

No. 793,791.

PATENTED JULY 4, 1905.

J. JOHNSON.  
KNITTING MACHINE.  
APPLICATION FILED MAR. 18, 1901.

3 SHEETS—SHEET 1.

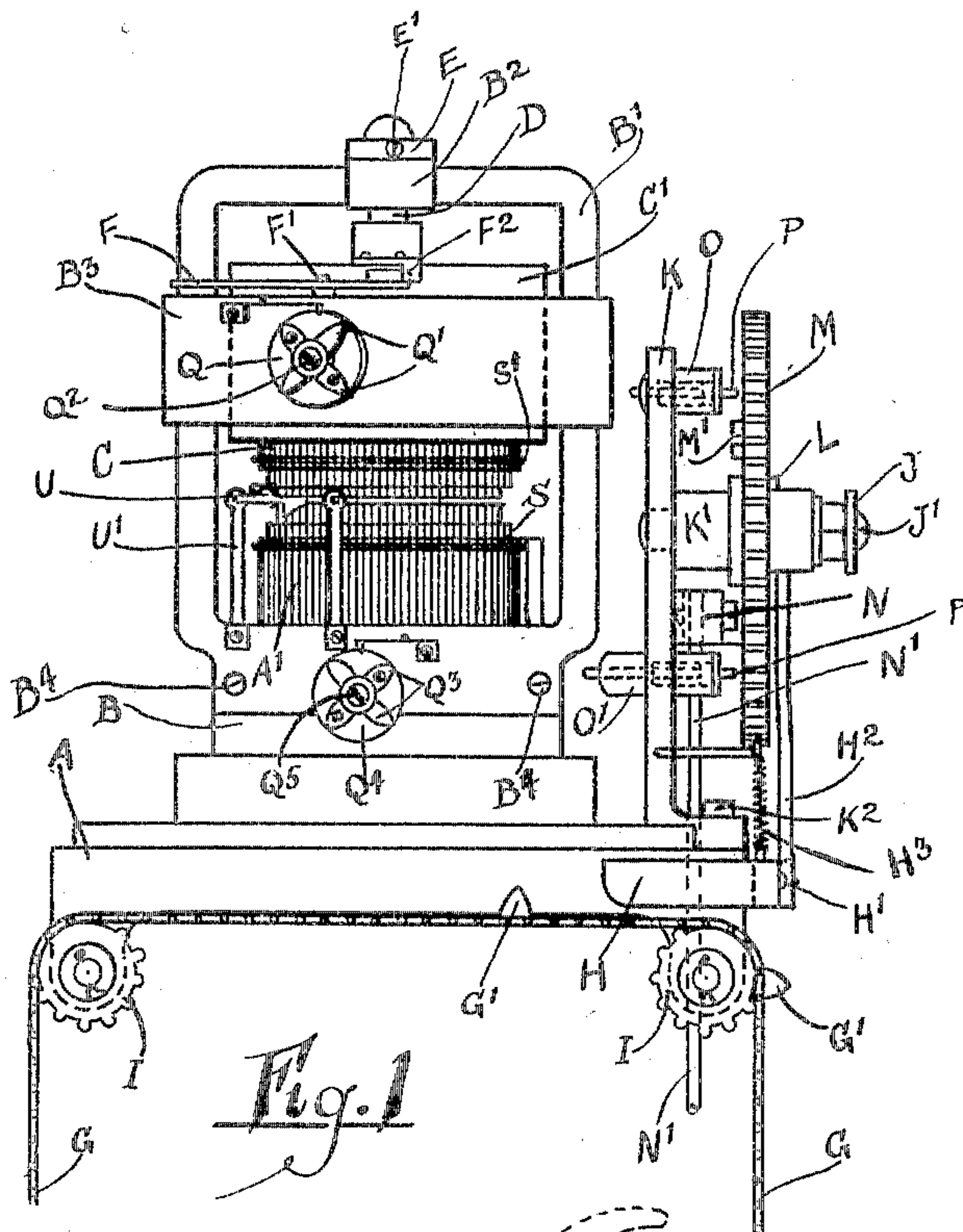


Fig. 1

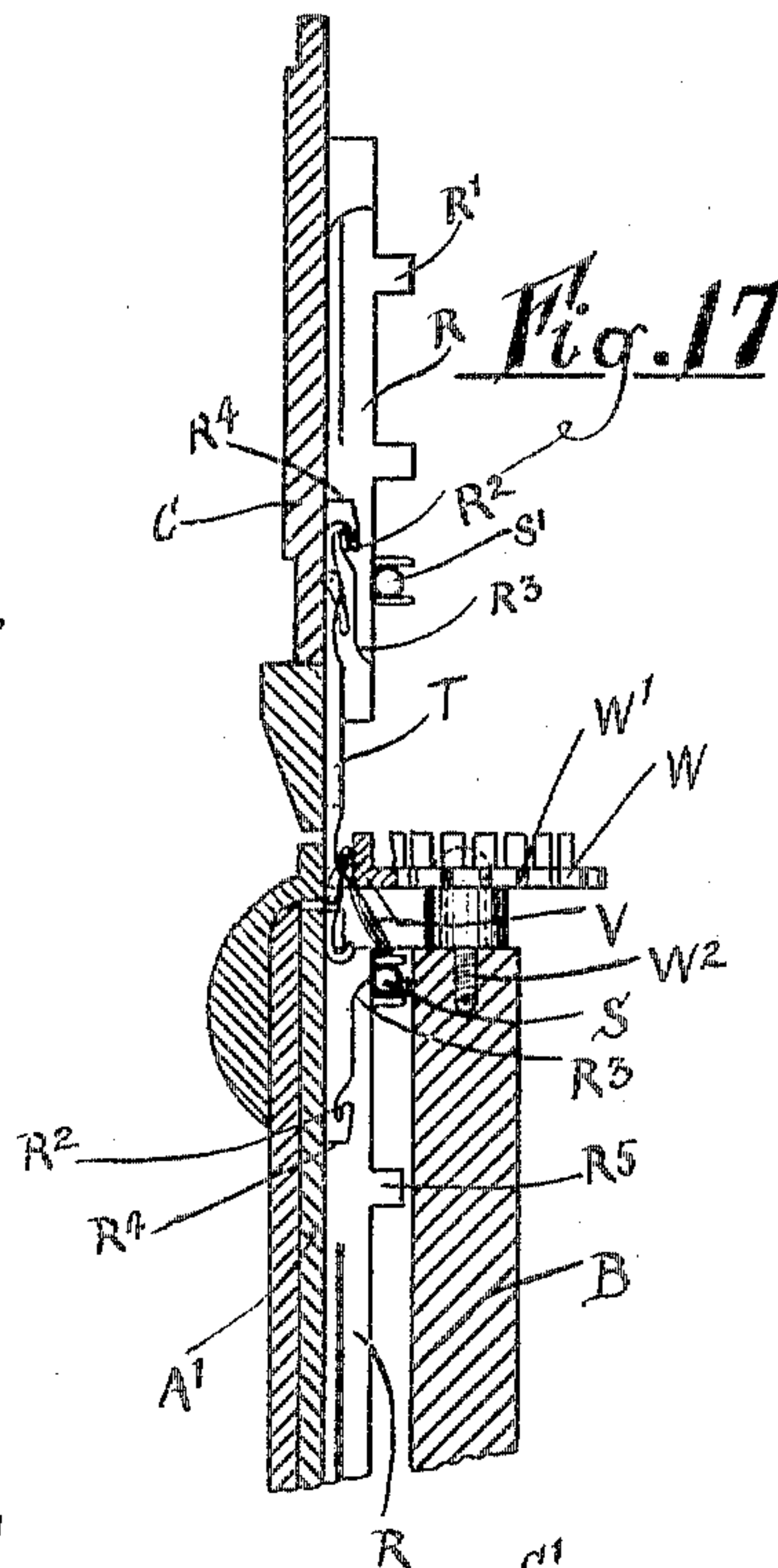


Fig. 17

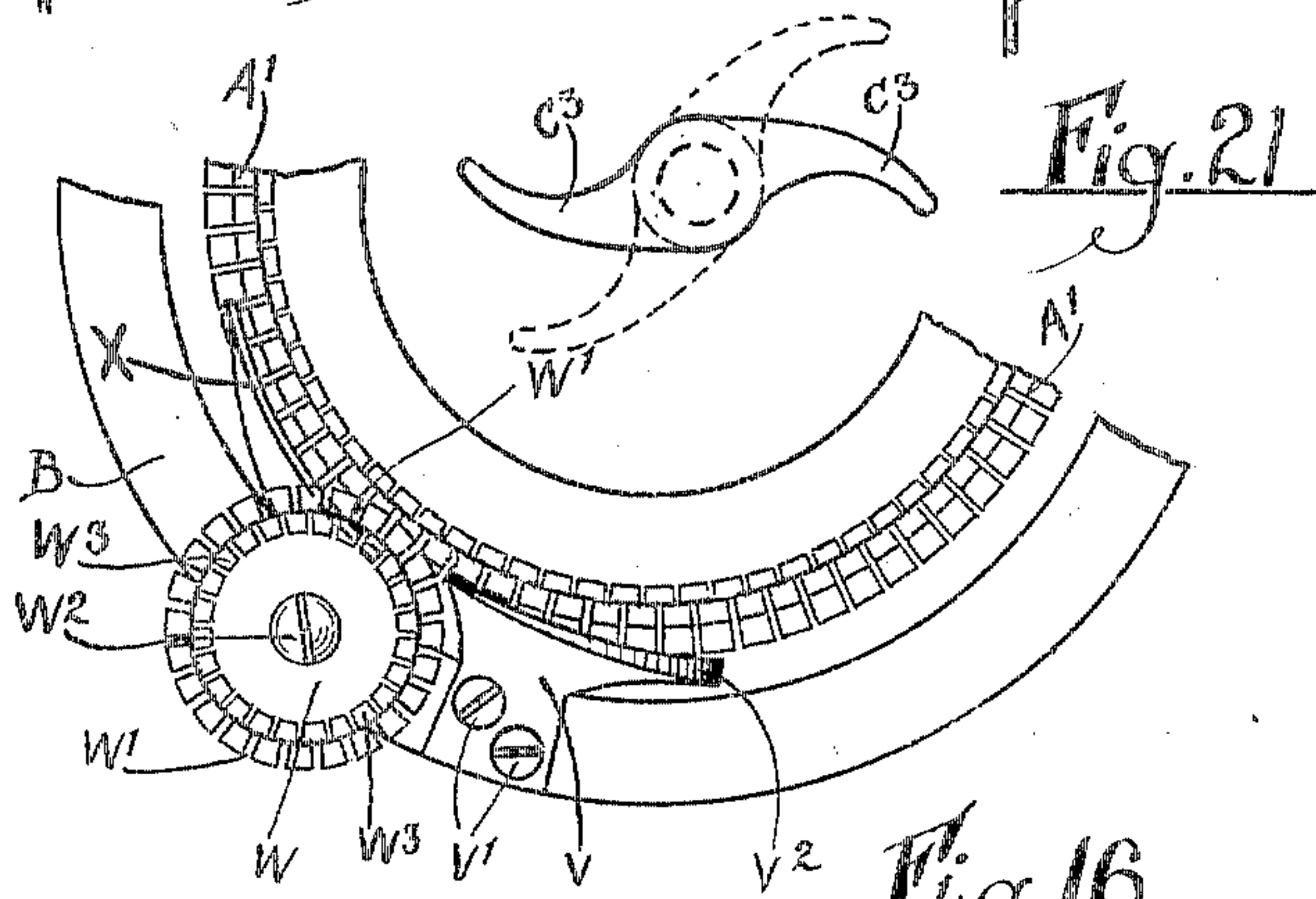


Fig. 21



Fig. 16

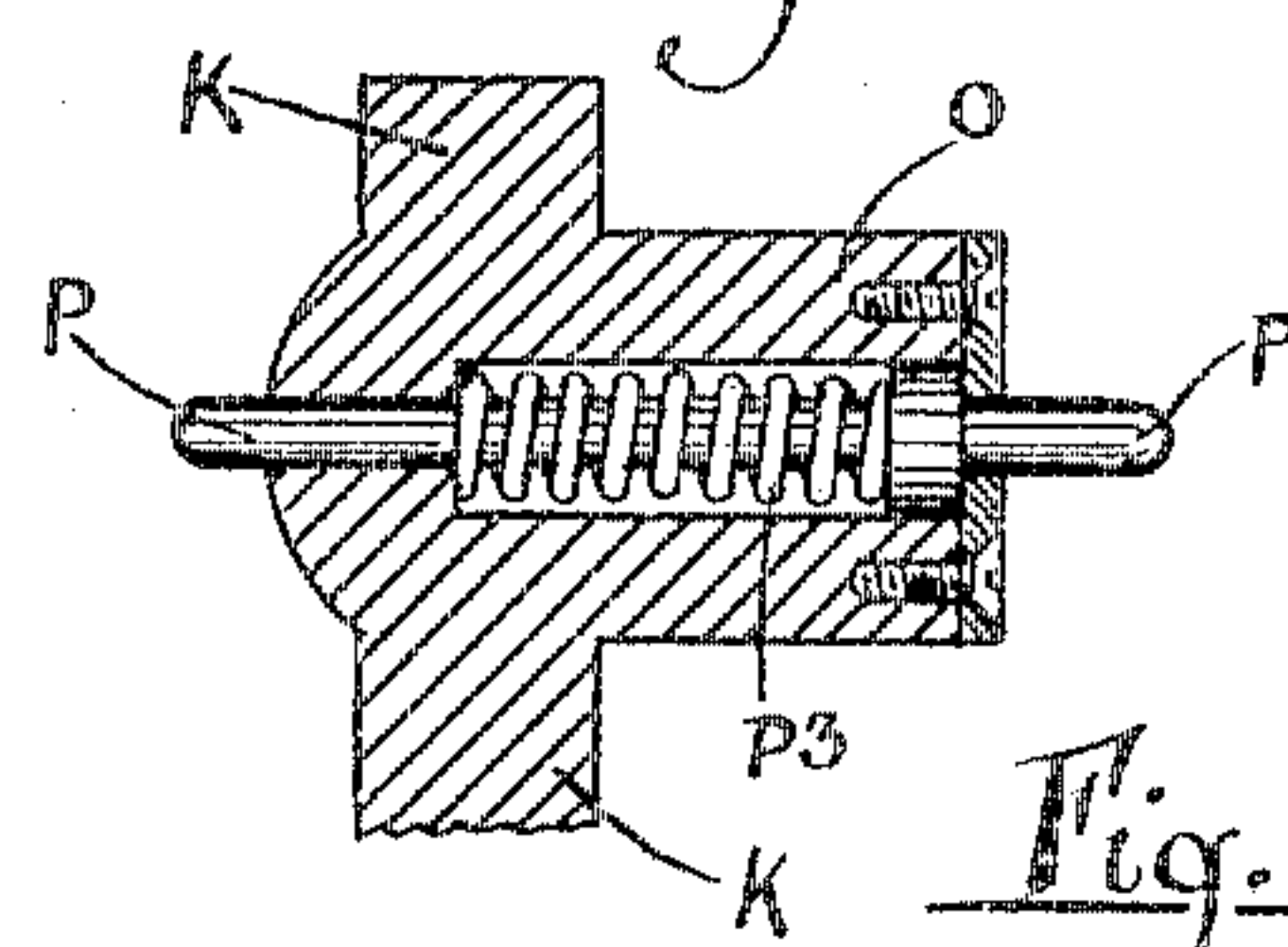


Fig. 19

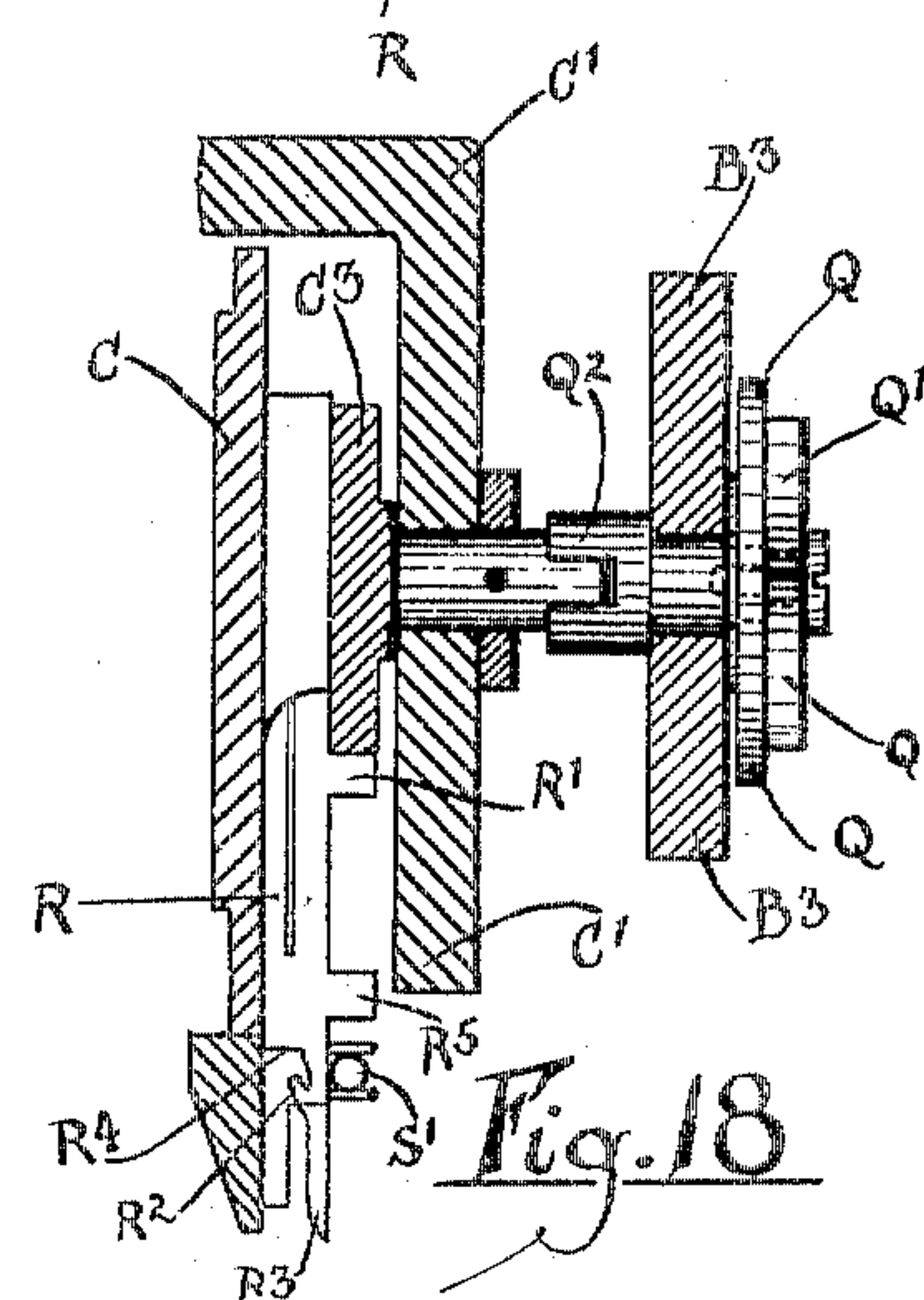


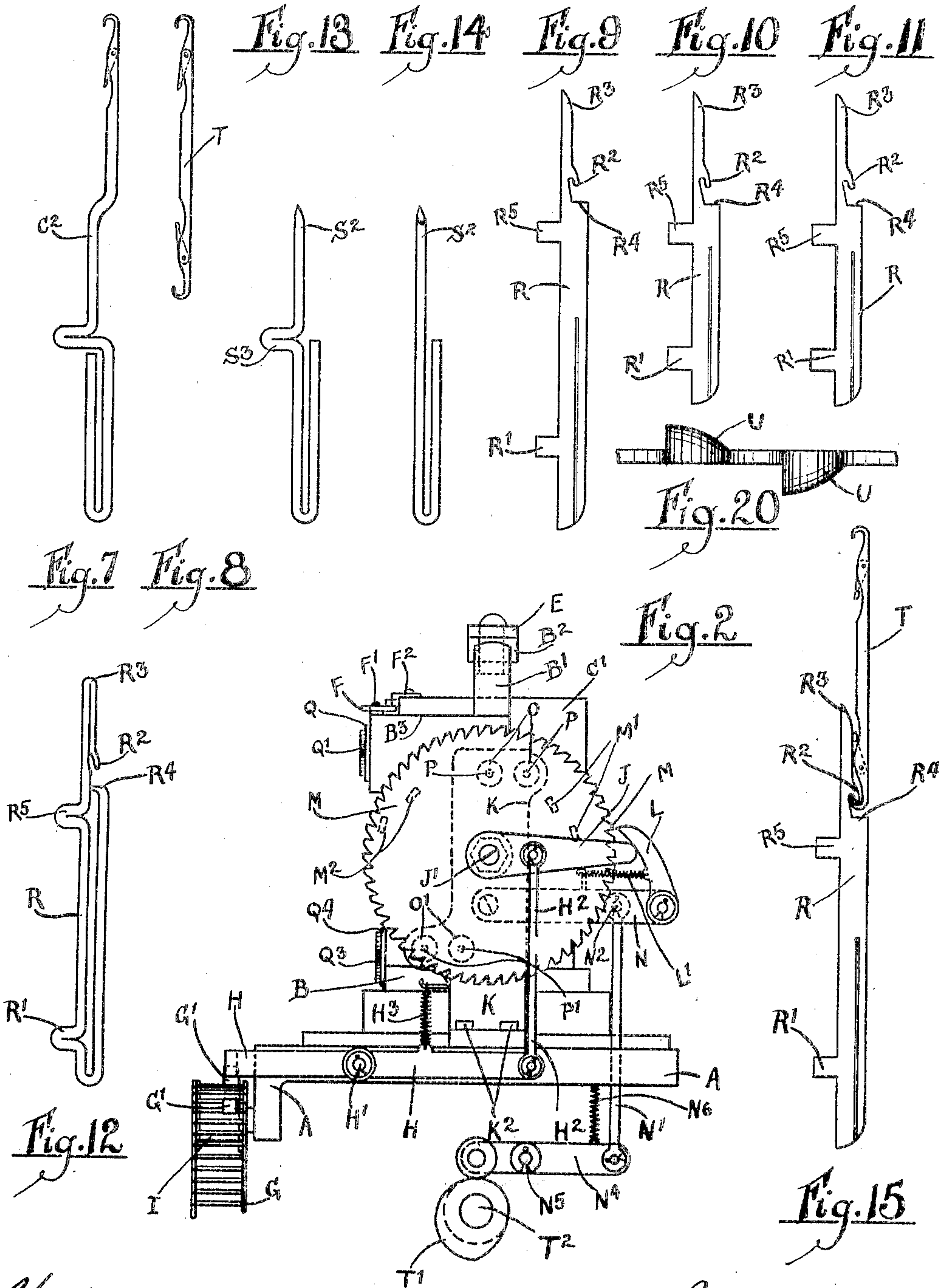
Fig. 18

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3 SHEETS—SHEET 2.



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3 SHEETS—SHEET 3.

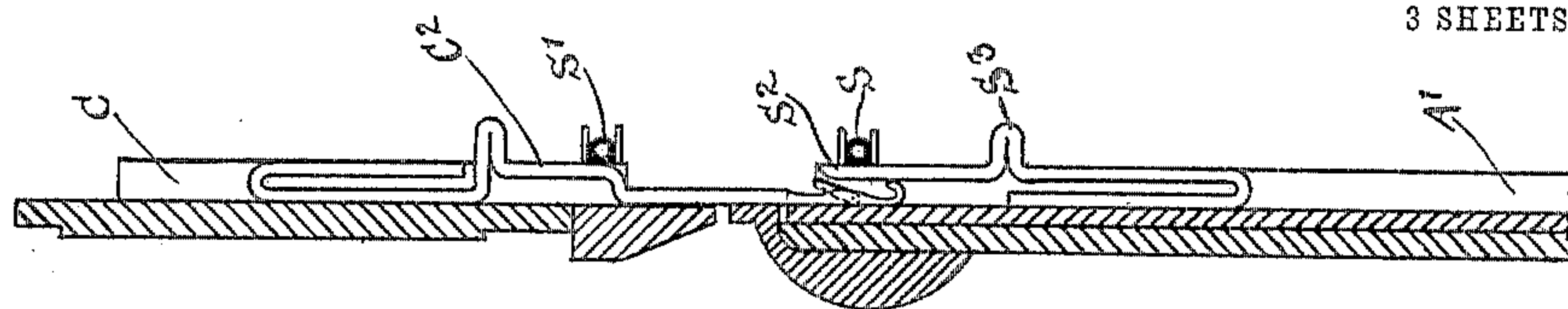


Fig. 6

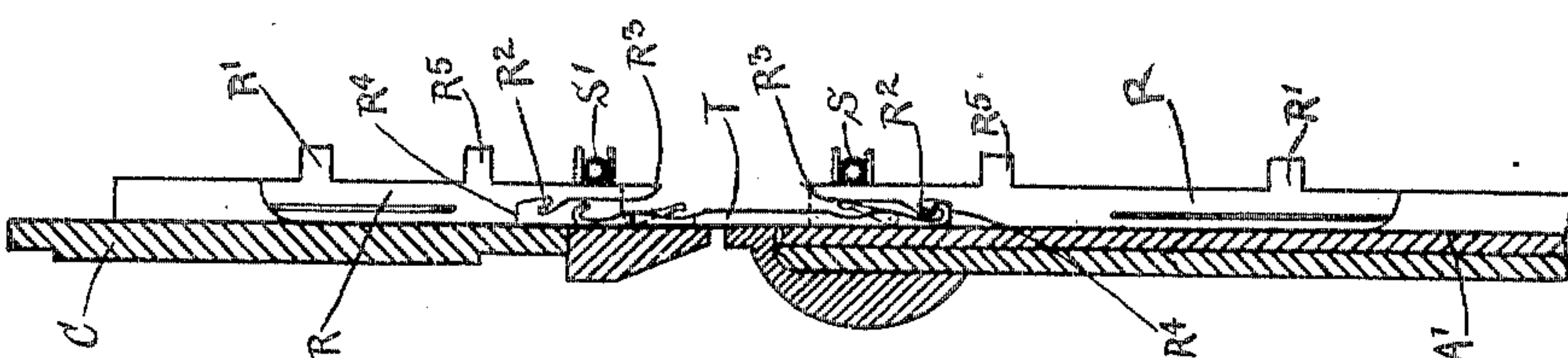


Fig. 5

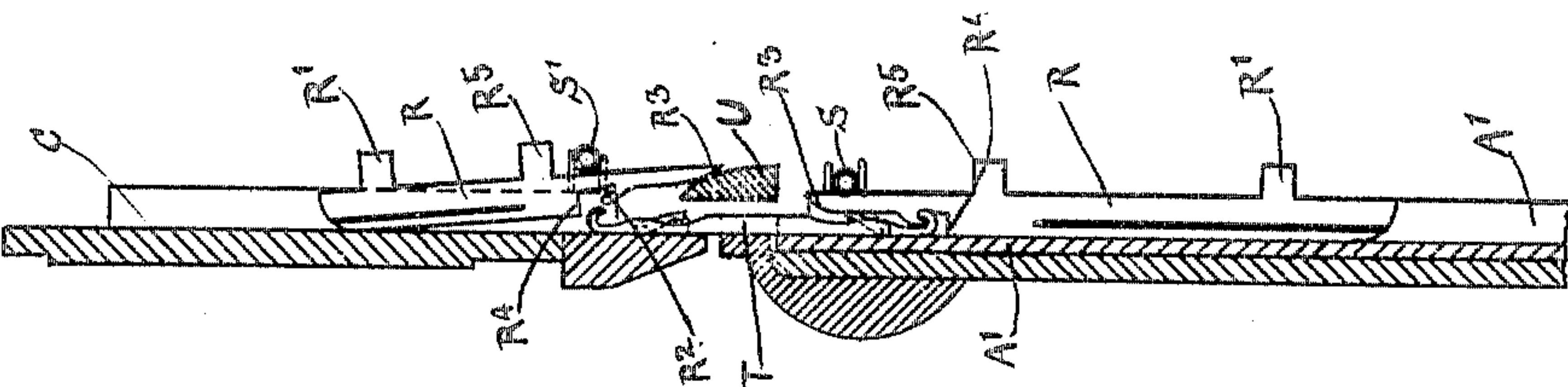


Fig. 4

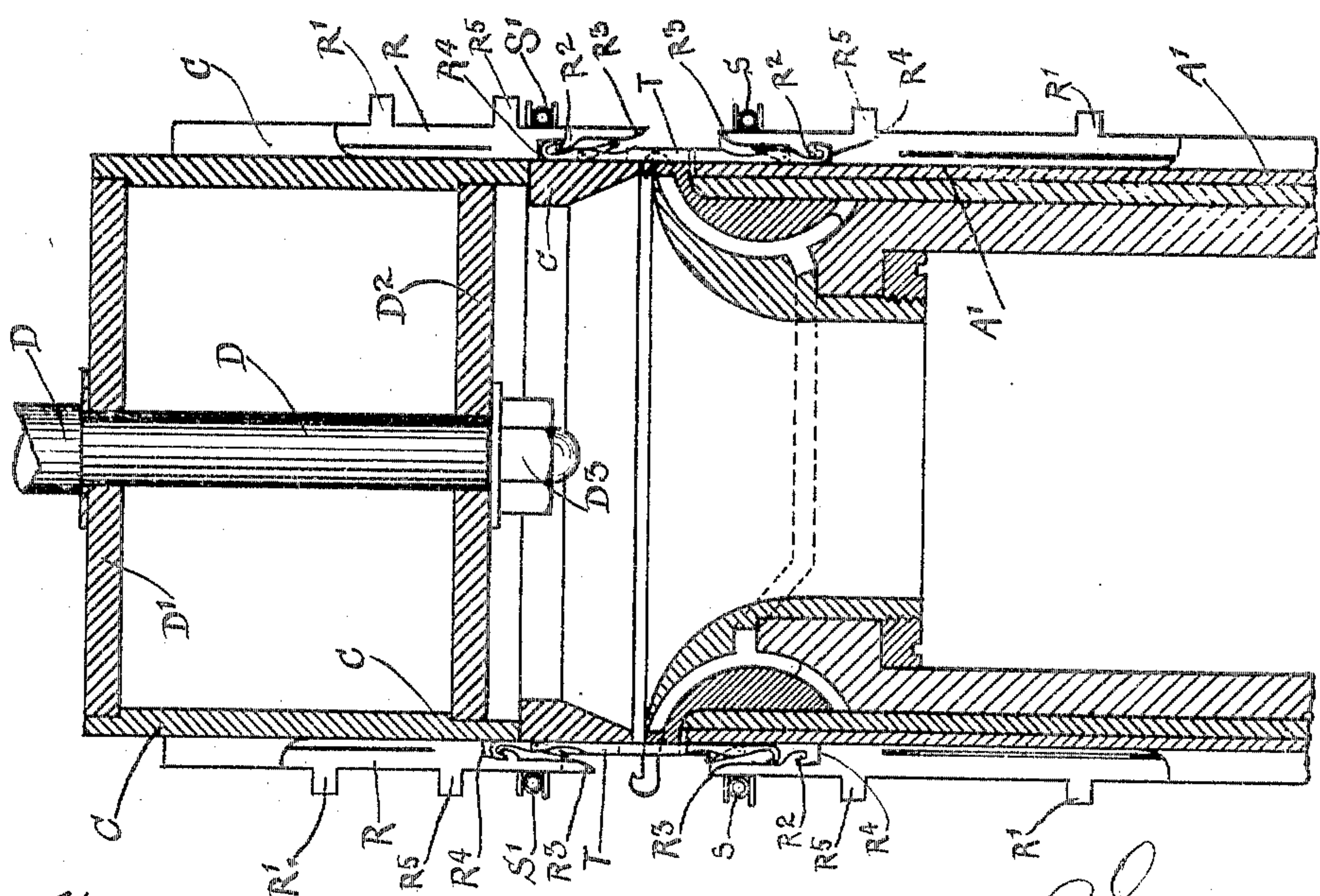


Fig. 3

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# UNITED STATES PATENT OFFICE.

JOSIAH JOHNSON, OF LEICESTER, ENGLAND, ASSIGNOR OF ONE-HALF  
TO STEPHEN STRETTON AND SIMEON STRETTON, OF LEICESTER,  
ENGLAND.

## KNITTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 793,791, dated July 4, 1905.

Application filed March 18, 1901. Serial No. 51,723.

*To all whom it may concern:*

Be it known that I, JOSIAH JOHNSON, hosiery manufacturer's manager, a subject of the King of Great Britain, and whose post-office address is Southgate street, Leicester, England, have invented certain new and useful Improvements in or Relating to Knitting-Machines, (for which Letters Patent have been applied for in Great Britain, Application No. 15,008, dated August 22, 1900,) of which the following is a specification.

This invention has reference to knitting-machines of the circular type for the production of tubular seamless fabrics, and has for its object the production of a machine by means of which a change from one pattern or combination of rib to another or to plain fabric, or vice versa, may be automatically effected.

In a machine constructed according to this invention for the purpose named two grooved needle-cylinders are employed disposed endwise relatively to each other, preferably in vertical positions and stationary, the upper needle-cylinder being supported by a bridge or one or more arms detachably or otherwise connected to the cam-shell or cam-carrier of the lower cylinder. Two kinds of latch-needles are preferably employed—viz., the ordinary latch or single-hook needles and double-ended needles, the latter having a hook at each end. The double-ended needles are those by which the change of rib is effected, they being transferred from one cylinder to the other at the required time to effect variation in the fabric by drawing the loops to the other side of the fabric, as will be understood. The said double-ended needles are placed in the needle-cylinders in such alternation or combination with the ordinary needles as the required change in the fabric necessitates. The double-ended needles are shorter than the ordinary needles, but are engaged by jacks or sliders provided with at least two butts or heels, which are actuated by cams for knitting or loop-forming purposes and also for moving the sliders forward to engage the hooks of the needles to actuate the latter.

Referring to the accompanying drawings, Figures 1 and 2 are front and side elevations,

respectively, of sufficient of a circular-knitting machine to illustrate the present invention which is applied thereto. Fig. 3 is a central vertical section of the two needle-cylinders in their relative positions with the cam-carriers removed. Figs. 4, 5, and 6 are sectional details of the needle-cylinders, showing the needles and sliders in different positions. Fig. 7 is a side elevation of a single-ended or ordinary knitting-needle. Fig. 8 is a side elevation of a double-ended knitting-needle used for transferring. Figs. 9, 10, and 11 are side elevations of the jacks or sliders for use with the double-ended needles. Fig. 12 is a side elevation of a slider formed of steel wire. Fig. 13 is a side elevation of a latch-guard furnished with a butt. Fig. 14 is a side elevation of a stationary latch-guard. Fig. 15 is a side elevation of a jack or slider and a double-ended needle in engagement for knitting purposes. Fig. 16 is a plan of a portion of the needle-cylinder, cam-carrier, and latch-opening devices. Fig. 17 is a sectional detail of the latch-opening devices, showing a latch held open by contact with a post of the wheel as the needle rises preparatory to taking the thread. Fig. 18 is a detail vertical section of the top needle-cylinder, cam-carrier, cam C<sup>3</sup> for actuating sliders, and disk on same spindle for actuating said cam. Fig. 19 is an enlarged detail section of one of the spring-controlled pins which actuate the disk Q<sup>1</sup> and slider-cam. Fig. 20 is a front elevation of the cam for disengaging the sliders from the double-ended needles. Fig. 21 is a front elevation of the revoluble cam C<sup>3</sup> for transferring the needles from one cylinder to the other.

Referring to Fig. 1, A represents the bed-plate, A' the needle-cylinder, and B the cam-carrier, of an ordinary circular-knitting machine, to which carrier a bridge B' is attached by screws B<sup>1</sup>. The said bridge supports the top needle-cylinder C and its cam-carrier C', Figs. 1, 2, 3, and 18, by means of a spindle D, one end of which passes through the boss B<sup>2</sup> in the top of the bridge B' and is held in position by a collar E, fastened to the spindle D by a screw E', while the other end passes through the cam-carrier C', loose there-



on, and through two disks or circular plates D' D<sup>2</sup>, Fig. 3, let into the upper and lower ends, respectively, of the needle-cylinder C and secured thereto by the nut D<sup>3</sup>.

5 The cam-carrier C' is revolved from the carrier B by means of a horizontal lever F, Figs. 1 and 2, pivoted at F' to the upper edge of a semicircular plate B<sup>3</sup>, having an integral connection at each end to the vertical arms of the  
10 bridge, while the other end of the said lever bears against a lug or projection F<sup>2</sup> onto the cam-carrier C' and revolves the latter thereby.

Ordinary needles C<sup>2</sup> may be used in both the top and bottom needle-cylinders when  
15 ordinary rib fabrics uniform in pattern are to be produced; but when it is desired to change the combination of rib at some point in the knitting double-ended needles, such as T, Figs. 8 and 15, are employed. These needles  
20 are used in connection with sliders R, Figs. 9, 10, 11, and 15, which latter are provided with two butts R' R<sup>5</sup>, a hook R<sup>2</sup>, a beveled or inclined end R<sup>3</sup>, and a shoulder R<sup>4</sup>.

For knitting purposes the hook of the needle engages the hook R<sup>2</sup> of the slider, as shown  
25 in Figs. 5 and 15, and the two when so engaged receive their vertical reciprocating motion for loop-forming purposes by means of the usual knitting-cams of the machine acting  
30 on the butts R<sup>5</sup>, while for transferring purposes cams to be described act upon the butts R' of the slider.

Assuming that a 1/1 rib fabric is being made and it is desired to change during the  
35 knitting to a 3/1 rib fabric, the needles would be arranged as follows: an ordinary needle in every alternate groove in preferably the lower needle-cylinder and in the upper needle-cylinder a needle, also in every alternate  
40 groove; but every alternate needle in the upper needle-cylinder will be a double-ended needle, which latter upon being slid or transferred from its groove in one cylinder to an  
45 opposite empty groove (containing a slider only) in the other cylinder would present an alternation of three needles and one empty groove in one cylinder, with three empty grooves and one needle in the other cylinder, being the required arrangement to produce a  
50 3/1 rib fabric.

The transferring of the double-ended needles from one cylinder to the other is effected by means of a revoluble cam C<sup>3</sup> in each of the cam-carriers B and C', respectively. These  
55 cams are actuated, through intermediate mechanism, from dogs G' on the chain G. This chain is carried over two sprocket-wheels I, driven by a clawker and ratchet-wheel mechanism, which are common to most circular-  
60 knitting machines, and therefore need no further description.

The dogs G' are so arranged on the chain that when it is desired to transfer a needle from the top to the bottom needle-cylinder, or  
65 vice versa, to change the pattern or combina-

tion of rib in the fabric being knitted one of these dogs passes under and raises the end of a lever H, pivoted at H', Fig. 2, to the bed-plate A. This action depresses the opposite  
70 end of the said lever and draws down a connecting-rod H<sup>2</sup>, Figs. 1 and 2, pivoted thereto and also to an arm J, one end of which is fulcrumed at J' to the spindle K', Fig. 1, while the opposite end normally supports and holds  
75 out of action a driving-clawker L. When, however, the rod H<sup>2</sup> is lowered, as described, it also lowers the arm J and permits the clawker L to gear with and drive the ratchet-wheel M. A spring H<sup>3</sup>, connected at one end  
80 to the bracket K, fixed by bolts K<sup>2</sup> to the bed-plate A, and the other end to the lever H, returns the latter to its original position after the dog G' has passed out of contact with it. The clawker L, pivoted to the end of a horizontal lever N, fulcrumed at its opposite end  
85 to the bracket K, is continuously operated through the medium of a connecting-rod N' and lever N<sup>4</sup>, the latter being pivoted at N<sup>5</sup> to the framing of the machine and operated by a revolving cam T', mounted on a shaft T<sup>2</sup>, acting  
90 on its opposite end and having bearings in the framing. (Not shown.)

When the arm J has been lowered, as hereinbefore described, the spring L' draws the  
95 clawker into engagement with the ratchet-wheel M to actuate it. This ratchet-wheel is loosely carried on the spindle K', Fig. 1, and carries on its inner face two sets of lugs M' M<sup>2</sup>, which through mechanism to be described act upon the cams C<sup>3</sup>, which transfer the needles  
100 from one cylinder to the other.

As the lug or lugs M' M<sup>2</sup> revolve with the ratchet-wheel they come into contact with spring-controlled pins P P', projected into  
105 their path by means of a spring P<sup>3</sup>, Fig. 16, located in a short tube or barrel O O', Figs. 1 and 2, which forms an integral part of the bracket K, as indicated in Figs. 1 and 19. As the lug M' presses against the pin P it  
110 pushes the opposite end of the latter into the track of radial arms Q', Figs. 1 and 18, on the face of a disk Q, mounted on a spindle Q<sup>2</sup>, which, as shown most clearly in Fig. 18, passes through the plate B<sup>3</sup>, through the cam-carrier C', and has on its inner end a cam C<sup>3</sup>, Figs.  
115 18 and 21, which acts upon the butts R' of the sliders and moves the latter in their grooves, so that the needles connected thereto are projected into opposite grooves in the other cylinder and engaged by sliders therein, as hereinafter described. When the cam C<sup>3</sup> acts upon  
120 the butt R' of the slider, the shoulder R<sup>4</sup> of the latter bears on the adjacent hook of the needle and moves the needle along into an opposite groove in the other cylinder, which  
125 contains a slider ready to receive it, and as the opposite or free hook of the needle bears against the hook R<sup>2</sup> of the slider the latter moves aside—i. e., outwardly—so as to let the  
130 needle-hook slip past and engage it, as shown



on the right-hand side of Fig. 3 and in Fig. 15. An elastic or coiled spring S, which encircles the needle-cylinder, permits this outward movement of the slider and presses it back again immediately, thereby causing the needle-hook and slider-hook to engage each other. The two hooks of each needle are now engaged, one with the slider in the top cylinder and the other with the slider in the bottom cylinder. A curved bevel-edged cam U, Figs. 1 and 4, supported on two uprights or pillars U', screwed to the cam-carrier B, is employed to release the slider from one needle-hook immediately a slider in the opposite groove in the other needle-cylinder has engaged its opposite hook, as hereinbefore described. This is effected as follows: As the slider either rises or descends in its groove to project its needle into an opposite groove, as stated, its lower end R<sup>3</sup> passes over the edge of the cam U, which, being bevel edges, gradually draws the slider away from the needle-hook, as in Fig. 4, and when the two are disengaged, as shown. A cam acts upon the butt R' of the disengaged slider and draws the latter up, as shown in Fig. 5, so that the needle is now left in engagement with the slider in the bottom cylinders, or vice versa, if the slider which was to transfer its needle had been in the bottom cylinder.

It will be observed that two pins P and two lugs M' are employed for actuating the slider-cam C<sup>3</sup>, the one for moving the cam into position to act on the butts of the sliders to move them in their grooves for transferring purposes and the other for returning the cam C<sup>3</sup> to its original or inoperative position after the sliders have been moved as stated.

The pins P and lugs M' are a short distance apart, the object of which is that the pin shall not come into action to reverse the cam C<sup>3</sup> until the cam-cylinder C' has made more than a complete revolution, so as to act on and move those few sliders which were not operated upon by the cam while the latter was changing its position as the result of being operated upon by the first pin.

The parts Q<sup>3</sup> Q<sup>4</sup> Q<sup>5</sup> (seen in Fig. 1) correspond to the parts Q Q' Q<sup>2</sup> and are operated in a similar manner, the pin P' when acted upon by the lug M' projecting at one end into the track of the arms Q<sup>3</sup>. As will be evident, the upper cam C<sup>3</sup> lowers the needles from the top to the bottom needle-cylinder and the lower cam C<sup>3</sup> operates reversely.

It will be observed upon reference to the left-hand side of Fig. 3 that the upper beveled end R<sup>3</sup> of the slider R acts as a latch-guard and keeps the latch open while the needles in the top cylinder are descending; but immediately the needles commence to rise the latches move in contact with the inner face V<sup>2</sup> of a curved plate V, fixed by screws V' to the cam-carrier B, which plate keeps the

latches open until the needles enter between the teeth W' of a wheel W, provided also with upright posts W<sup>3</sup>, which also keep the latches open, as shown in Fig. 17, until the needles reach the yarn-guide X thereagainst, as in Fig. 16, from which they take the yarn. The wheel W is mounted upon a bolt W<sup>2</sup>, having a shank threaded into the boss B<sup>2</sup>.

When ordinary needles C<sup>3</sup>, Fig. 7, are used in the top-cylinder C, devices such as S<sup>2</sup>, as shown in Figs. 13 and 14, are employed, the beveled upper end of which by supporting the latch, Fig. 6, acts as a guard and keeps the latch open. These devices S<sup>2</sup> may be provided with a butt S<sup>3</sup>, to be acted upon by the usual knitting-cams, or without such a butt, in which case the device would be stationary.

The sliders, Figs. 9, 10, and 11, are made out of flat steel; but in Fig. 12 a slider is shown made out of steel wire, similar letters of reference indicating corresponding parts to those in Figs. 9, 10, and 11.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

1. In a knitting-machine, the combination with two grooved cylinders arranged endwise relatively to each other, and a cam-carrier B, of sliders and double-ended needles therein, a curved plate V secured to the cam-carrier in such position that the latches of the needles will move in contact with the inner edge of the said plate when the needles begin to rise and said latches be kept open, as described, and a revoluble wheel W provided with teeth W' between which the needles are adapted to enter and also provided with upright posts W<sup>3</sup>, for the purpose specified.

2. In a knitting-machine, the combination with two grooved cylinders, of sliders and double-ended needles therein, cams C<sup>3</sup> for actuating the said sliders, disks Q Q', spring-controlled pins for actuating the latter, ratchet-wheel M with lugs thereon for actuating said pins and means for driving the ratchet-wheel for the purpose described.

3. In a knitting-machine, the combination with two grooved cylinders, of sliders and double-ended needles therein, cams C<sup>3</sup> for actuating the said sliders, disks Q Q', spring-controlled pins for actuating the latter, ratchet-wheel M lugs thereon for actuating said pins, ratchet-wheel, driving-clawker for the latter and means between the said clawker and the cam T' for actuating the said clawker for the purpose described.

In testimony whereof I affix my signature in presence of two witnesses.

JOSIAH JOHNSON.

Witnesses:

E. N. LEWIS,

WALTER W. BALL.