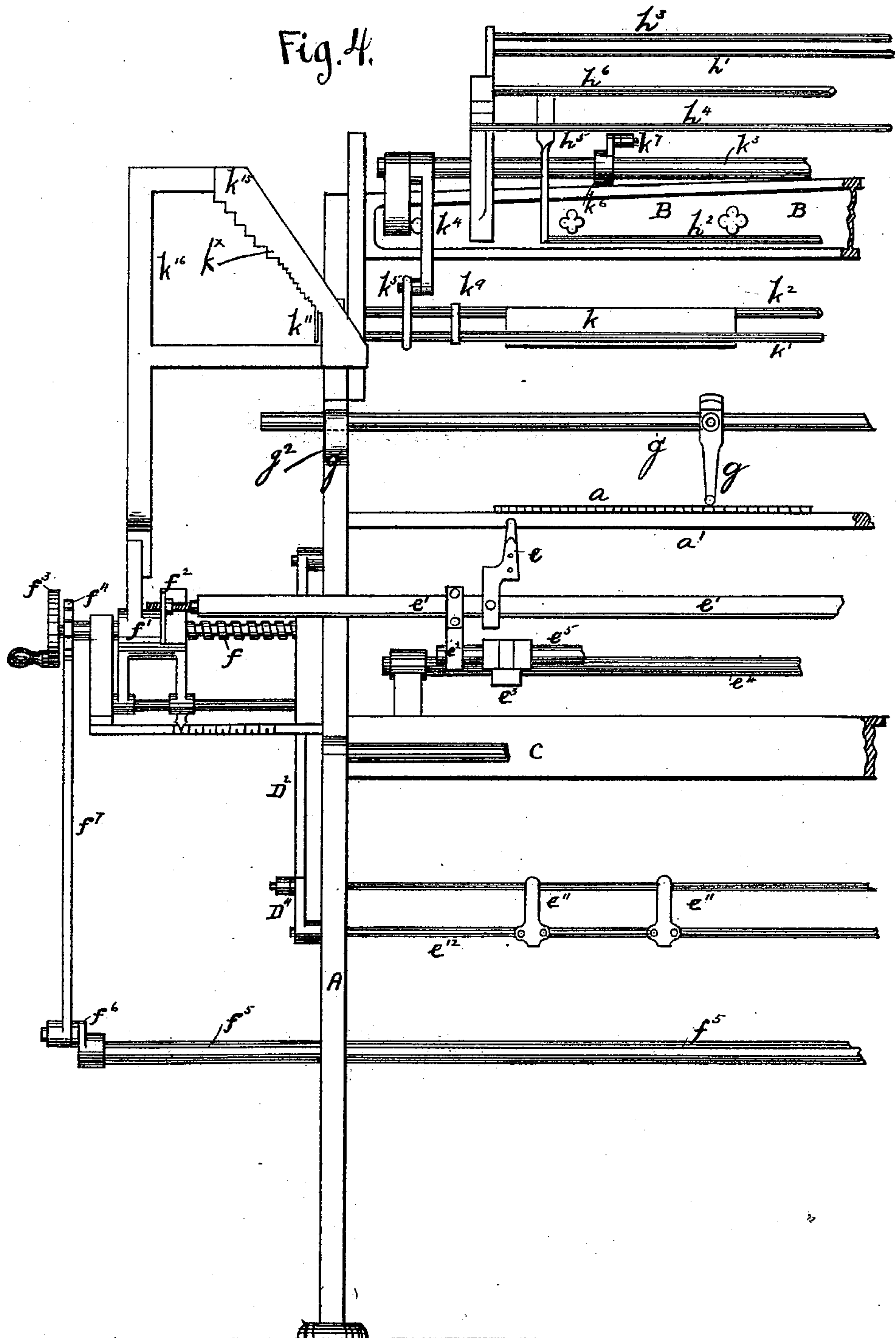
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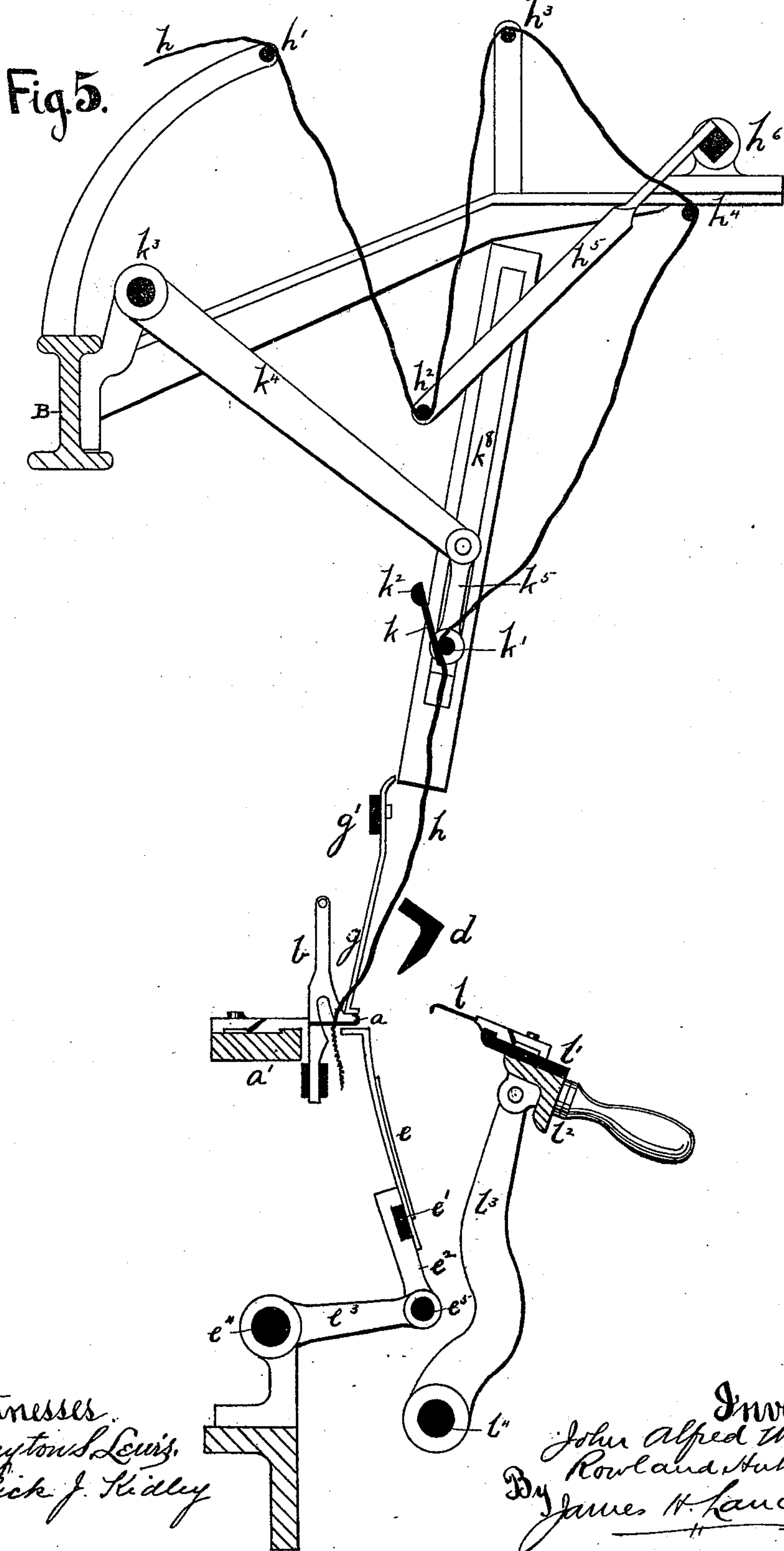
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Fig 5.



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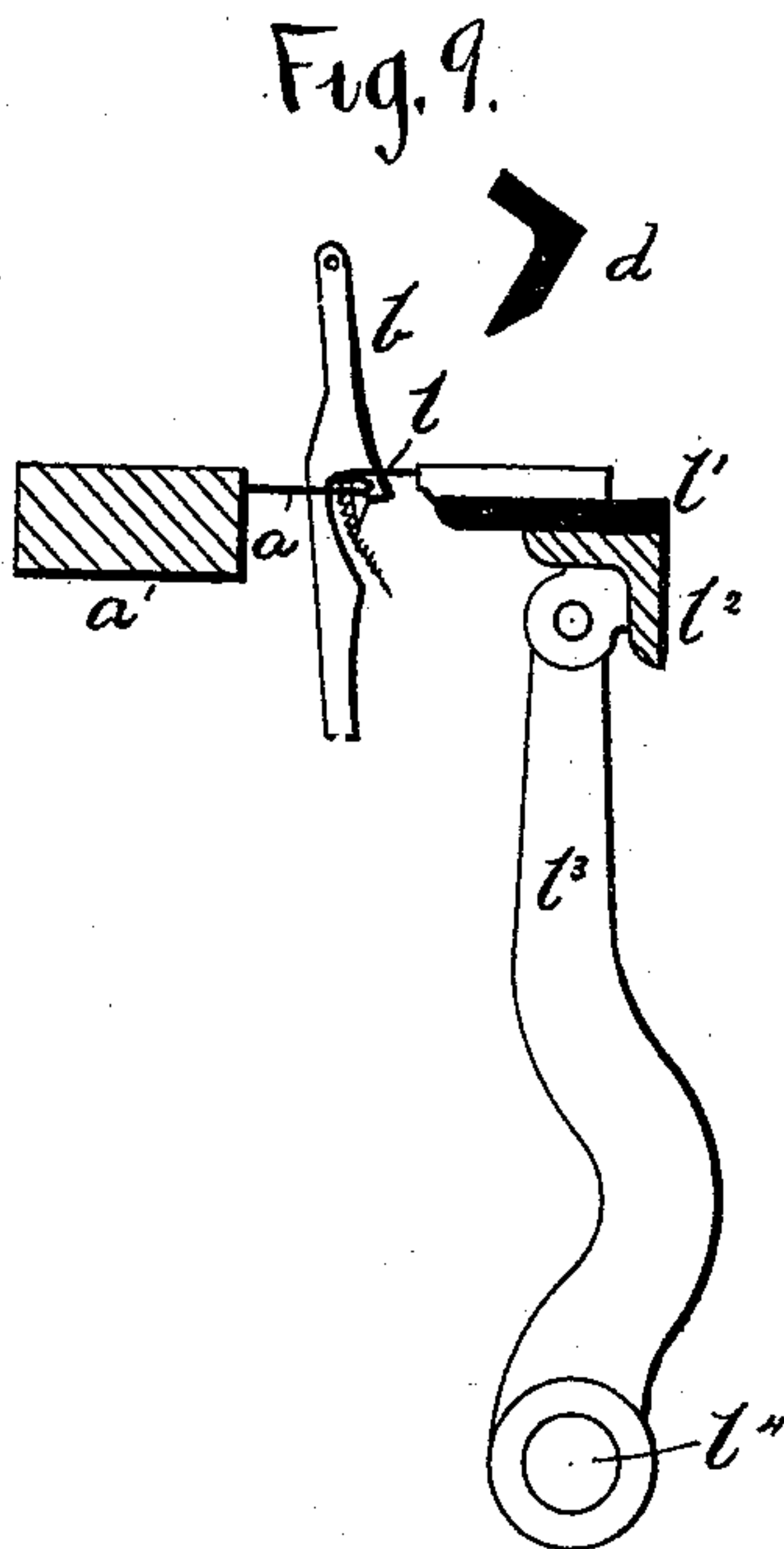
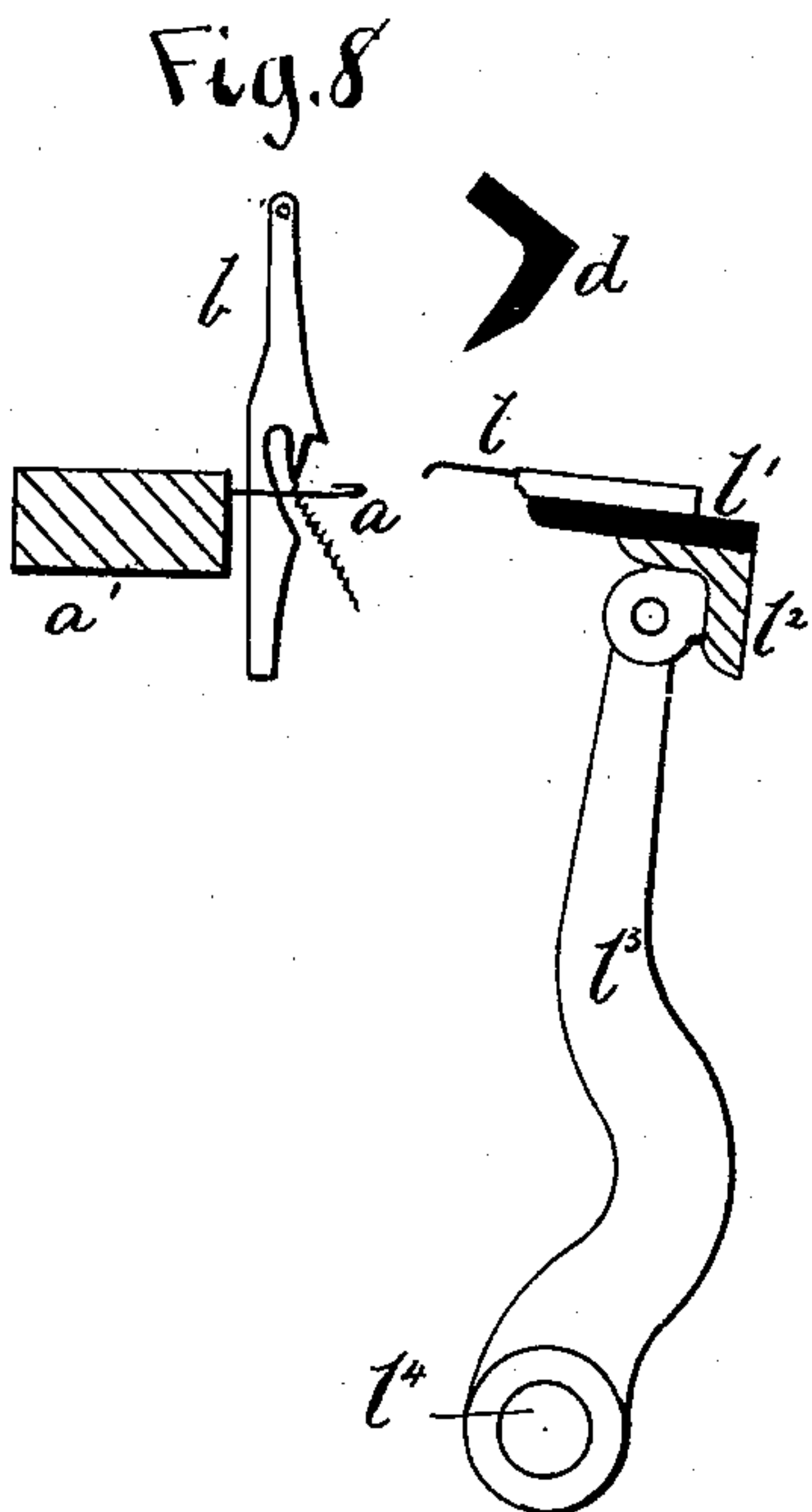
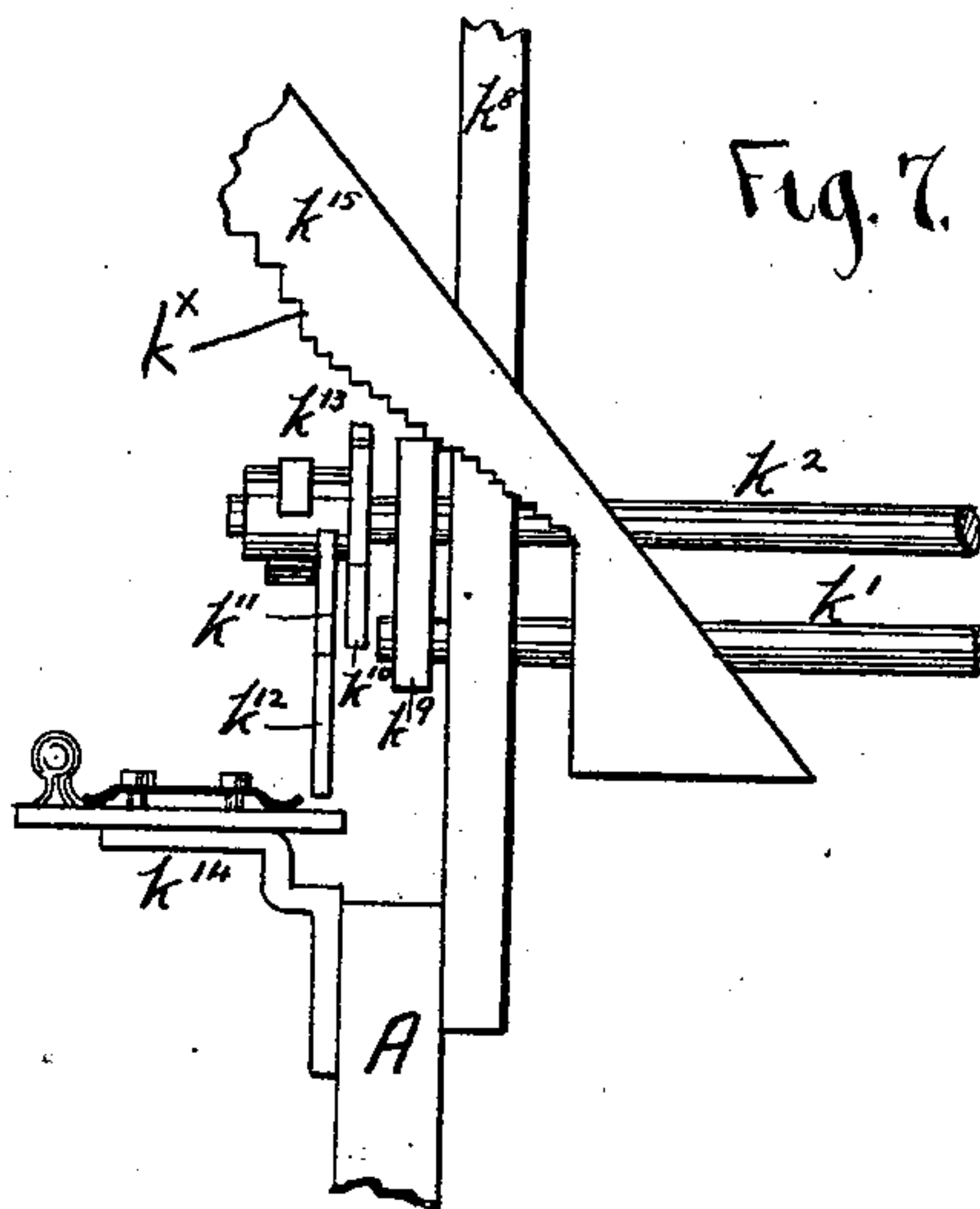
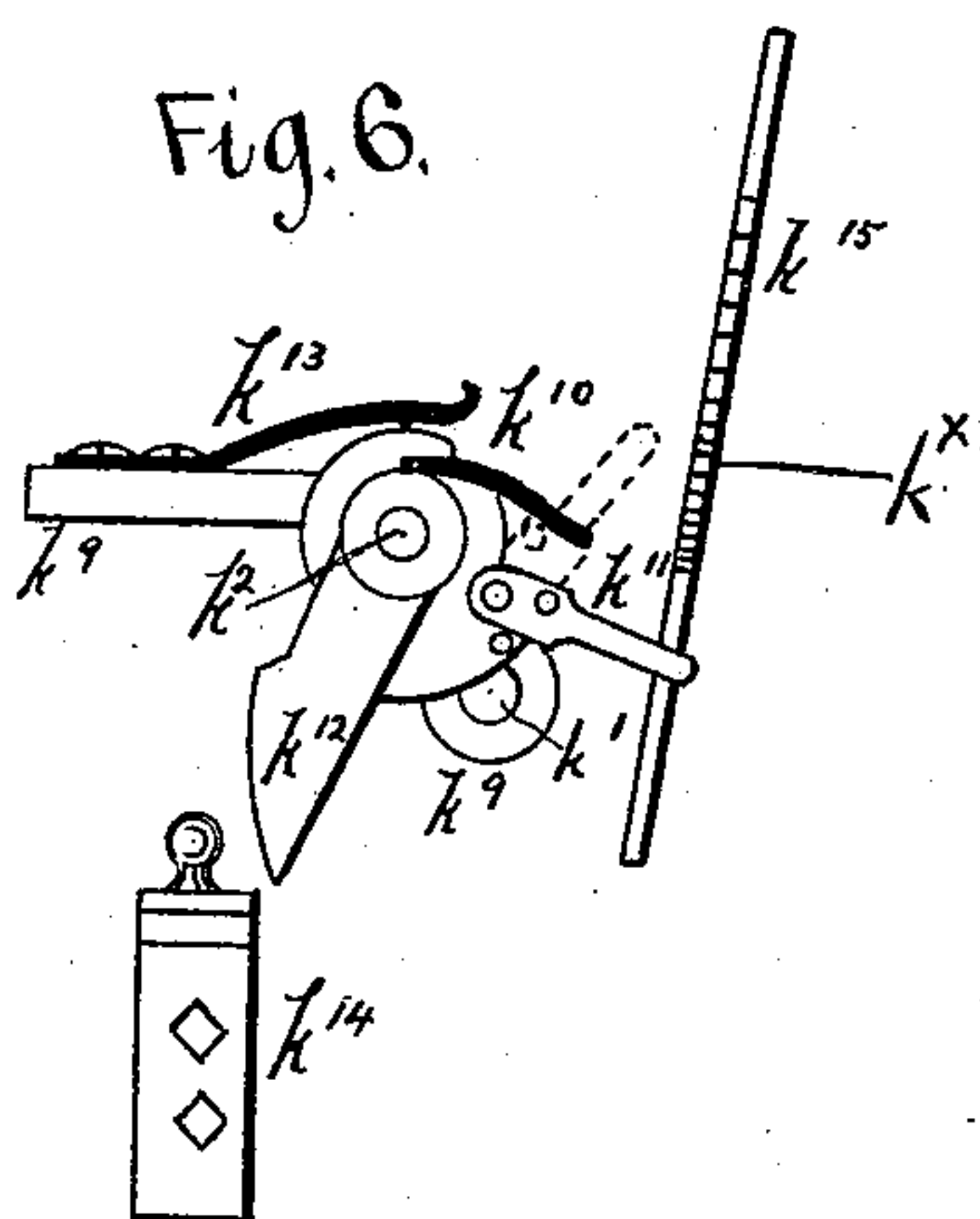
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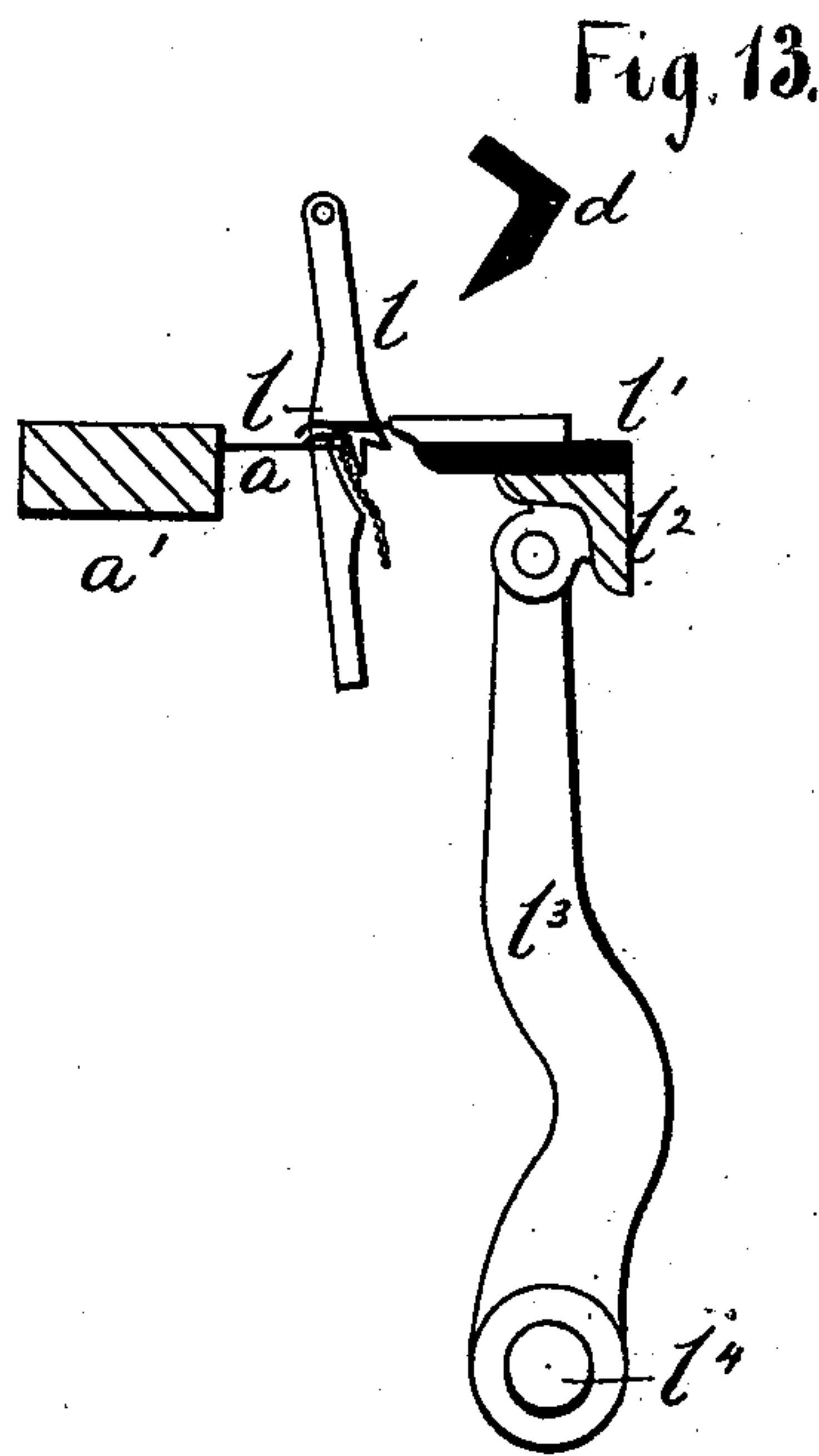
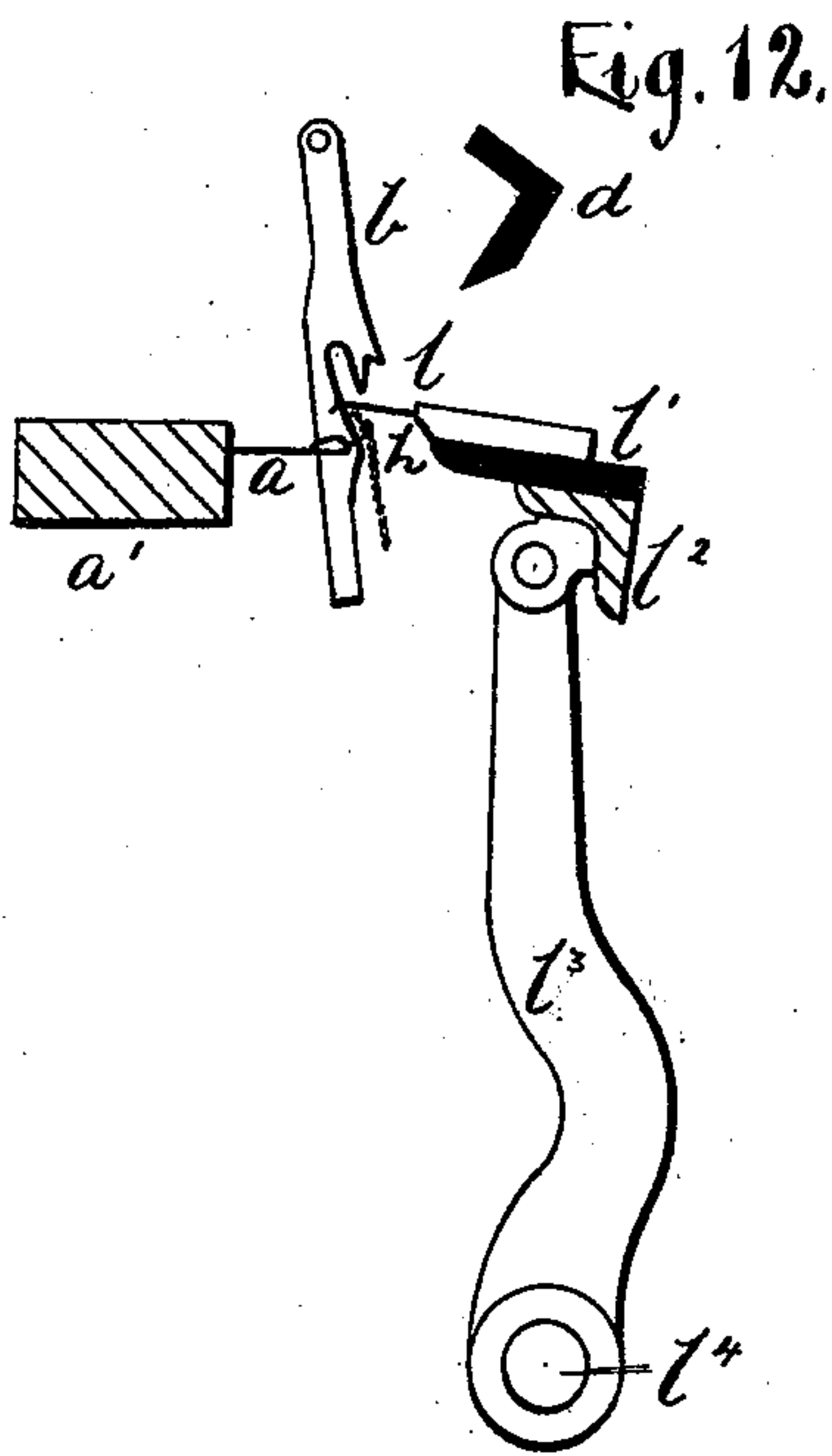
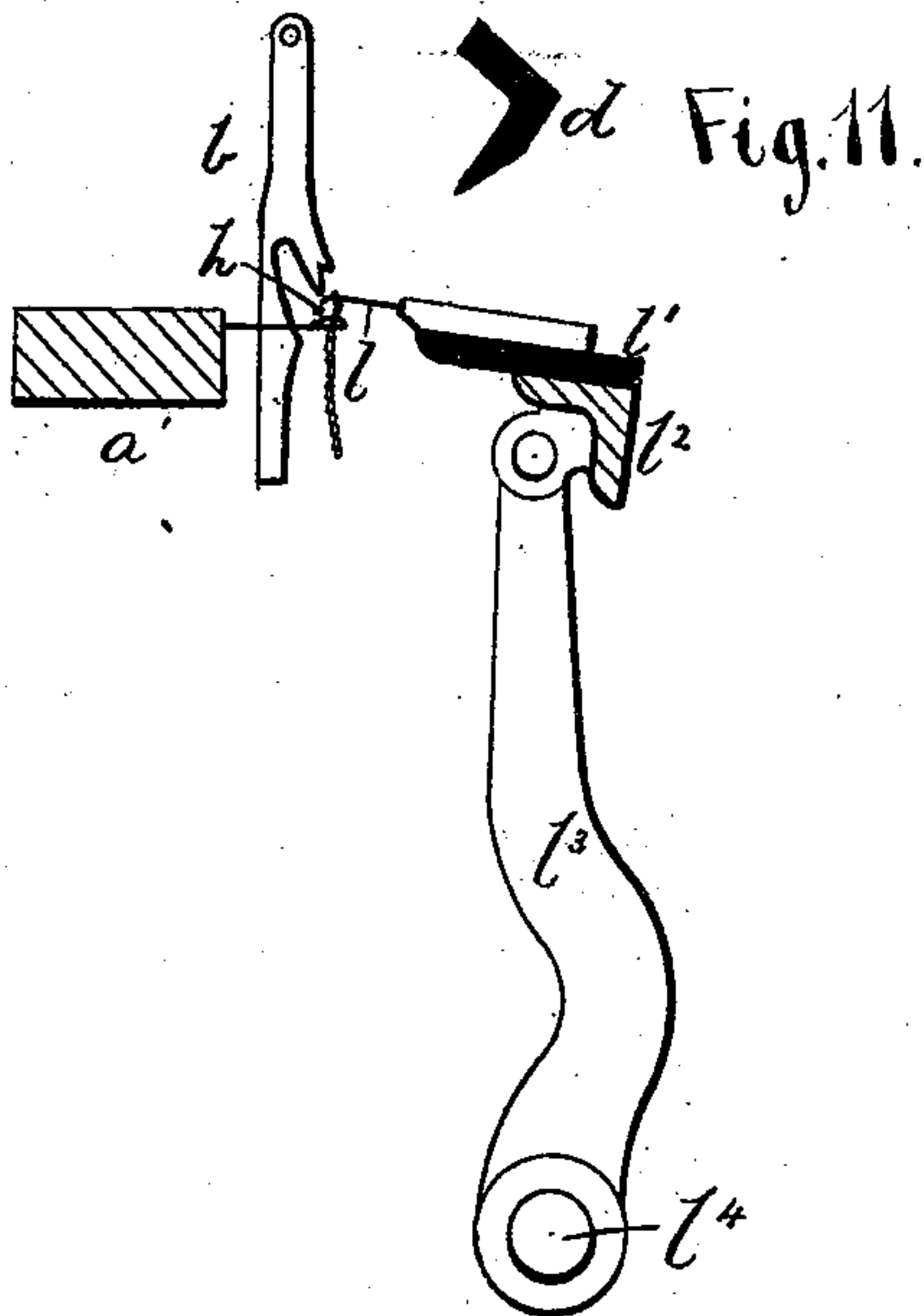
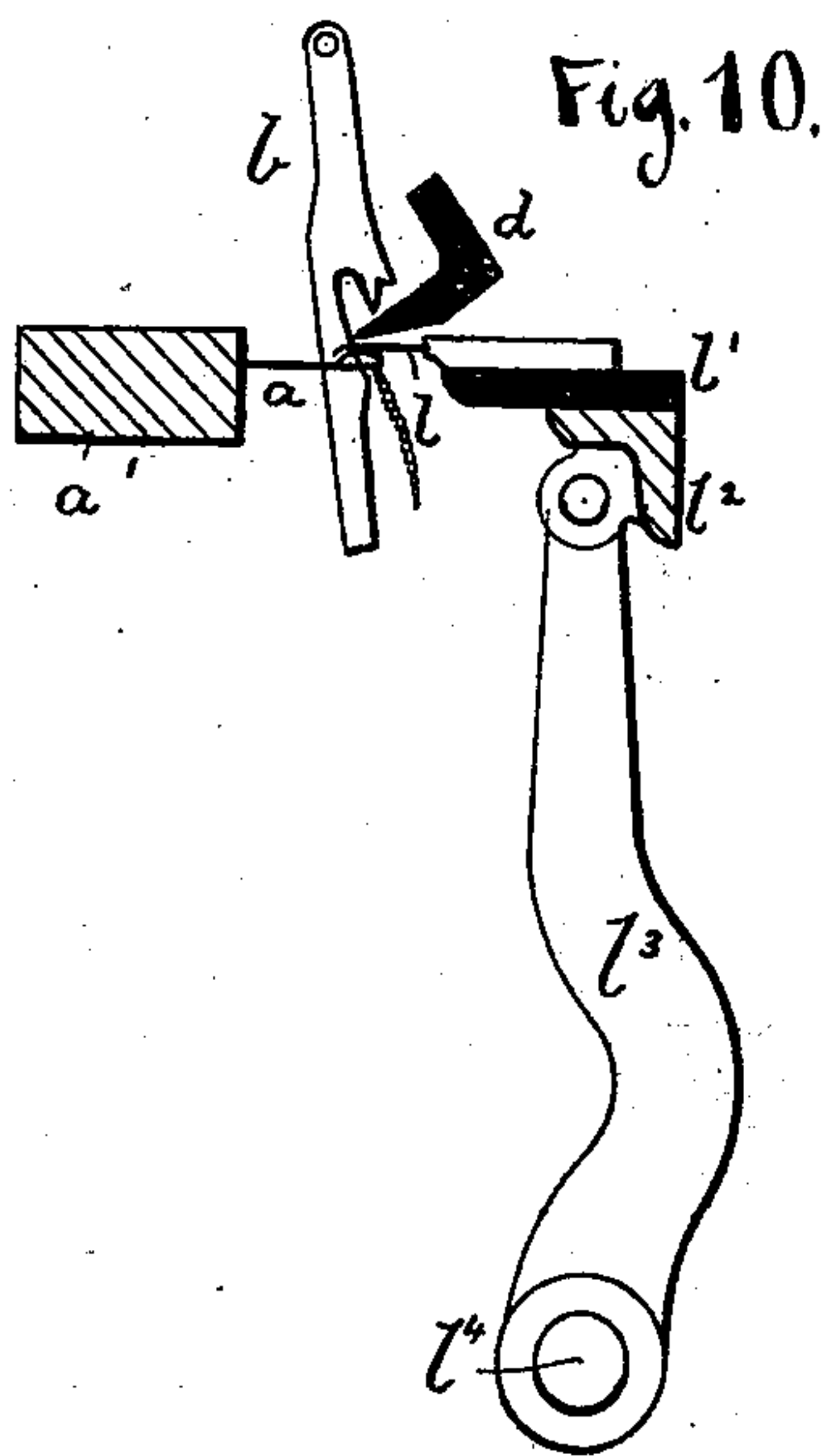
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Alice J. Kidley

Inventors:—
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Rowland Hutchinson.
By James H. Lancaster, Atty.

UNITED STATES PATENT OFFICE.

JOHN ALFRED WILSON AND ROWLAND HUTCHINSON, OF NOTTINGHAM,
ENGLAND.

STRAIGHT-KNITTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 516,144, dated March 6, 1894.

Application filed January 3, 1893. Serial No. 457,178. (No model.) Patented in England October 12, 1891, No. 17,339; in France April 9, 1892, No. 220,784, and in Germany April 13, 1892, No. 68,812.

To all whom it may concern:

Be it known that we, JOHN ALFRED WILSON and ROWLAND HUTCHINSON, subjects of the Queen of Great Britain, residing at Nottingham, in the county of Nottingham, England, have invented certain new and useful Improvements in Straight-Knitting Machines, (for which we have obtained a patent in Great Britain, No. 17,339, dated October 12, 1891; in France, No. 220,784, dated April 9, 1892, and in Germany, No. 68,812, dated April 13, 1892,) of which the following is a specification.

Our invention relates to knitting machines used in the production of knitted elastic hosiery and other elastic fabrics, and refers more particularly to machines having a fixed needle bar, but is partially applicable to machines with a movable needle bar.

The principal object of our invention is to lay the elastic thread into the work without putting tension upon it, and this we accomplish by the mechanisms hereinafter described with reference to the accompanying drawings in which—

Figure 1 is an elevation of the right hand end of the machine; Fig. 2 a front elevation of the same; Fig. 3 an elevation of the left hand end of the machine and Fig. 4 a front elevation of the same. Fig. 5 is a vertical cross section of the machine through the center of one division of needles showing the working parts in their relative position. Fig. 6 is an end elevation of details connected with the take-up arrangements; Fig. 7 a front elevation of the same and Figs. 8, 9, 10, 11, 12, and 13 are diagrams illustrating the various relative positions of the working parts during the knitting of a course.

The same reference letters refer to the same parts in the different drawings.

The standards A are connected by a tie bar B and other suitable cross rails, upon which are bearings for the various rocking axles, and shafts.

The machine is driven from a shaft C which gives motion to a shaft D carrying the cams for actuating the various parts and hereinafter referred to as the cam shaft.

The needles *a* Fig. 5 are cast in leads and secured to a fixed bar *a'* which extends across

the machine between the end standards. The sinkers *b* are of the usual description, consisting of jack and dividing sinkers, and are mounted and actuated by the usual mechanisms. There is also a presser bar *d* which is mounted upon arms and brought upon the needles by the usual means.

The thread carriers *e* for supplying the ordinary thread are attached to a bar *e'* which is fitted to slide in arms *e²* attached to a shaft *e⁵* which is mounted in arms *e³* and rocked by means of a shaft *e⁴*, this rocking movement placing the carriers *e* above the needles during their traverse across the same and bringing the carriers below the needles during the formation of the loops. At the right hand end of the machine the bar *e'* Figs. 1 and 2 is connected by a friction box *e⁶* to a slide *e⁷*, which is traversed to and fro on the shaft *e⁹* by a draw cam of the usual construction the cam and slide being connected by levers, slides, and a link *e⁸*.

The fashioning screws *f* at both ends of the machine are fitted with nuts *f'* which carry the stops *f²* for regulating the amount of traverse given to the thread carriers *e*. At the right hand end of the machine the bar *e'* carries an adjusting screw *e¹⁰* Figs. 1 and 2, and at the other end of the machine the adjusting screw is carried by a bracket on the nut *f'*. The screws *f* are fitted with the usual hand wheels *f³* and springs for holding the screws in position, and also with ratchet wheels *f⁴* by which the screws are worked from a shaft *f⁵* through arms *f⁶* and clawers *f⁷*, the rocking motion of the shaft *f⁵* being obtained by a lever which is moved by hand when required.

The ordinary threads are drawn from bobbins or spools and pass under snapping levers *e¹¹* which are actuated by a cam *D'* Fig. 3 through a lever *D²*, link *D³*, and an arm *D⁴* on the shaft *e¹²* carrying the levers *e¹¹*.

In machines of the character illustrated in the drawings, whether they are used for elastic or other work, it is customary to knock down one of the jack sinkers near each side of the fabric, and just before the carrier which supplies the ordinary thread reaches the end of its traverse in either direction. The jack knocked down is the one next to the last nee-

dle on which there is a loop, and the purpose for such action is to prevent the thread carrier from damaging the sinker. Such knock down apparatus which is common in the art, and forms no part of the invention need not be described in detail, suffice it to say, it is connected to the rods o and p which are rocked by an arm o^2 , link o^3 , lever o^5 , and cam o^4 . The rod o is moved endwise by an arm o' on the screw nut at the right hand end of the machine and the rod p by an arm p' which is attached to the screw nut at the left hand end of the machine.

The carriers g for the elastic thread are attached to a bar g' which is fitted to slide in brackets g^2 and driven with a positive amount of motion from a lever g^3 through a link g^4 , the lever g^3 being connected by a link g^5 to a draw-bar arrangement of the usual construction, the draw cam however being shaped to give a slight return motion to the carriers g at the end of their traverse for the purpose hereinafter described.

The elastic threads h Fig. 5 are drawn over a fixed rod h' , under the draw-off rod h^2 and then over the rods h^3 and h^4 to the nipping plate k and rod k' , the threads passing between the two latter and are then led to the carriers g . The rod h^2 is carried by levers h^5 attached to a shaft h^6 which is oscillated by a cam h^7 Fig. 1 through a lever h^8 , link h^9 , bell cranked lever h^{10} , link h^{11} , and arm h^{12} .

It will be understood that the amount of slack in the elastic thread varies with the width of the fabric being knitted, from the fact that the traverse of the carrier for the elastic thread is always the same and equal to the width of each division of needles, so that when a narrow fabric is being formed there is more slack or unused thread than when a wider fabric is being made. We have devised a mechanism for effectually taking up this slack, which consists of a reciprocating part carrying a nipper for the thread, which nipper begins to take up the slack as the thread carrier starts on its return stroke, and releases the thread at the time the carrier reaches the edge of the fabric and begins to deliver the thread to the needles. In order that the nipper may release the thread at the proper time, we combine therewith an adjustable cam or releasing device which operates the nipper to cause it to release the thread at the proper time; and in order to render the operation of this take up apparatus automatic we combine such releasing device with the fashioning nut and screw. We will now describe in detail the mechanism for automatically taking up the slack of the elastic thread.

The mechanism for taking up the slack of the elastic threads is carried by a rod k' Fig. 5 from a shaft k^3 by arms k^4 which are connected to the rod k' by links k^5 . The shaft k^3 is oscillated by a suitable cam through the link k^7 Fig. 3 and arm k^6 . The rod k' slides in slotted guides k^8 which are bolted to the

standards and it is fitted at intervals with brackets k^9 for supporting another rod k^2 , which is fitted at each division of needles with a plate k which nips the elastic thread upon the rod k' . On one end of the rod k^2 there is fitted a boss k^{10} (Figs. 6 and 7) which carries a pivoted lever k^{11} and a fixed cam k^{12} . The bracket k^9 nearest to the boss k^{10} is extended to carry a spring catch k^{13} which holds the plate k on to or away from the rod k' . There is also a sliding stop k^{14} fixed to the standard, and as the take-up apparatus completes its downward stroke the cam k^{12} strikes upon the stop k^{14} and nips the elastic thread between the rod k' and plate k . As the take-up apparatus ascends the lever k^{11} strikes upon a cam plate k^{15} and turns the rod k^2 which carries the plate k back from the rod k' . The cam k^{15} (Figs. 3, 4, 6 and 7) is carried by a frame k^{16} Fig. 4 from the fashioning screw nut f' and is moved in and out with it, while the cam k^{15} is so shaped with the stepped shoulders or stops k^x , as shown in Figs. 4 and 7 that the amount of the slack of the elastic thread taken up is inversely proportionate to the width of the fabric, that is to say, if a narrow fabric is being made the nut f' is nearer the standard A, and consequently the lever k^{11} does not strike upon the cam k^{15} until it has ascended a greater distance than it would have done if a wider fabric were being made. The stop k^{14} can be pulled back if required and the lever k^{11} raised to the dotted position Fig. 6 so as to miss the cam as it ascends. The points l for raising the loops for the insertion of the elastic thread are attached to a bar l' , fitted to slide upon an angle bar l^2 which is pivoted upon arms l^3 and actuated by cams on the cam shaft through a rocking shaft l^4 . There is one point to every two needles and they are moved endwise between each course so as to act upon alternate needles, the sliding motion being derived from the cam shaft through suitable levers and links. When a course is being knitted the points l are moved in by hand to the position shown in Fig. 8 and the shaft l^4 carrying them is connected to its operating lever. The thread carriers e then rise through the needles and traverse across them, the thread being sunk and divided upon the needles by the sinkers b which act in the usual manner, and at the end of the traverse the thread carriers pass below the needles. The sinkers are then brought forward to the position shown in Fig. 9 carrying the last laid thread under the beards of the needles and bringing forward the work, the points l at the same time being brought on to the top of the needle beards.

In making elastic work every other needle has two loops of ordinary thread upon it, and these are knocked over in the ordinary way, while the single loops on the other needles are pushed on to the points l as in Fig. 10 which shows the presser d pressing the points l and beards of the needles into the eyes of

the needles, the sinkers having moved forward to knock over the double loops and push the single loops on to the points *l*. The sinkers *b* then swing back as shown in Fig. 11, the presser *d* is returned to its original position and the points *l* are tipped about their pivot to stretch the single loops so that the elastic thread can be laid on the top of the needle beards and under the points *l*, this being done by the carrier *g* which traverses across all the needles and then returns a short distance in order to allow for any tension which may have been put upon the elastic thread by its passage through the carrier. The elastic thread is then pushed into the loops, and to the end of the needles by the sinkers *b* which swing forward to the position shown in Fig. 12 after which the sinkers fall to the position shown in Fig. 13 and knock the elastic thread over the end of the needles, the points *l* at the same time lowering the loops held by them on to the needles, and these loops together with the new loops are then brought to the back of the needles by the return motion of the sinkers. During this latter motion the take-up apparatus is lowered, the cam *k*¹² coming into contact with the stop *k*¹⁴ which forces the plate *k* on to the rod *k*' and thus nip the elastic thread between them. The take-up apparatus then ascends, drawing up the slack of the elastic thread until the lever *k*¹¹ strikes the cam *k*¹⁵ and the thread is released. At the same time the draw-off rod *h*² is being lowered to pull off sufficient elastic thread for the next course. The take-up apparatus then returns to within about an inch of its lowest position, and remains at rest until the elastic thread for the next course has been laid.

The points *l* in some classes of work always act upon the same needles, as is generally the case when making the first few courses of an elastic stocking, but for the body of the fabric it is usual for the points to act upon alternate needles as described.

The ordinary covered elastic has a certain amount of tension put upon it during the covering process, consequently it always has a tendency to contract, and it is the difficulty of laying an elastic thread upon the needles without increasing the tension already upon it that has been one of the principal causes of the failure of other machines but this difficulty we overcome by giving a small return motion of the elastic thread carrier, and

by giving a definite amount of motion to the elastic thread carrier, and regulating the take-up of the slack according to the width of the fabric being made. The return motion of the elastic thread carrier at the end of the traverse can be used on machines having either a fixed or a movable needle bar, and is for the purpose of allowing for any tension which may be put upon the elastic thread by its friction as it passes through the carrier.

We are fully aware that other knitting machines have been made for the production of elastic knitted fabrics, and we lay no claim to a knitting machine for this purpose nor to the general arrangement of the knitting machine herein described.

Having now ascertained and described the nature of our invention and in what manner the same is to be performed, we declare that what we claim is—

1. In a knitting machine the combination with the needles and the thread carrier, of a reciprocating nipping device for the thread, mechanism for reciprocating the said device, and an adjustable releasing device for operating the nipping device to release the thread, substantially as described.

2. In a knitting machine, the combination with the needles, the fashioning nut and screw and the thread carrier, of a reciprocating nipping device for the thread, mechanism for reciprocating such device, an adjustable cam or releasing device for causing the nipper to release the thread, and the connections between the said cam and the fashioning nut and screw whereby the position of the cam or releasing device is automatically controlled thereby, substantially as and for the purposes hereinbefore set forth.

3. In a knitting machine, a take up device for the thread, provided with a nipping plate, in combination with means for moving the nipping plate toward or away from the thread, and a spring catch which holds the plate in either position to which it is moved with a yielding force, substantially as and for the purposes hereinbefore set forth.

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