

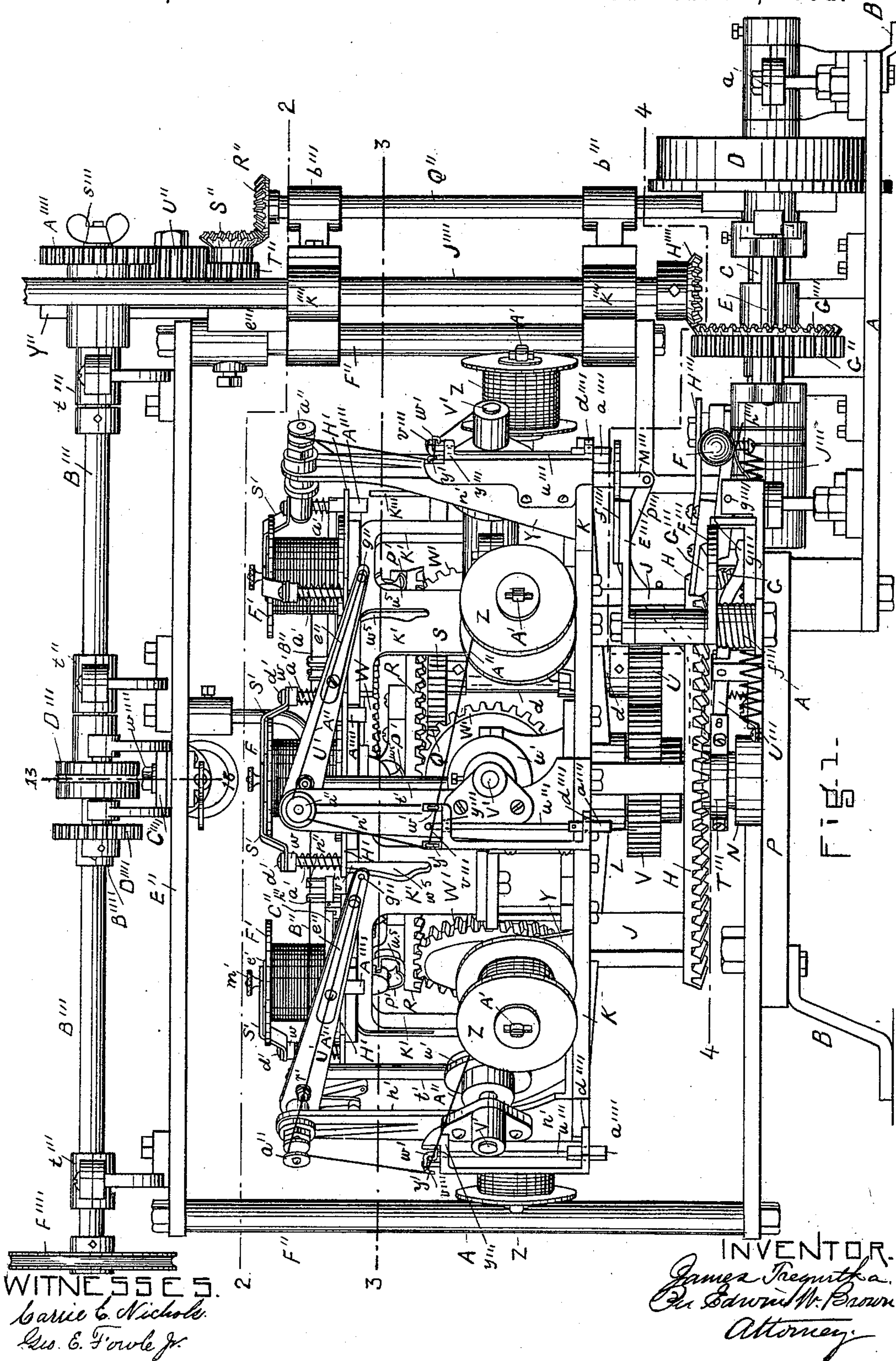
(No Model.)

10 Sheets—Sheet 1.

J. TREGURTHA.
BRAIDING MACHINE.

No. 447,262.

Patented Feb. 24, 1891.



WITNESSES.
Carrie C. Nichols.
Geo. E. Fowle Jr.

INVENTOR.
James Tregurtha.
Edwin W. Brown
Attorney.

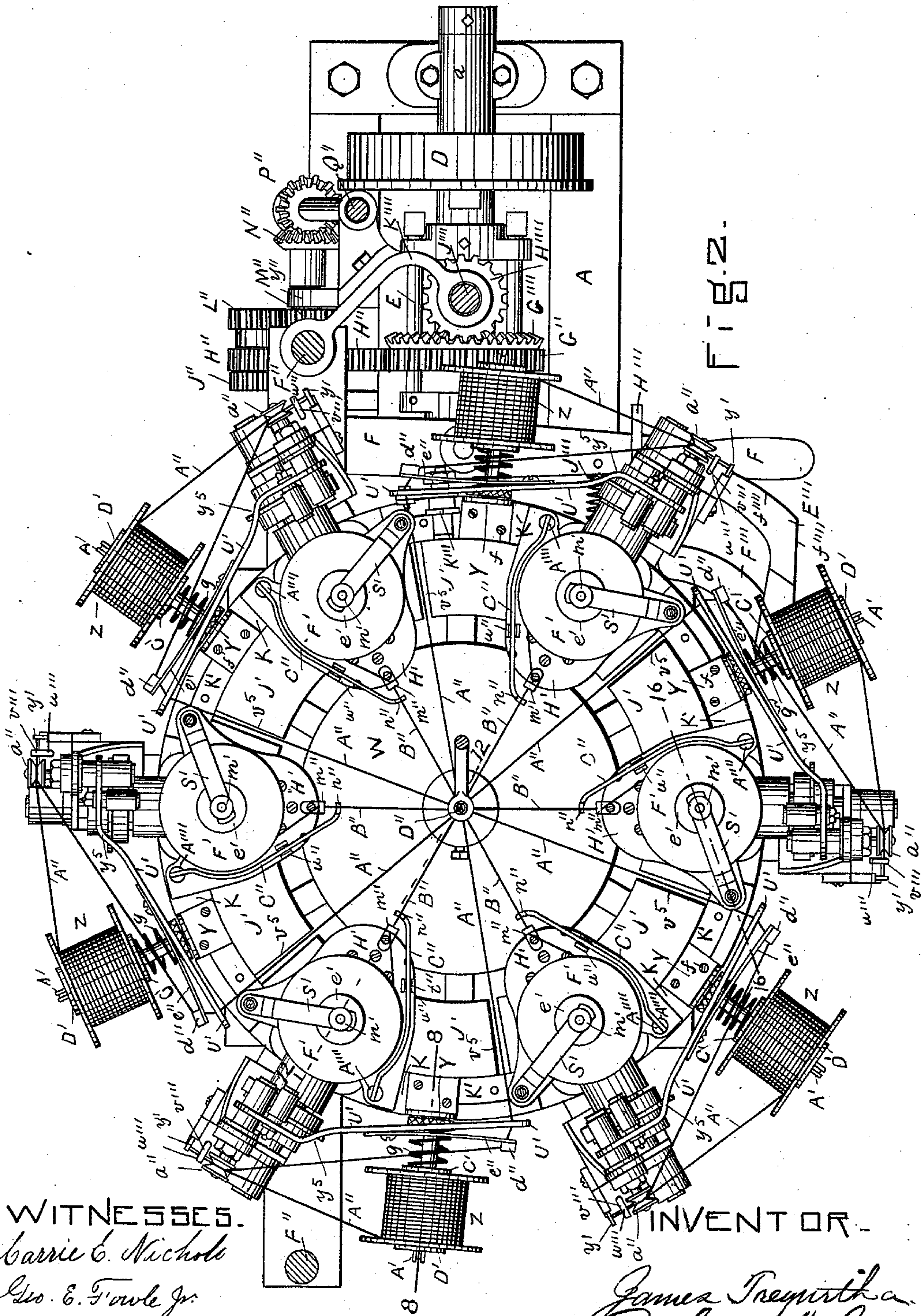
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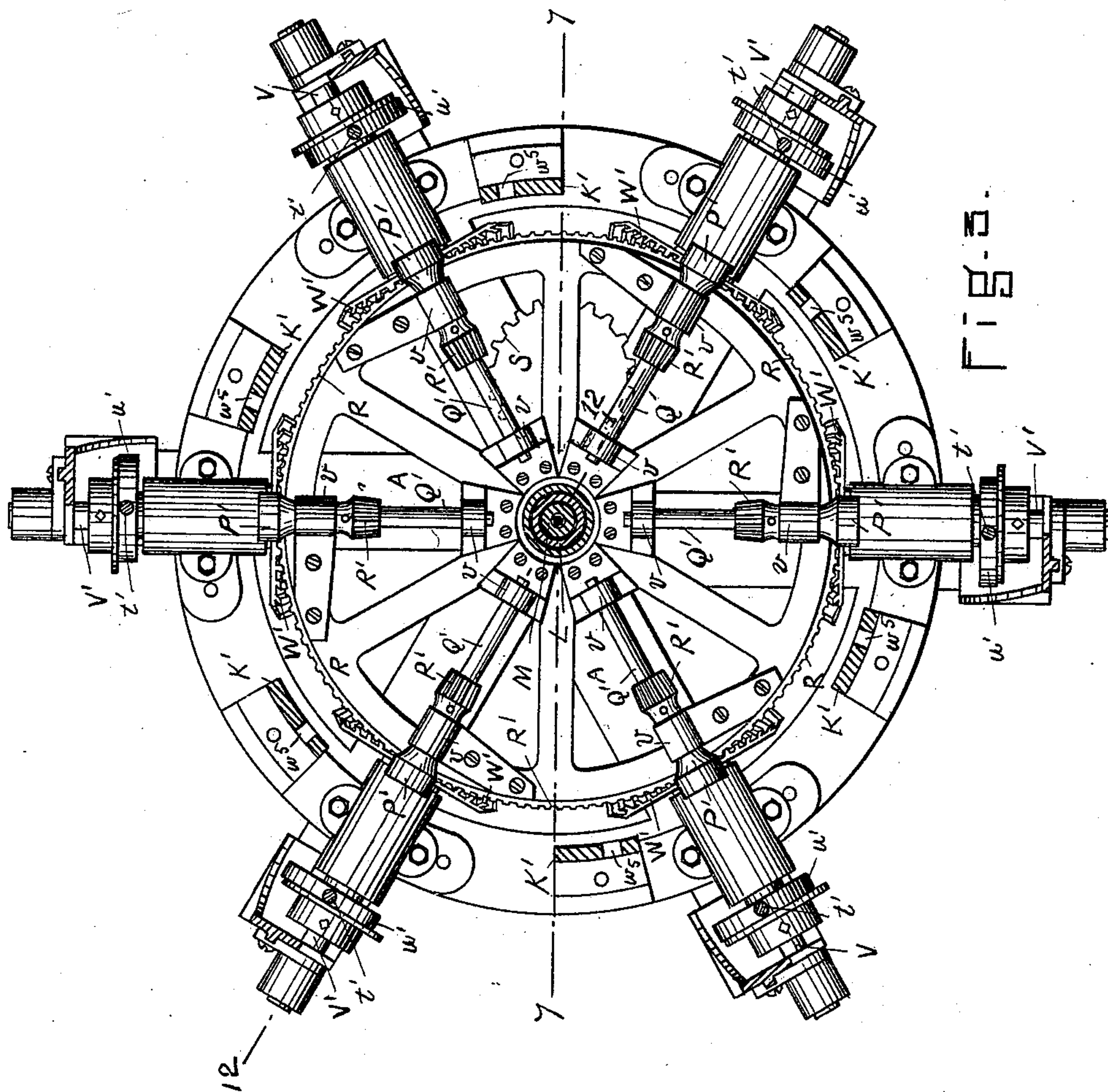
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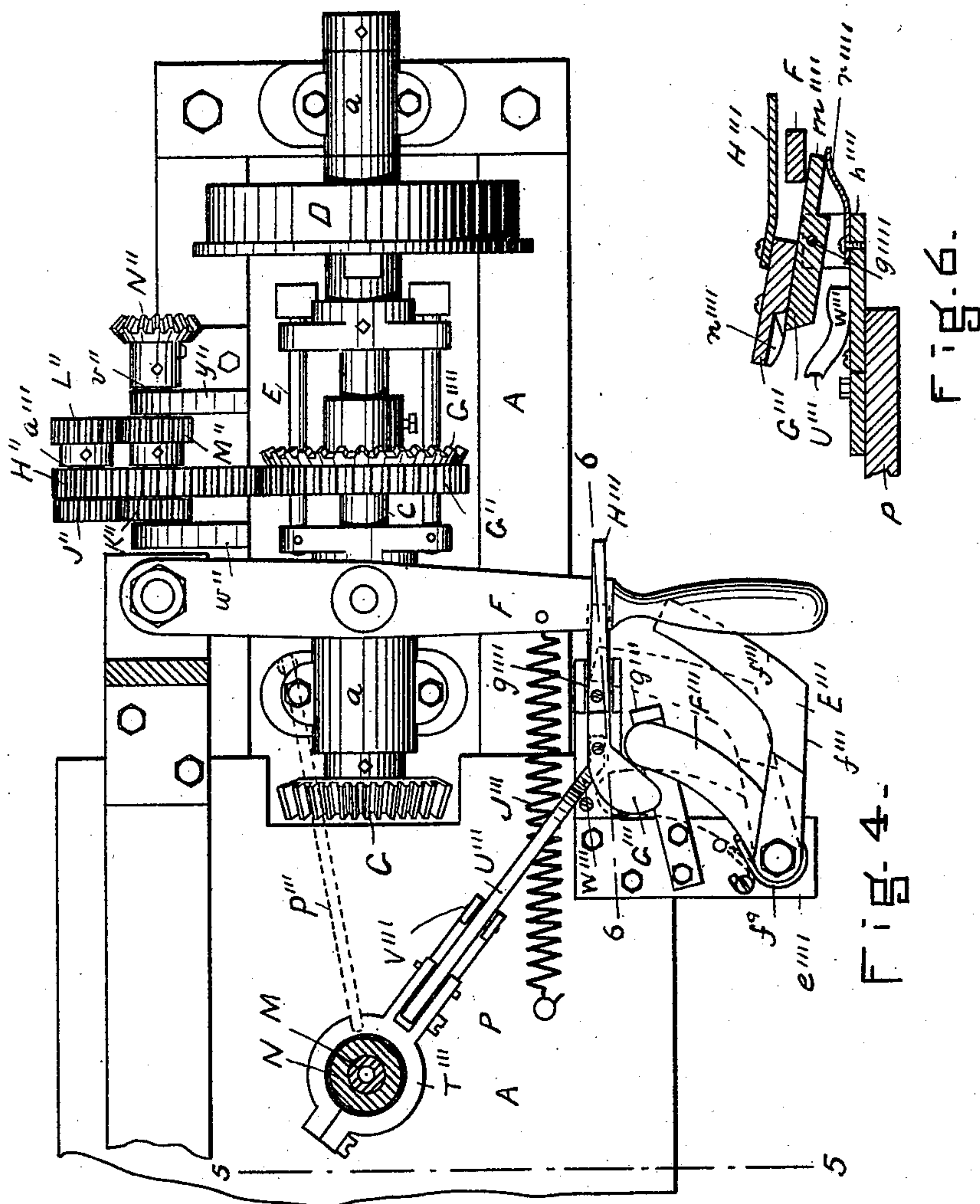
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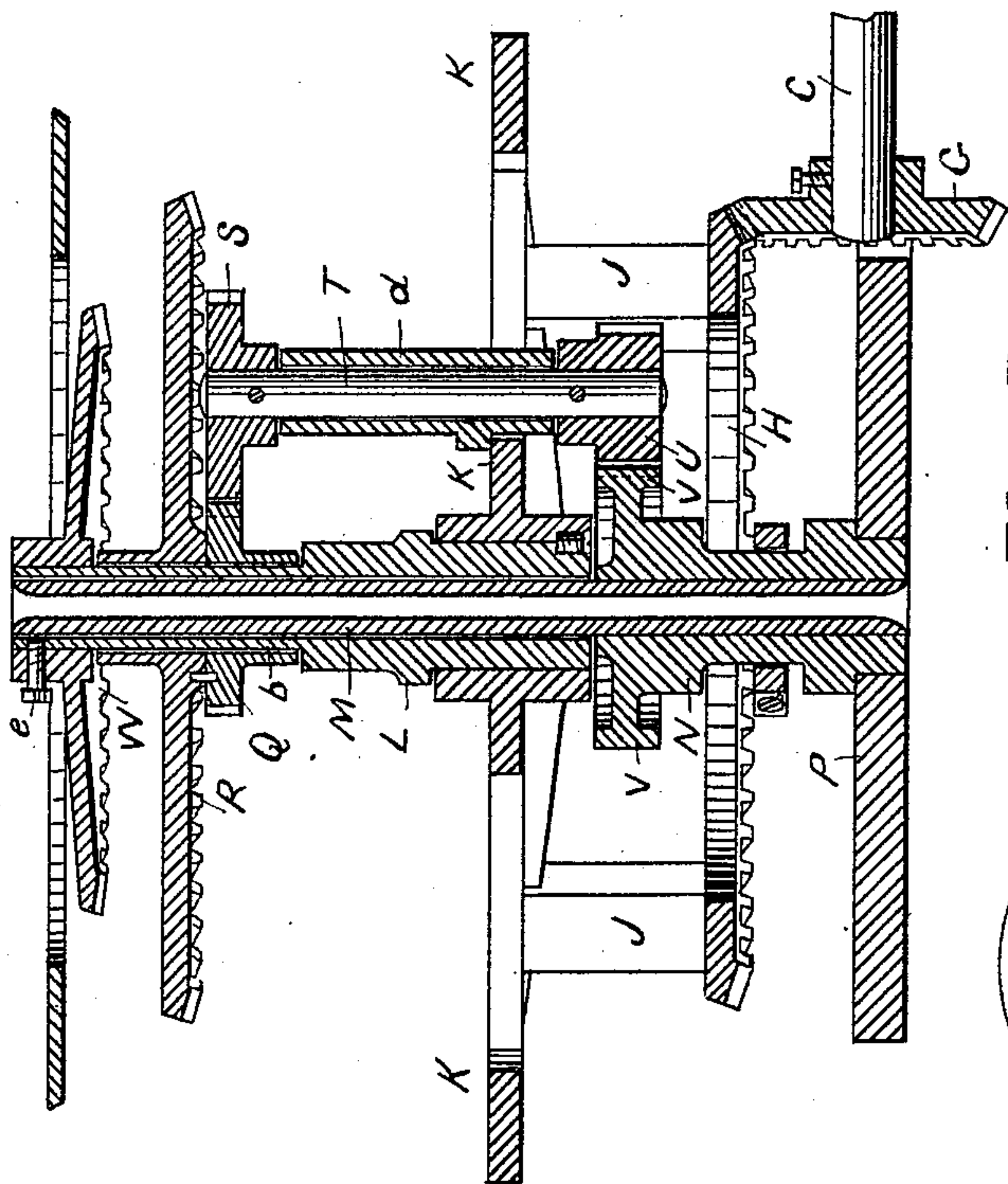


Fig. 7.

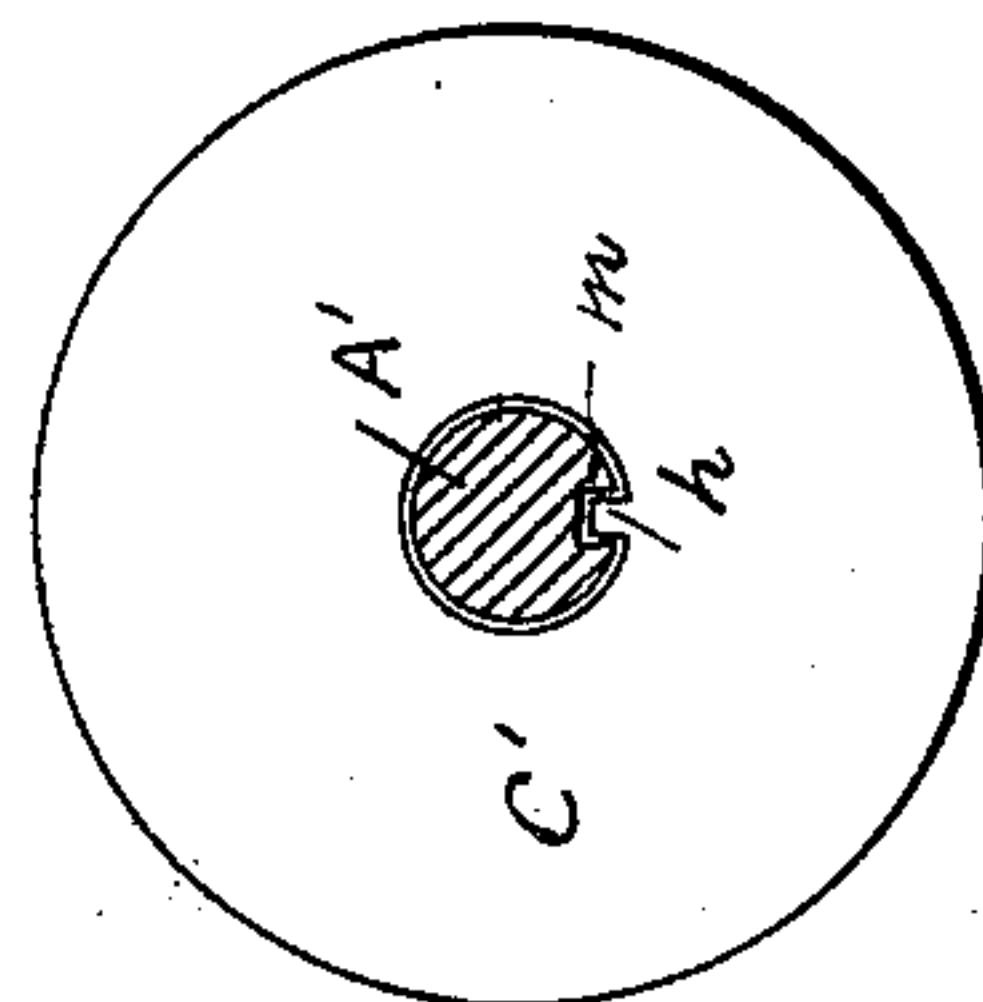


Fig. 10.

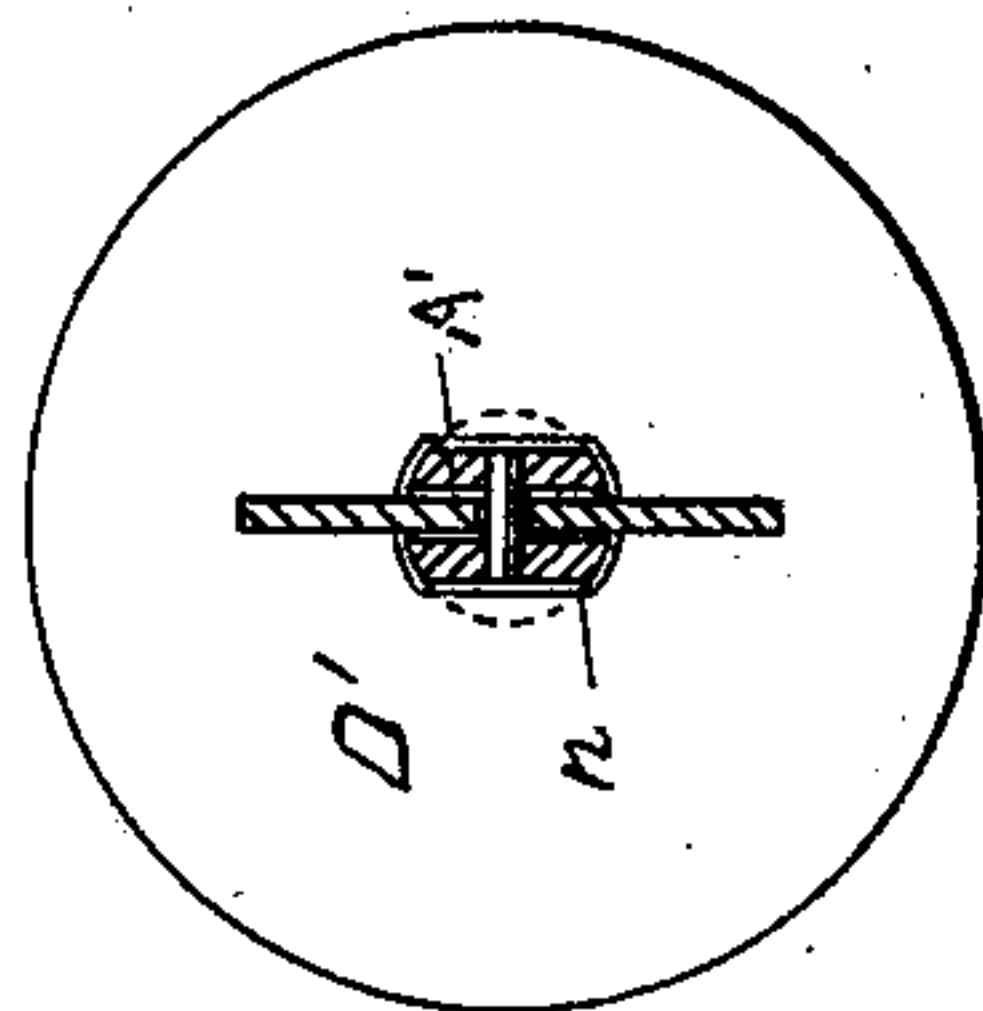


Fig. 9.

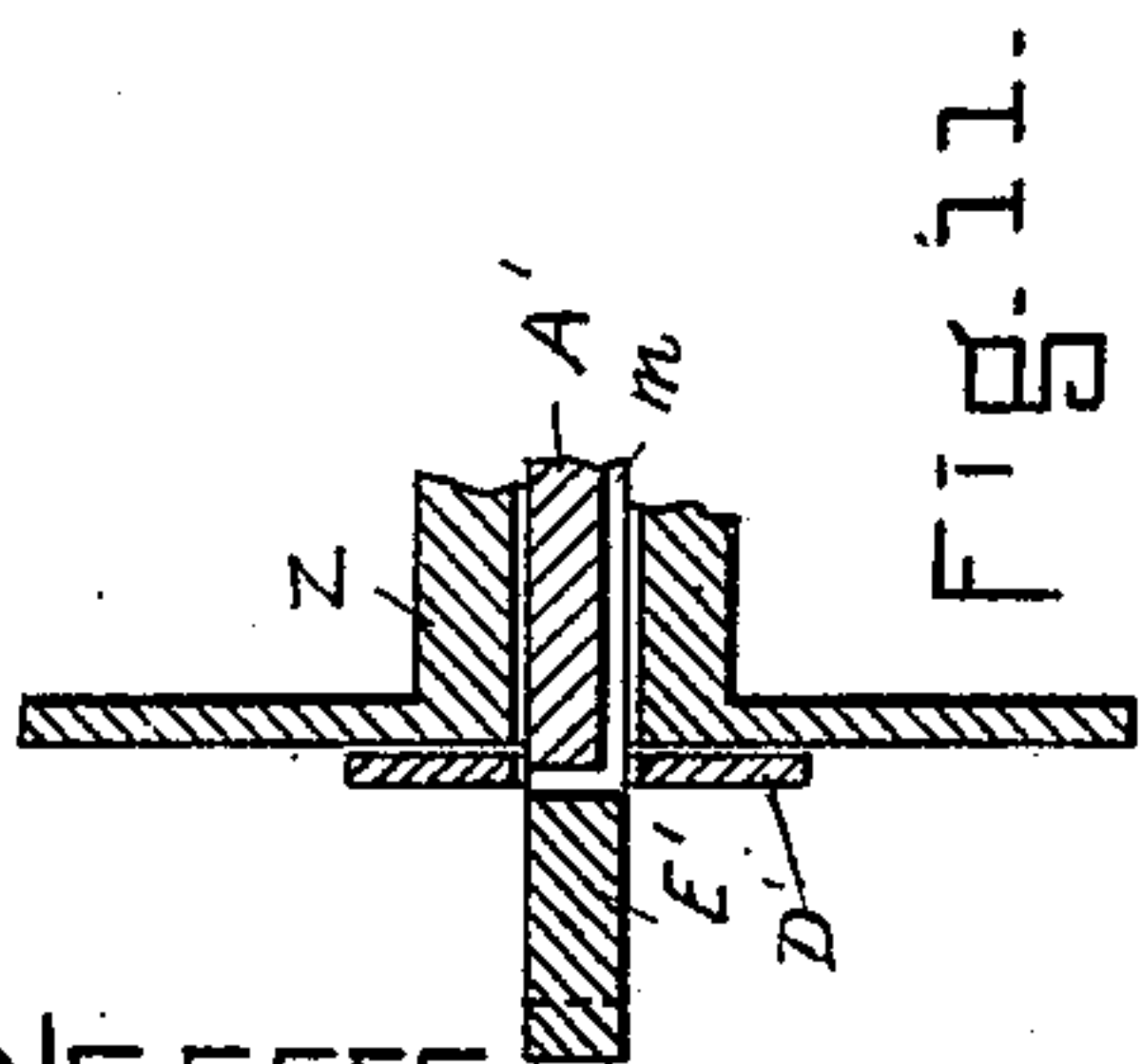


Fig. 11.

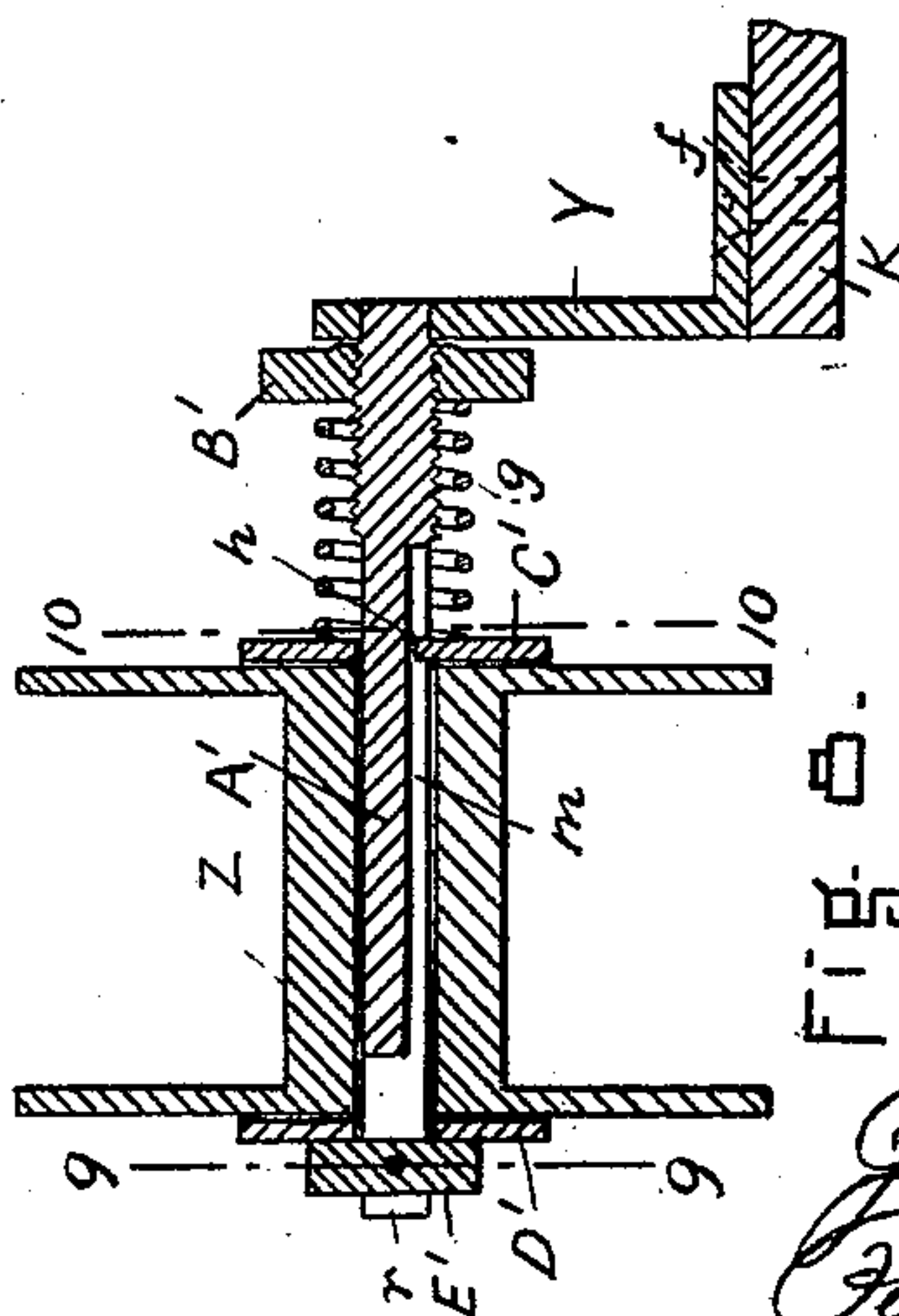


Fig. 8.

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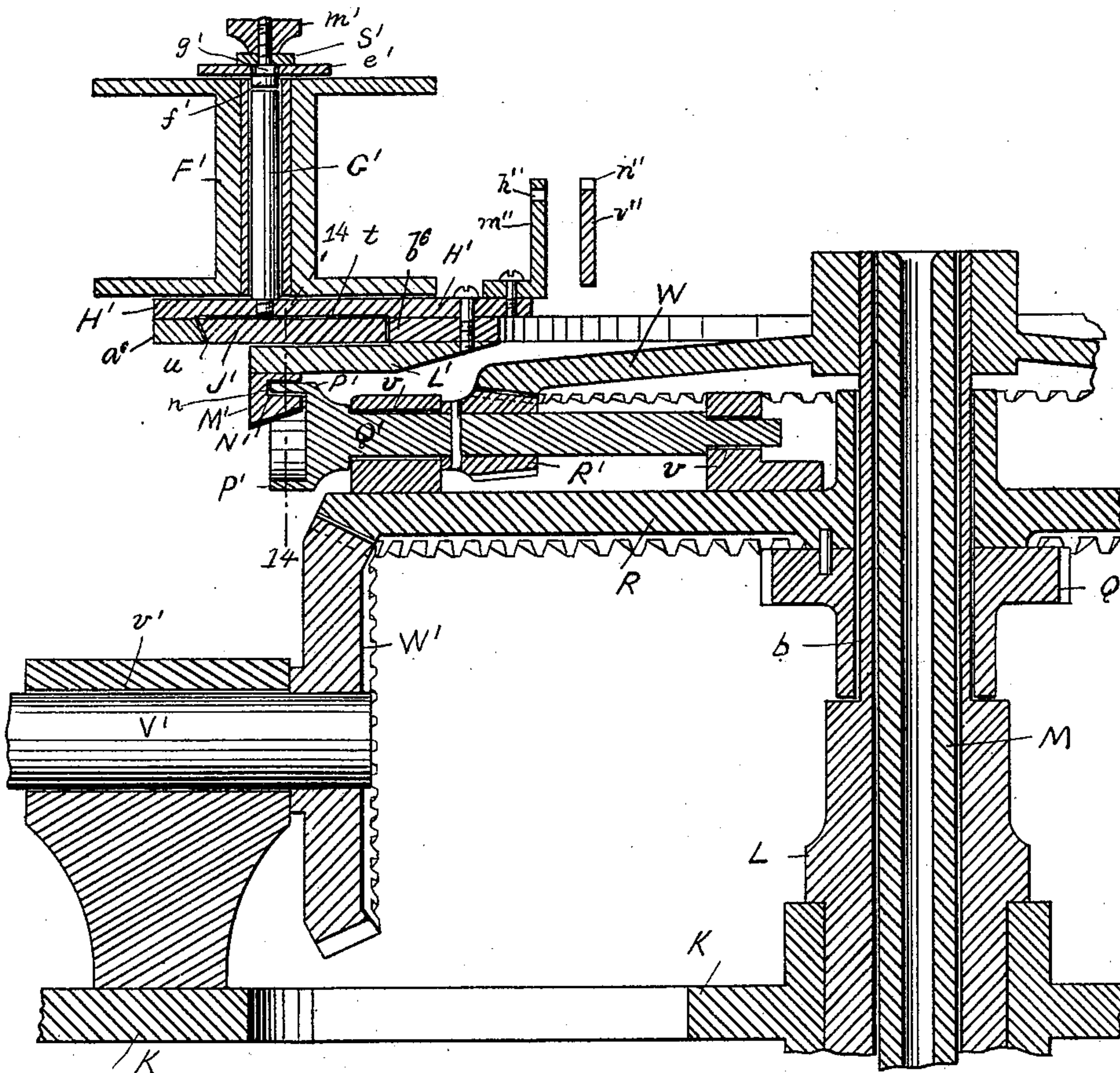


FIG. 12.

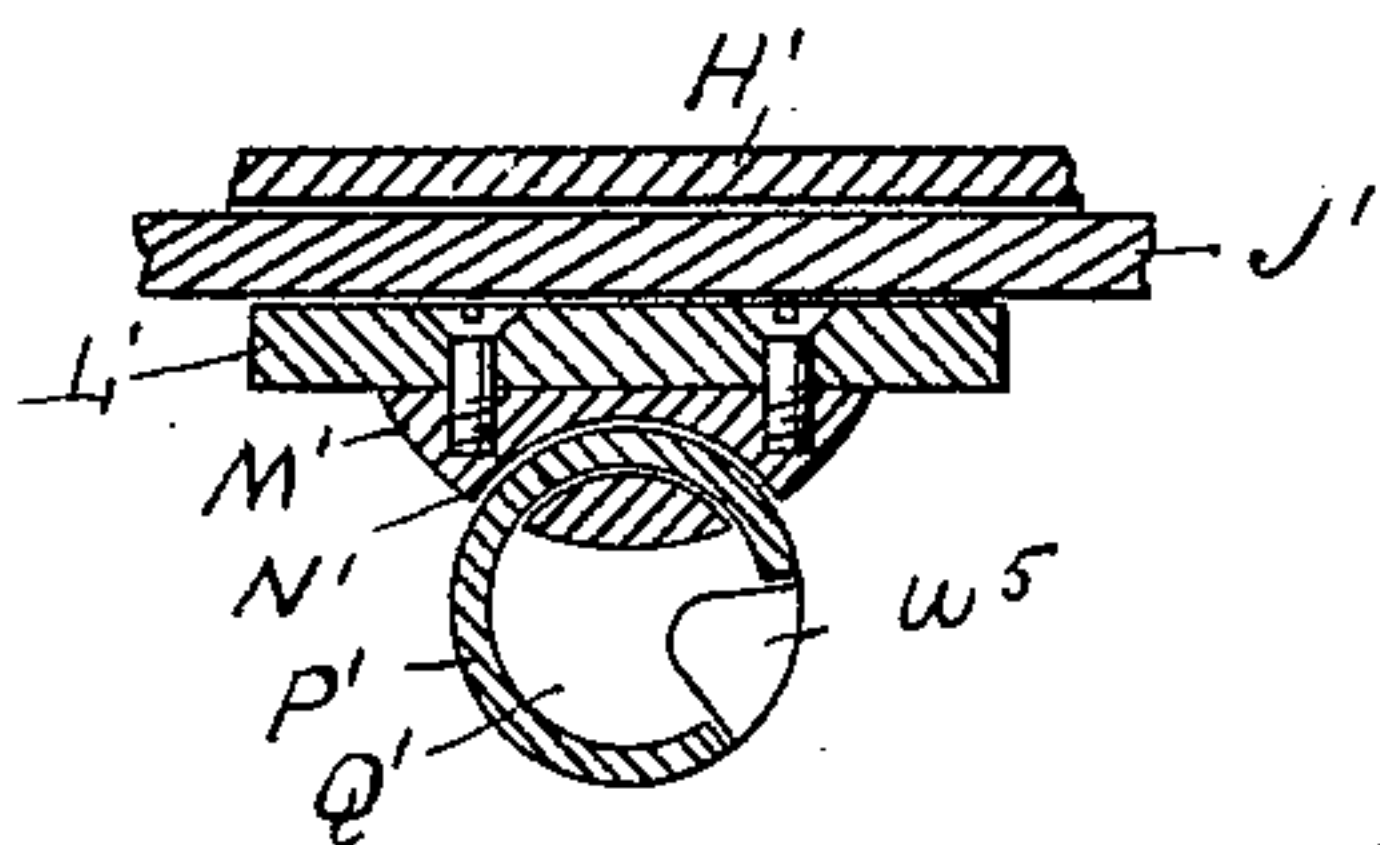


FIG. 14.

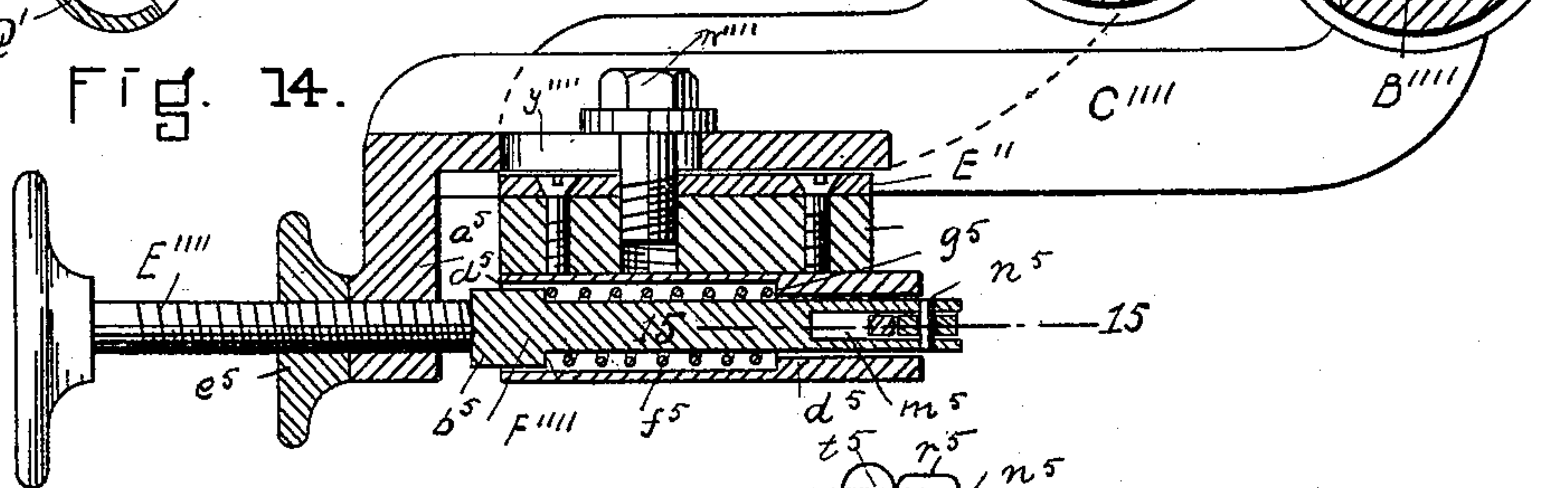


FIG. 15.

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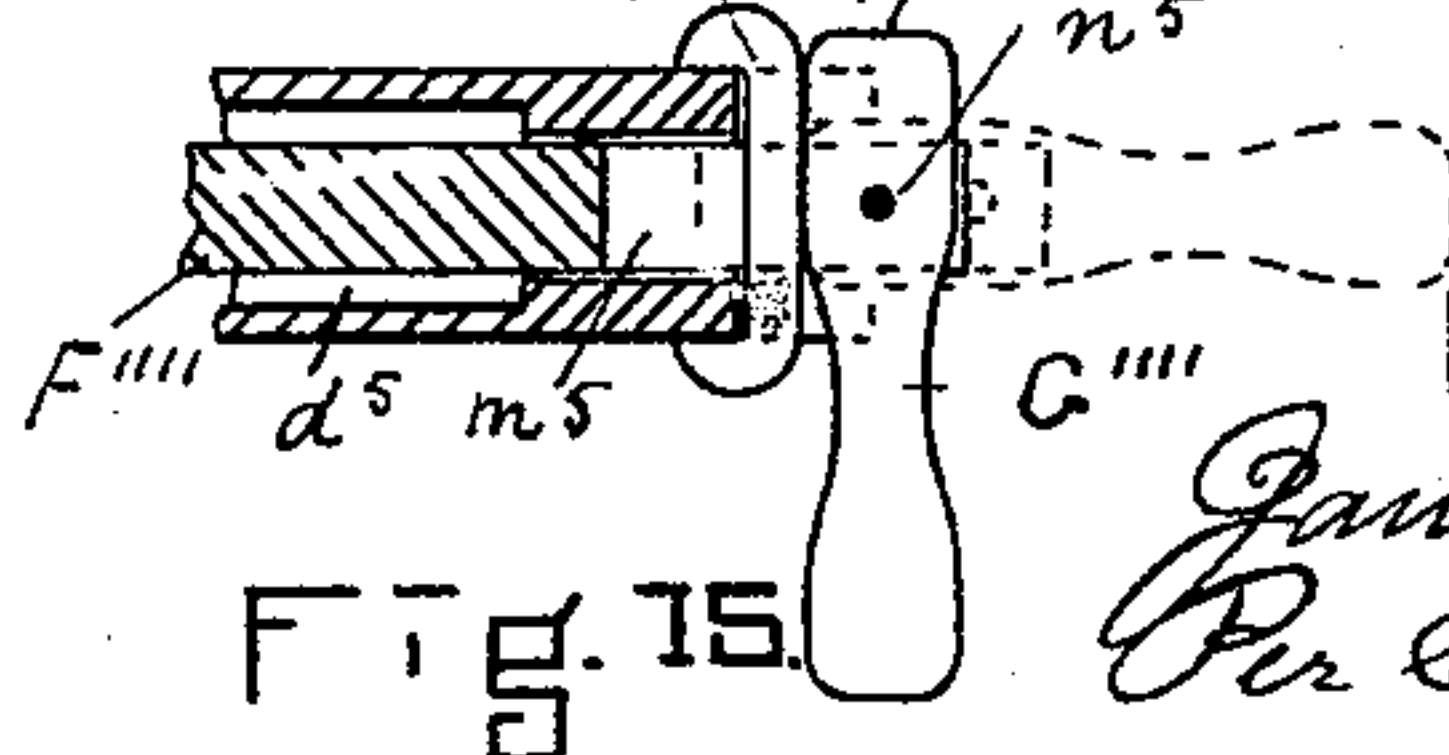


FIG. 13.

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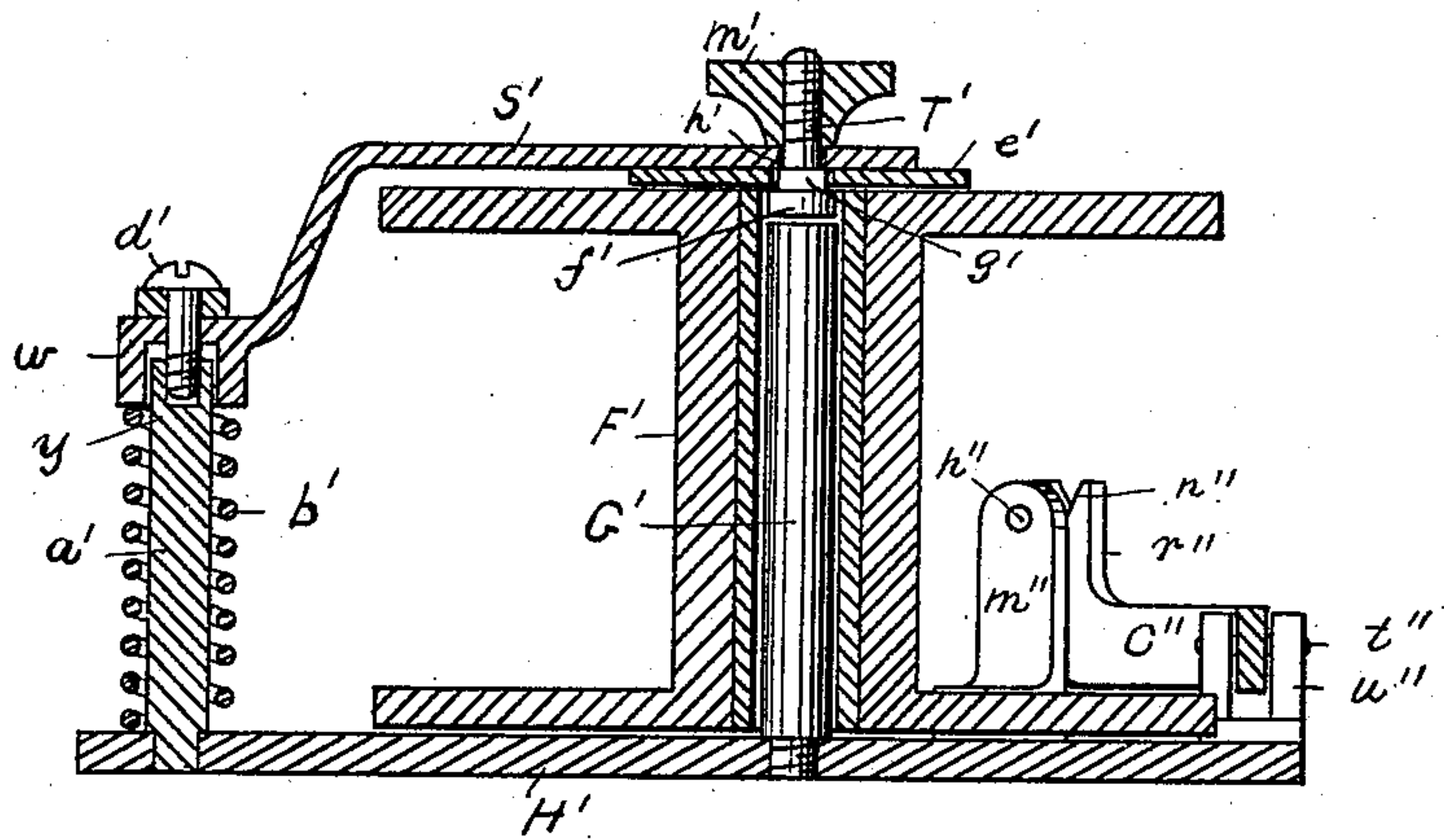


Fig. 16.

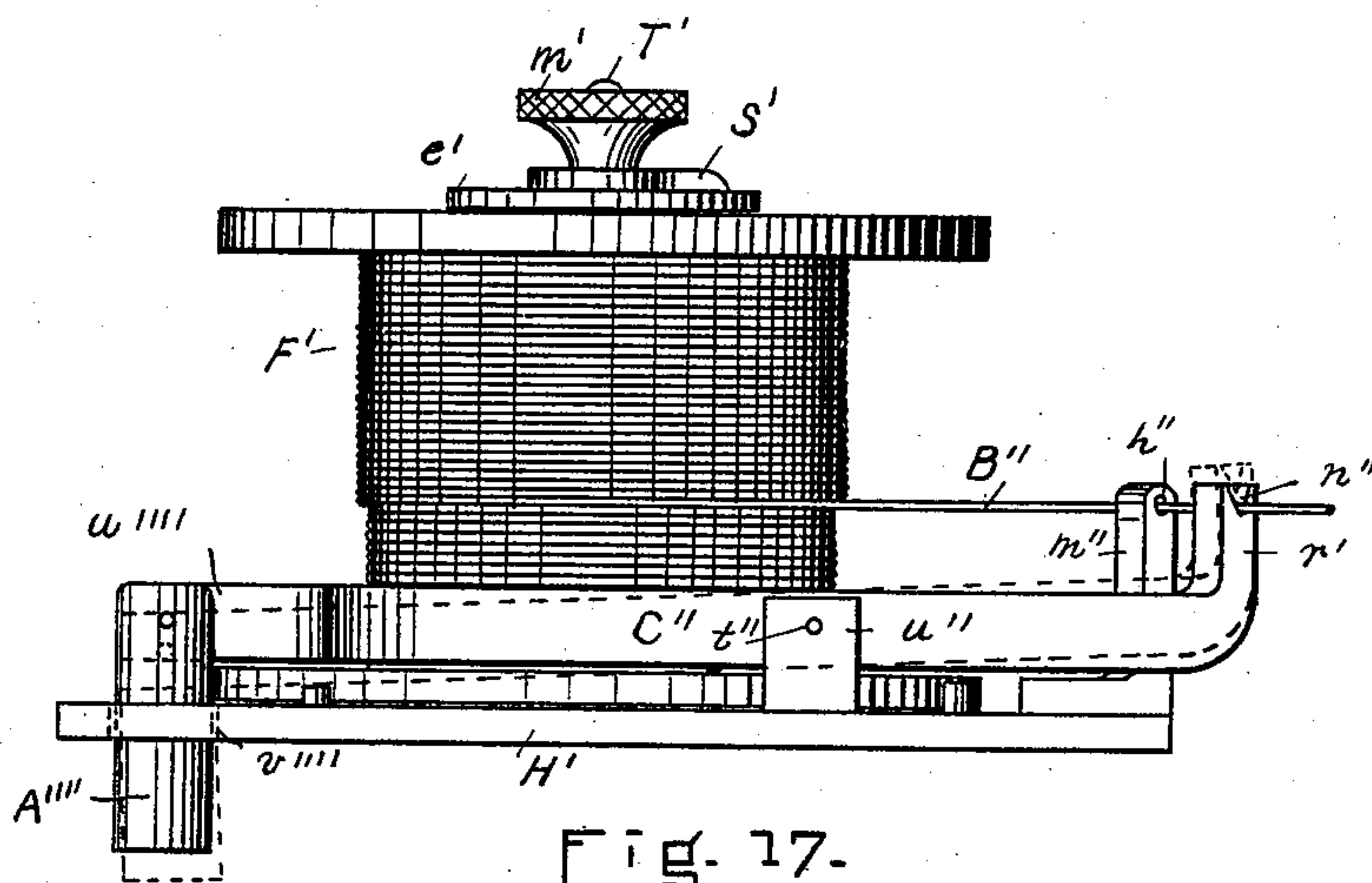


Fig. 17.

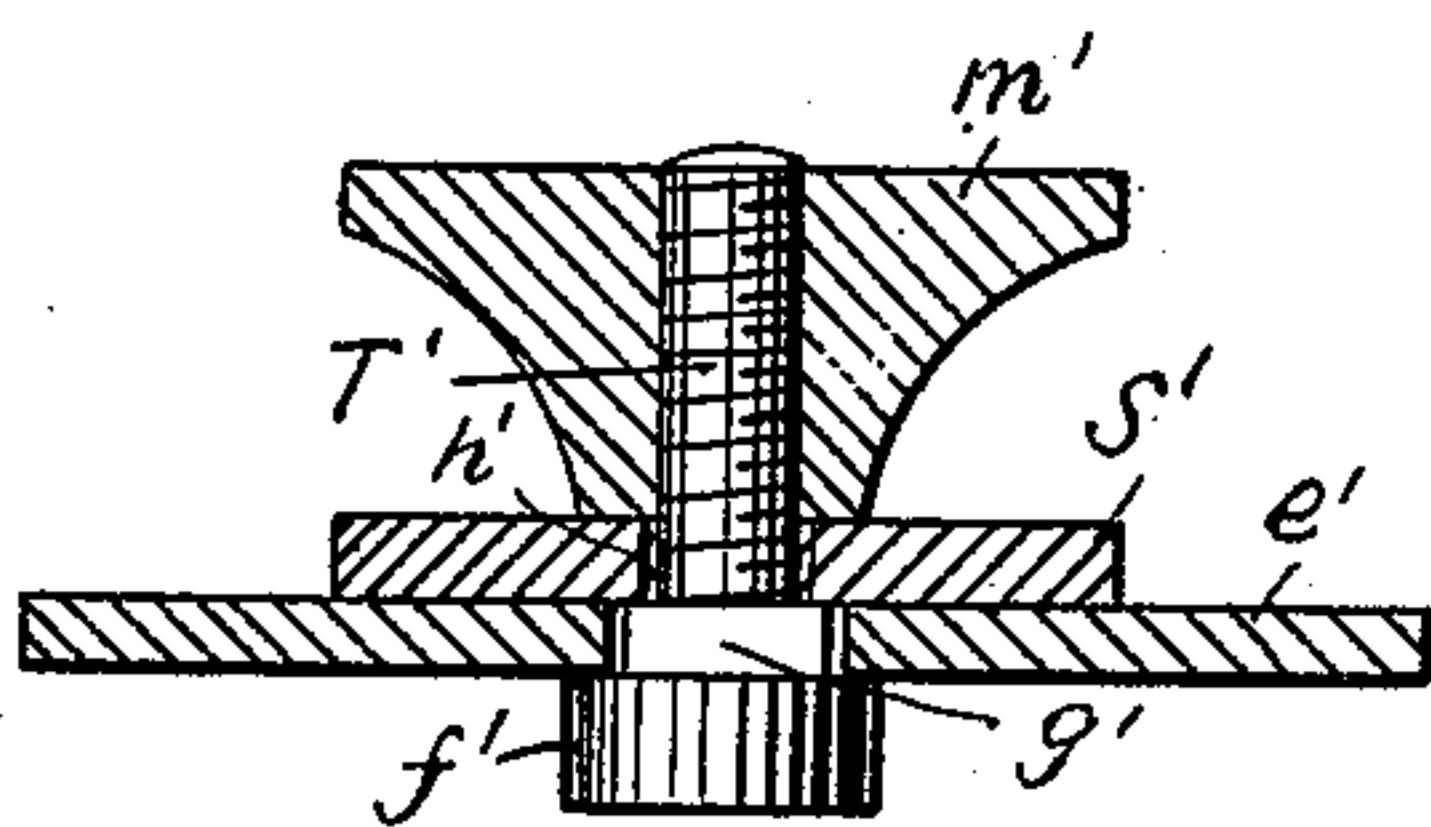


Fig. 18.

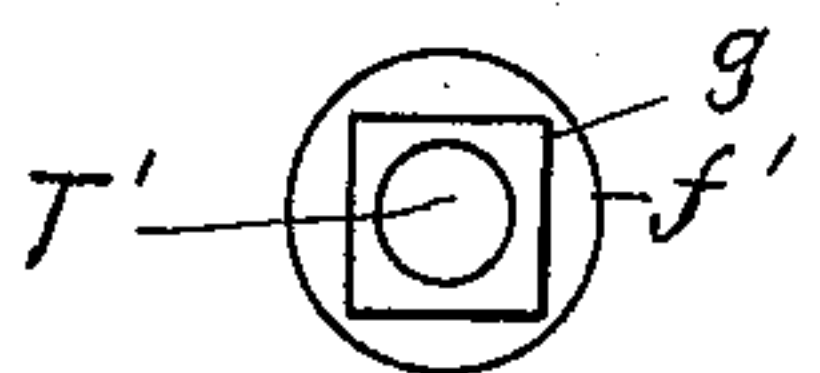


Fig. 19.

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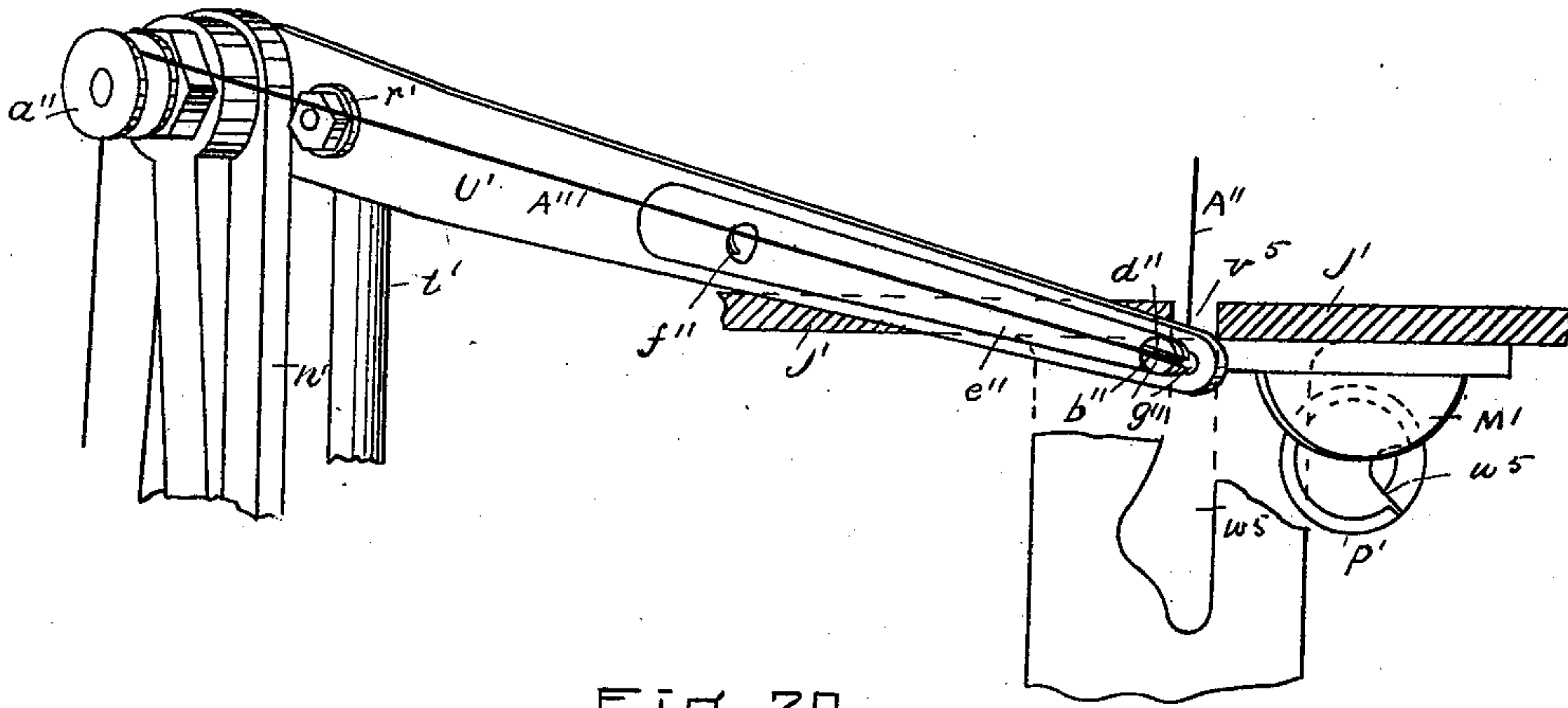


Fig. 20.

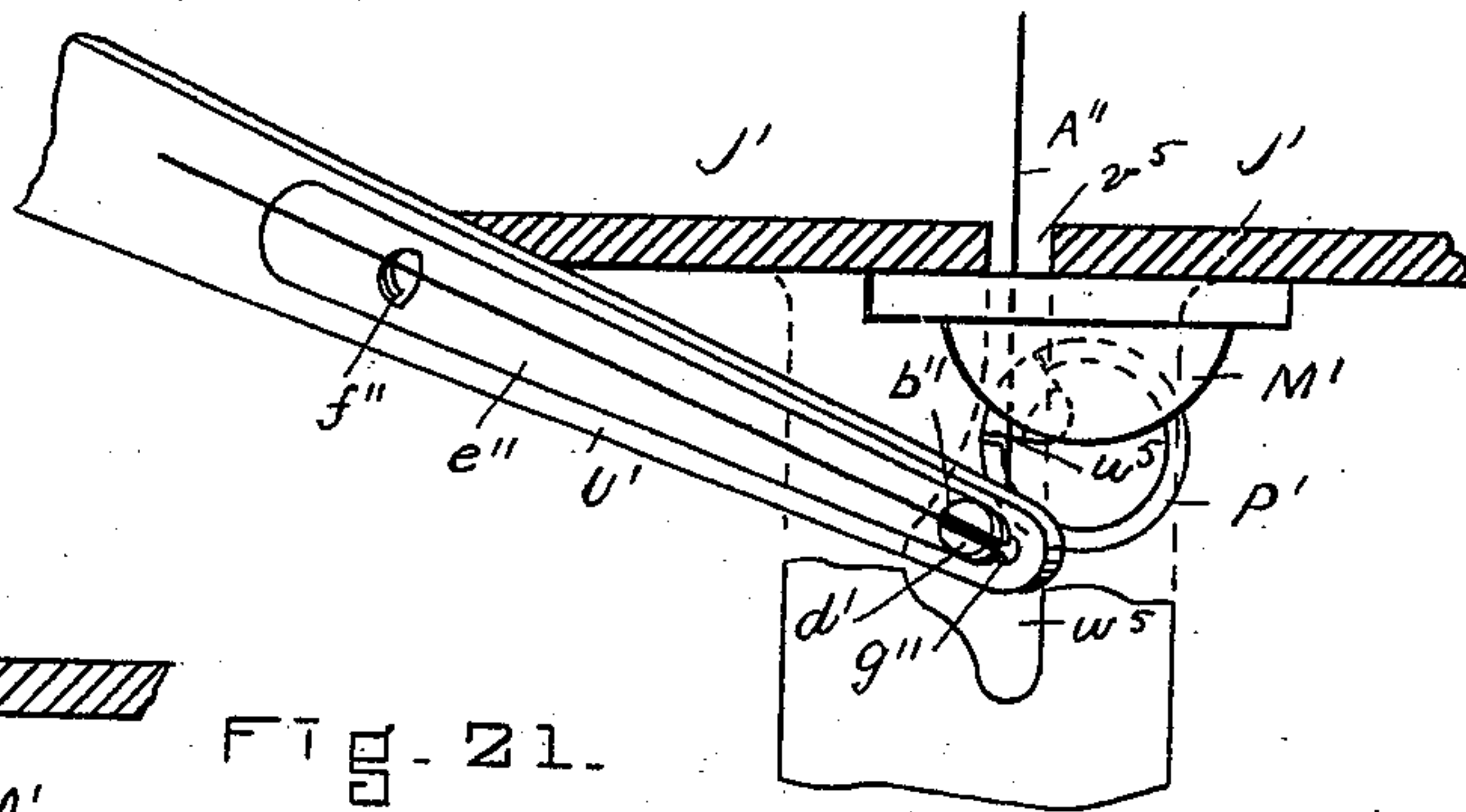


Fig. 21.

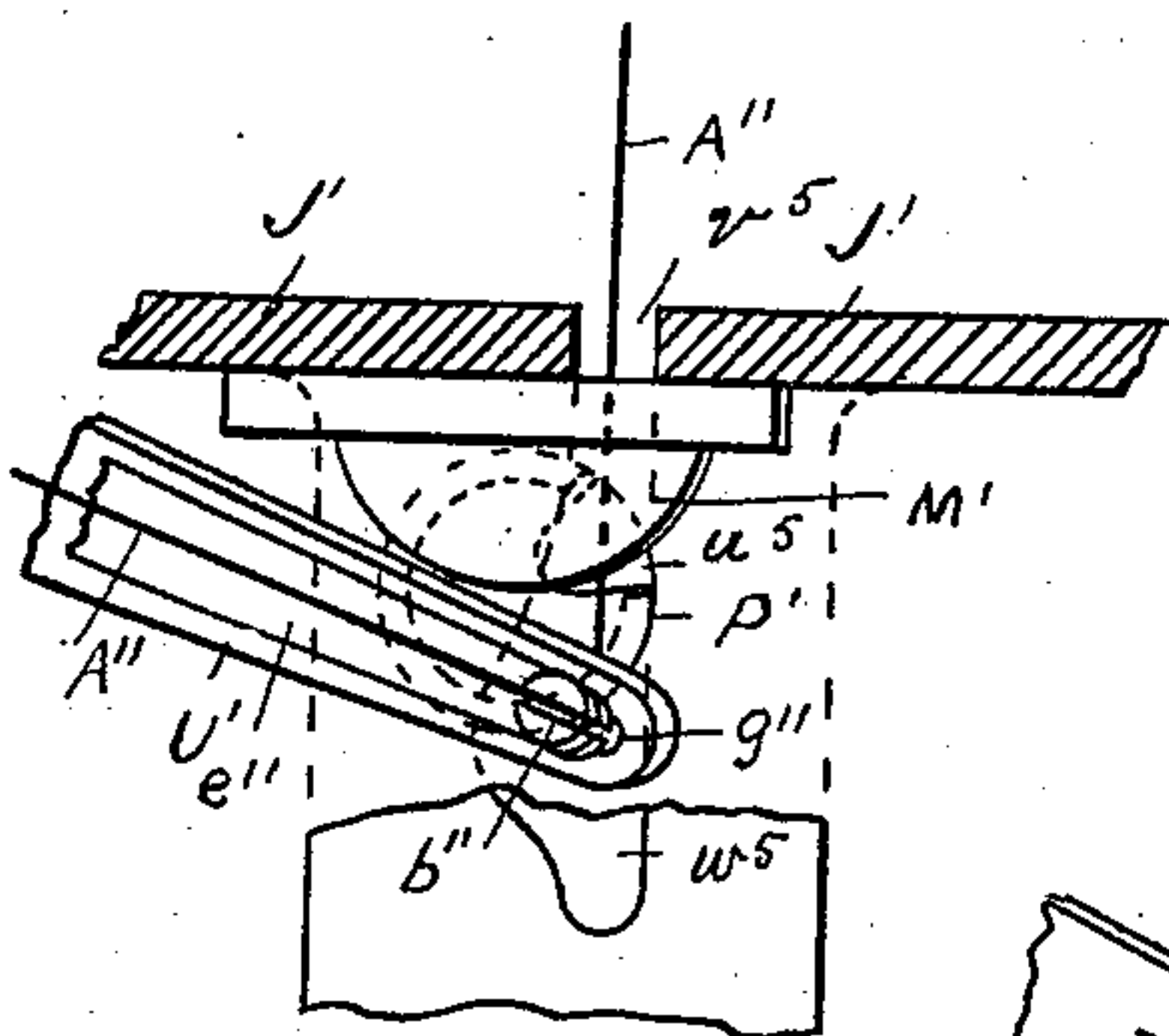


Fig. 23.

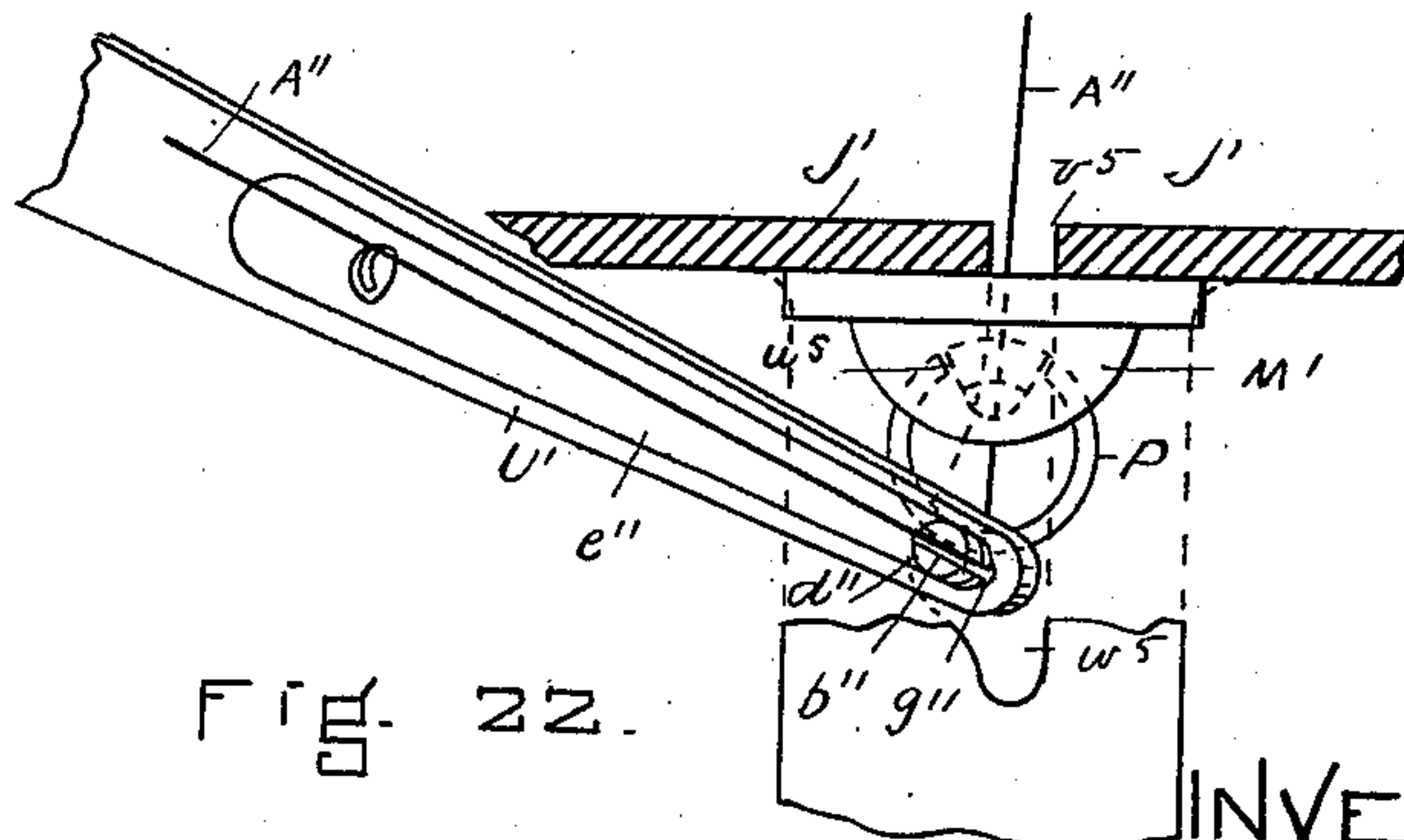


Fig. 22.

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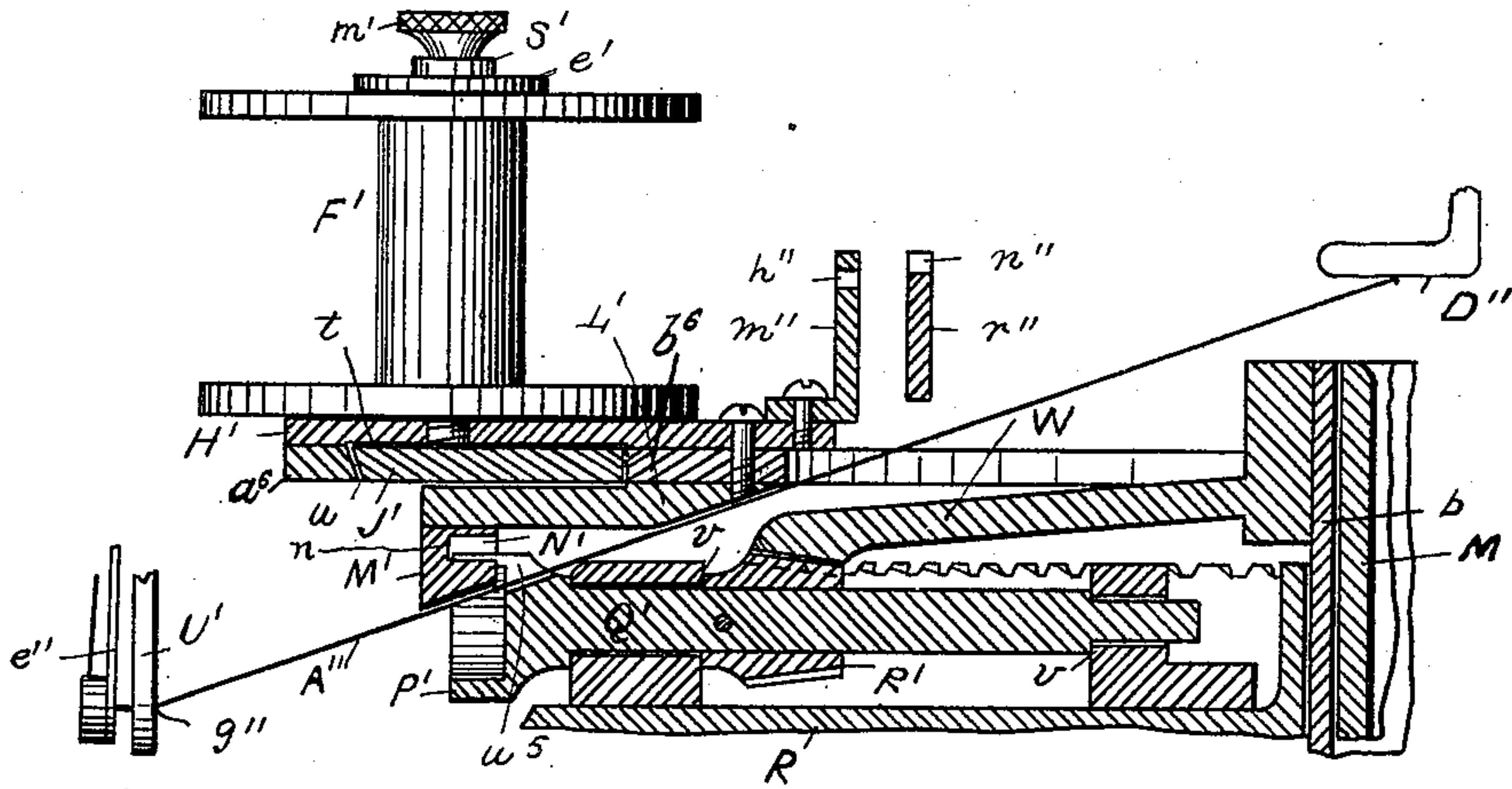


FIG. 24.

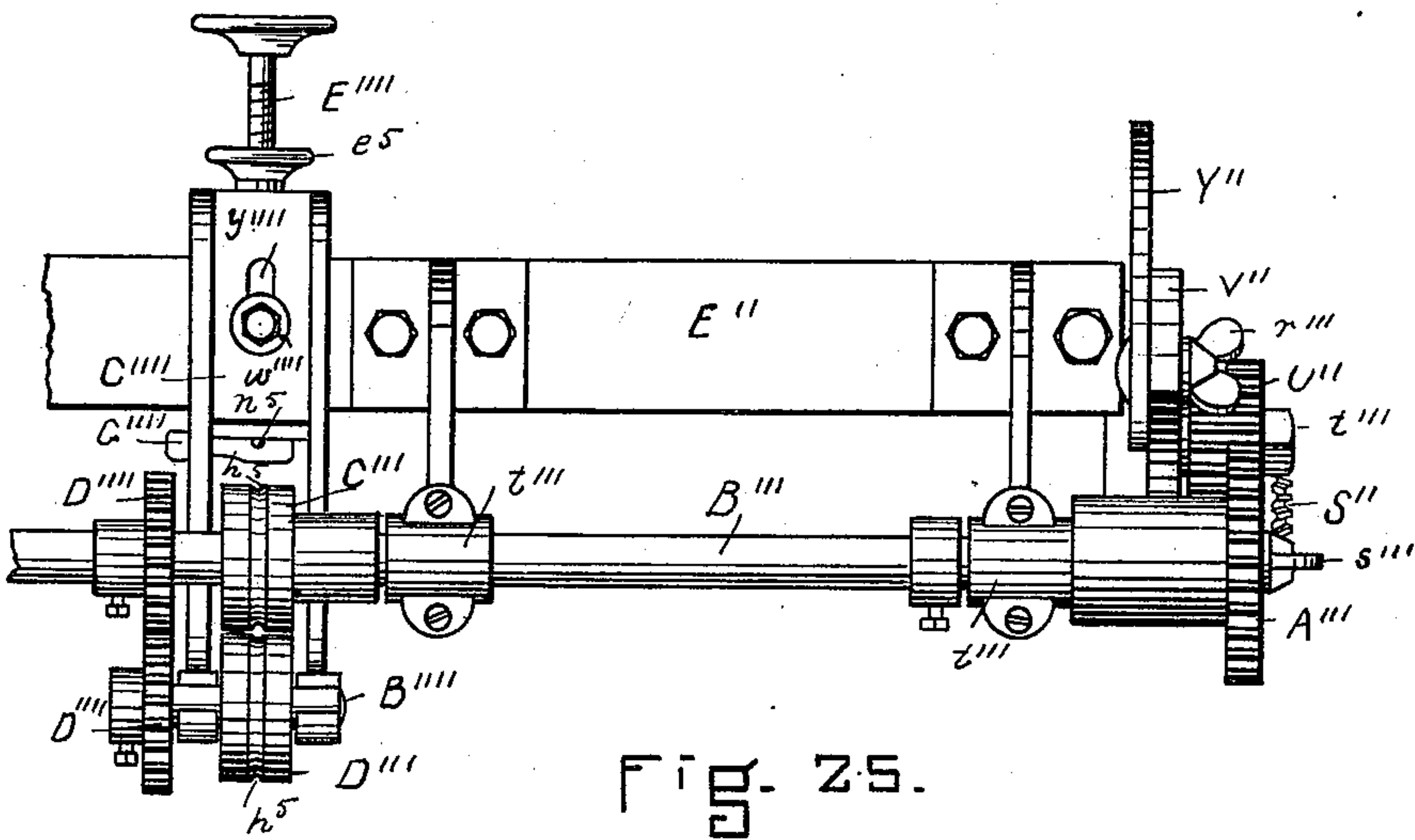


FIG. 25.

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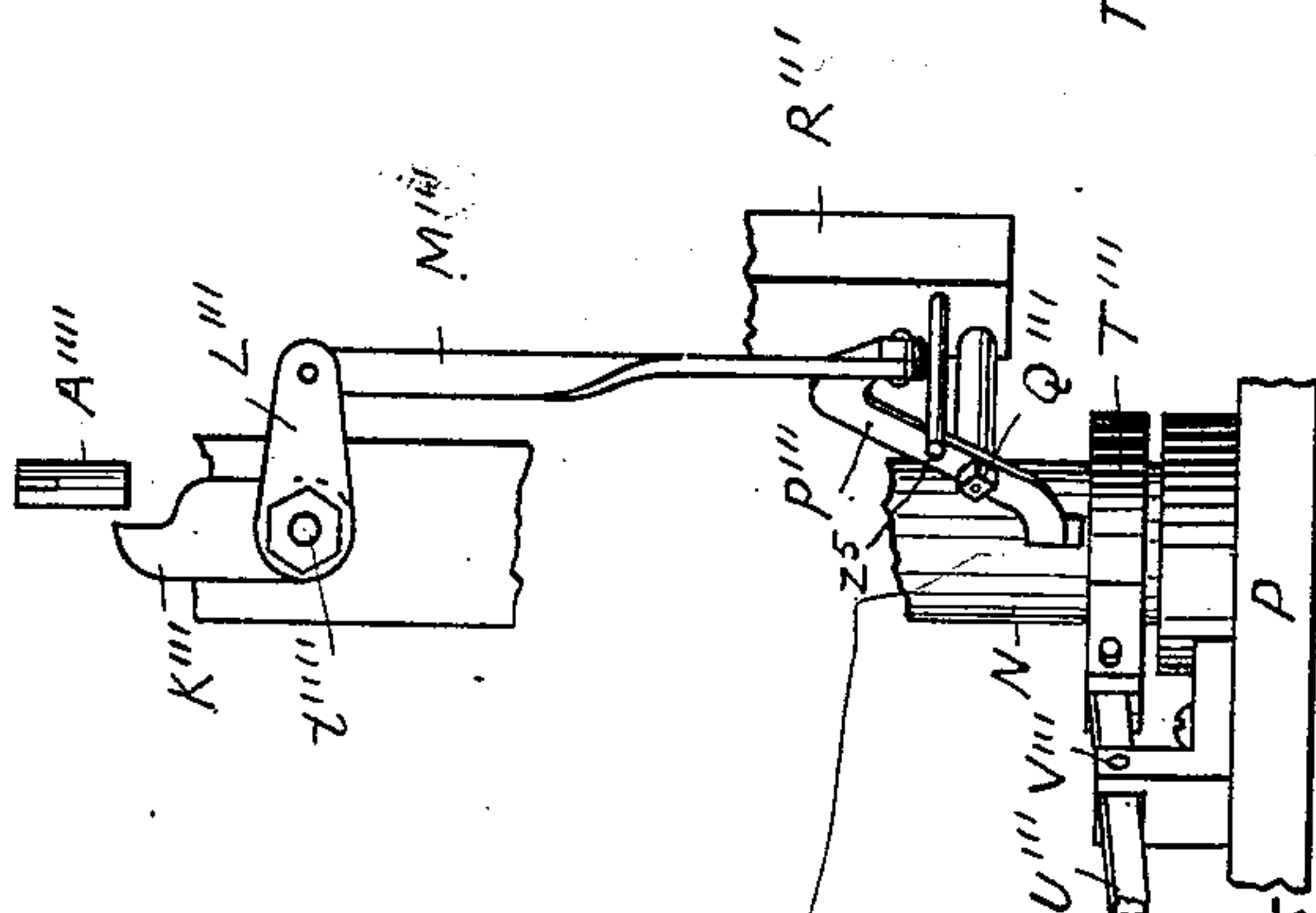
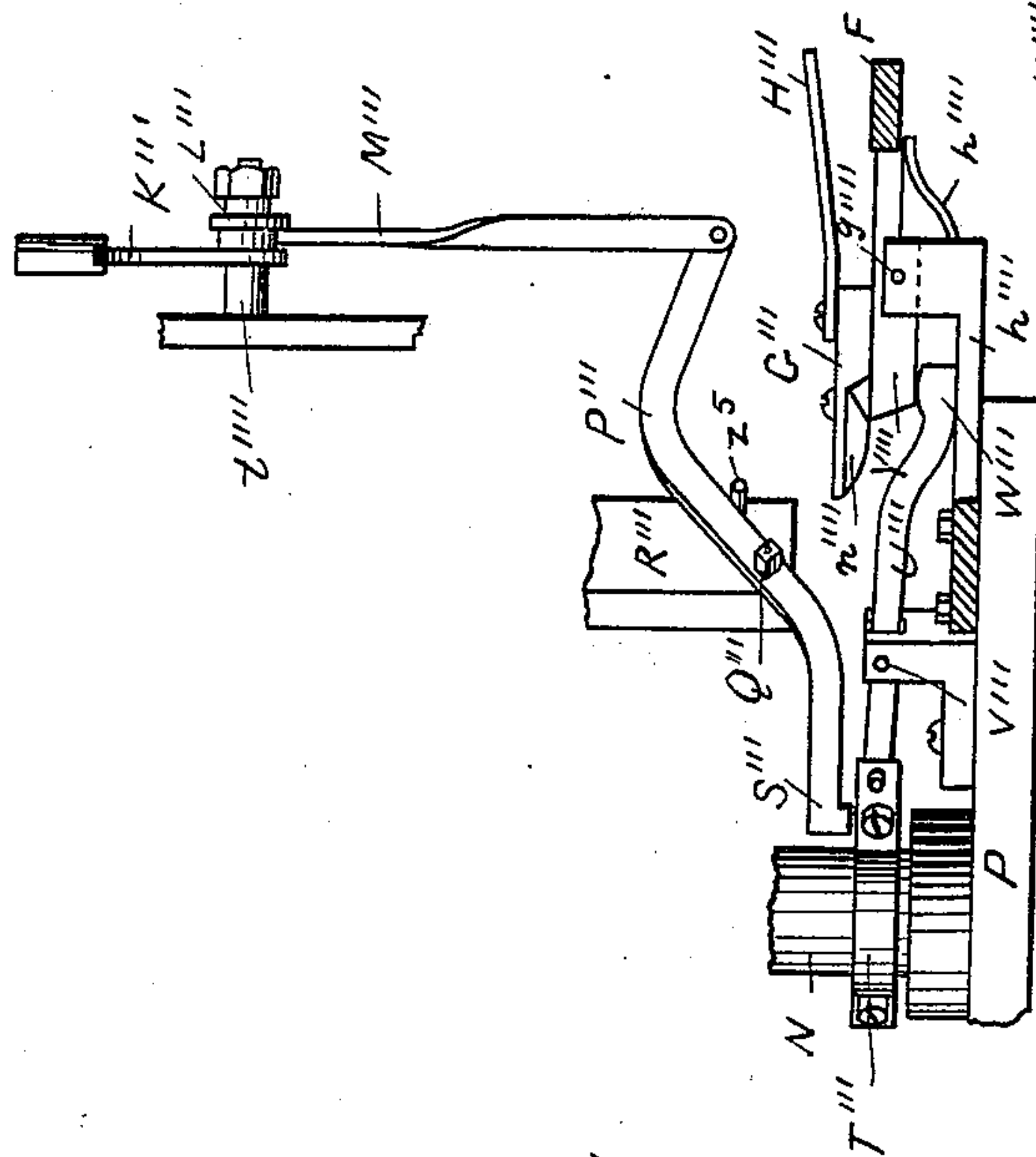
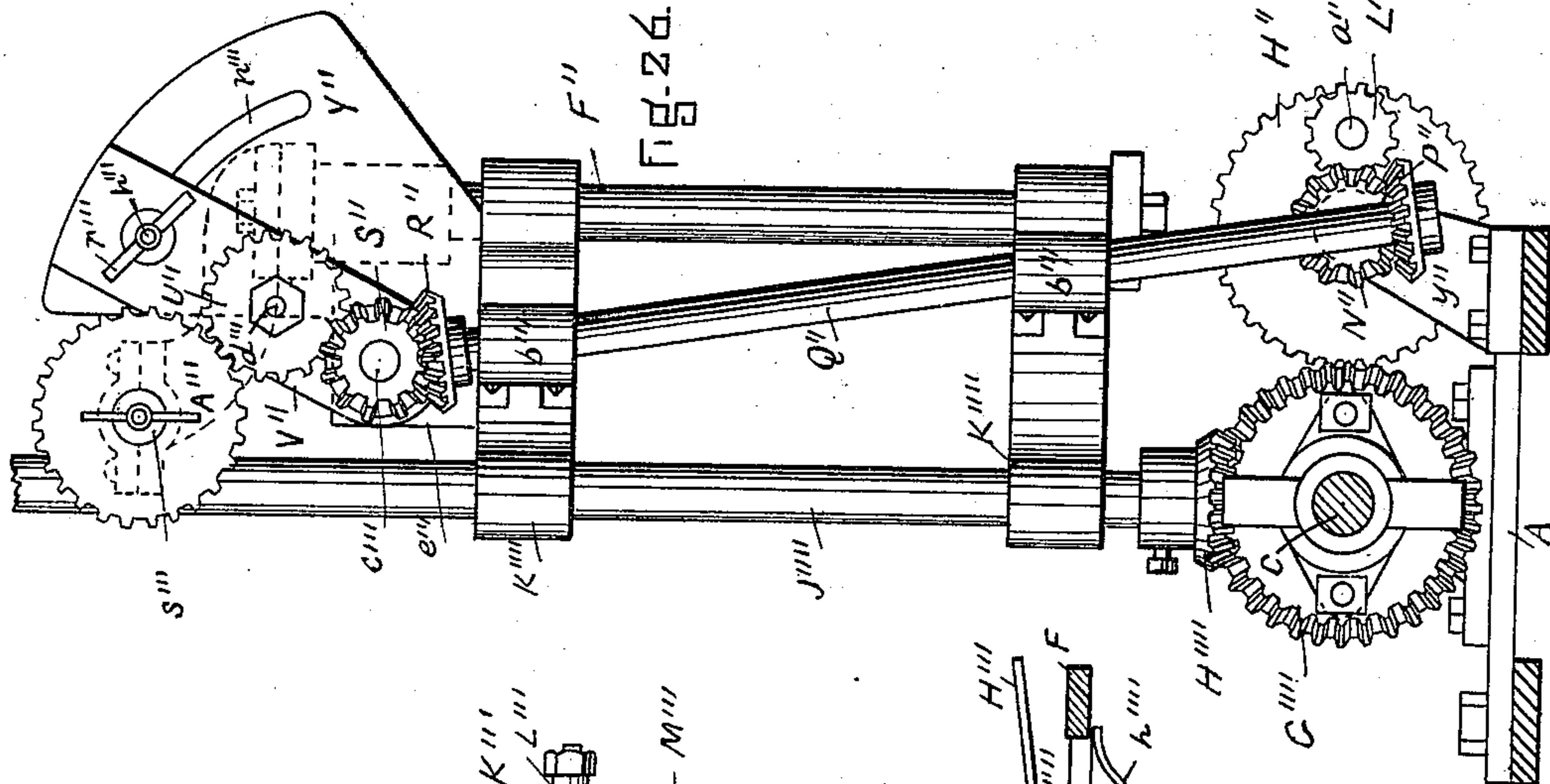
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UNITED STATES PATENT OFFICE.

JAMES TREGURTHA, OF MALDEN, ASSIGNOR TO HENRY A. CLARK AND
THOMAS A. JOHNSON, BOTH OF BOSTON, MASSACHUSETTS.

BRAIDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 447,262, dated February 24, 1891.

Application filed December 2, 1889. Serial No. 332,278. (No model.)

To all whom it may concern:

Be it known that I, JAMES TREGURTHA, of Malden, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Braiding-Machines, of which the following is a full, clear, and exact description.

This invention relates to rotary braiding-machines in which there are two sets of bobbins, one set above the other, the two sets being arranged to move concentrically in contrary directions; and the invention consists in a braiding-machine having two sets of bobbins, one set above the other and arranged to move concentrically in contrary directions, of the construction and arrangement of suitable mechanism and parts for the operation of the machine, all substantially as hereinafter fully described.

In the accompanying sheets of drawings is illustrated a braiding-machine constructed in accordance with this invention.

Figure 1 is a view of the entire machine in front elevation. Fig. 2 is a plan view thereof below line 2 2, Fig. 1. Fig. 3 is a detail plan view below line 3 3, Fig. 1. Fig. 4 is a detail view below line 4 4, Fig. 1. Fig. 5 is an end elevation in detail of parts shown in Fig. 4, looking to the right from the line 5 5, Fig. 4. Fig. 6 is a detail vertical central section on line 6 6, Fig. 4. Fig. 7 is a detail vertical section on line 7 7, Fig. 3, to show more particularly the means of driving the various parts. Fig. 8 is a central vertical section on line 8 8, Fig. 2, showing a bobbin in section and means for supporting it. Figs. 9 and 10 are detail sections on lines 9 9 and 10 10, respectively, Fig. 8. Fig. 11 is a detail central section of some of the parts more fully shown in Fig. 8. Fig. 12 is a detail central vertical section on line 12 12, Figs. 2 and 3, showing the manner of operating some of the parts. Fig. 13 is a detail vertical section on line 13 13, Fig. 1. Fig. 14 is a detail cross-section on line 14 14, Fig. 12. Fig. 15 is a detail longitudinal section on line 15 15, Fig. 13. Fig. 16 is a detail vertical section of one of the bobbins of the upper set of bobbins, showing its means of support and the mode of applying tension to its thread. Fig. 17 is a side view of the same bobbin a quarter round from the view in Fig.

16. Fig. 18 is a detail section of a part of Fig.

16. Fig. 19 is an end view of the screw shown in Fig. 18. Figs. 20, 21, 22, and 23 are detail views of some of the parts representing the manner of carrying one of the threads of a lower bobbin under a bobbin of the upper set. Fig. 24 is a detail section, some of the parts being shown in elevation, of some of the parts carrying the bobbin, and showing the thread as passing between them and under the bobbin. Fig. 25 is a detail plan view of some of the feeding mechanism. Fig. 26 is an end view of some of the same parts and other parts of the feeding mechanism; and Figs. 27 and 28 are two side elevations of the stop mechanism for the thread of a bobbin in the upper set from two different sides.

In the drawings, A A represents a framework on which the various parts of the machine are supported and carried and having legs B B.

C is a horizontal shaft adapted to turn in bearings *a a* of the frame.

D is the driving-pulley, arranged to turn loosely on said shaft and to be connected thereto for operation of the shaft and machine by a clutch E, constructed as usual and arranged to move back and forth on said shaft and having lever and handle F for operation thereof, moving the clutch-lever to the right, connecting the shaft with the pulley, and moving it back, disengaging it therewith.

G (see Fig. 7) is a vertical bevel gear-wheel secured to the inner end of the shaft, which engages with a horizontal bevel gear-wheel H, connected by uprights J to a horizontal flat ring or plate K, which is secured to a sleeve L, loosely fitting a central vertical tubular stem or rod M, on which it can freely turn, the tubular stem being secured at the lower end in a central standard N, secured in the horizontal bed-plate P.

Q is a small horizontal gear-wheel adapted to freely turn on an extension *b* of the sleeve L, resting on a shoulder thereon and having permanently secured to it on its upper side a horizontal bevel gear-wheel R.

Engaging with the gear-wheel Q is a small horizontal gear-wheel S, secured to the upper end of a vertical shaft T, arranged to freely

turn in a vertical bearing d , secured to the ring-plate K and extending down below and through the same, the shaft or rod having on its lower end below the ring-plate K a smaller horizontal gear-wheel U, which engages with a gear-wheel V, permanently secured to or forming a part of a central standard N.

Secured to the upper end of the extension of the sleeve L by a set-screw e is another horizontal bevel gear-wheel W, which turns with the bevel gear-wheel H and ring-plate K. On the ring-plate K are secured at regular distances apart by screws f brackets Y, which support the lower set of bobbins, there being one bracket to each bobbin, and in the present instance six bobbins, each bobbin being arranged to freely turn on a horizontal pin or shaft A' of its bracket.

B' is a screw-nut on the inner end of the pin A', against which bears a spiral spring g , encircling the pin, and against the end of this spring is placed a washer C', loosely fitting the pin, so it can freely slide back and forth thereon, and having a tongue h , which fits loosely in a longitudinal groove m in the under side of the pin and prevents the turning of the washer on the pin, but does not interfere with its longitudinal movements thereon. Against this washer rests the bobbin Z on the pin A', and at the outer end of the bobbin is another washer D', having an oblong opening n to fit the pin near its outer end, which at the end is correspondingly shaped in cross-section to receive the washer. The end has an open elongated longitudinal slot r , in which is arranged to swivel a thin flat piece E' of the width of the diameter of the pin, and when swung in line with the pin, as in Fig. 11, the end washer D' and bobbin can be easily removed from the pin, its width, however, preventing the washer C' from being removed because of its tongue h , and its length being such that swung across the pin, as shown in Fig. 8 more particularly, it holds the bobbin and washer D' on the pin and prevents their accidental detachment therefrom.

The spring g presses the washers and bobbin against the cross-piece E', creating the necessary drag on the bobbin, which can be increased or diminished, as required, by turning the screw-nut B' in one or the other direction on the pin. The two washers fit the pin somewhat loosely to accommodate themselves to their bearings on the bobbin; but not so that they will turn round with the bobbin. Each bobbin F' of the upper set turns upon its vertical pin or shaft G', each pin being secured to a small horizontal plate H', each plate having on its under side a wide transverse groove t and being arranged to move on a horizontal ring-plate J' above the bevel gear-wheel W, which ring-plate is secured at regular intervals by uprights K' to the lower ring-plate K.

The outer edge u of the ring-plate J' is cut under or beveled, as shown in Figs. 12 and 24, the groove t of the bobbin-plate H' being

made to correspondingly fit the same by securing to the under side of the plate separate cross-pieces a^b and b^b , although, if desired, the plate with the pieces can be made of one piece. In Figs. 16 and 17 the plate is shown without the pieces attached.

Secured to the front of each bobbin-plate H' and extending under the ring-plate J', but free thereof, is a plate L', which plate, with the upper plate H', makes the bearing and guide for the travel of the bobbin-plate round on the ring-plate, the plate L' having a downwardly-projecting portion or block M', which has in its inner face n an open segmental circular vertical groove N', with which engages a longitudinally end-projecting ring or short tube P' of a horizontal radial shaft Q', turning freely in bearings v , secured to the upper side of the gear-wheel R. Each of these radial shafts has a bevel gear-wheel R', which engages with the horizontal bevel gear-wheel W.

With motion communicated to the shaft C, turning it to the right, its bevel gear-wheel G turns the bevel gear-wheel H, the lower ring-plate K, and the bevel gear-wheel R to the right, consequently carrying the lower set of bobbins, which are on the ring-plate K, in such direction. The lower ring-plate K (see Fig. 7) as it revolves carries with it the vertical bearing d , the upright shaft T, mounted in said bearing, and the lower gear-wheel U around the stationary gear-wheel V of the central standard, thereby revolving the gear-wheel U and said shaft T. The gear S at the upper end of shaft T, engaging with the gear-wheel Q, secured to the horizontal bevel gear-wheel R, turns the gear-wheels Q and R, carrying around with them the radial shafts Q', which by their engagements with the plates L', secured to bed-plates H' of the bobbins of the upper set, carry the bobbins with them to the left, or in the contrary direction to that in which the lower set of bobbins are moving. At the same time by the carrying round of the radial shafts with the bevel gear-wheel R and by the engagement of their respective bevel gear-wheels R' with the horizontal bevel gear-wheel W, fixed to the sleeve L, each radial shaft is caused to revolve on its own axis, for the purpose hereinafter described.

To create drag on a bobbin F' of the upper set, a flat spring-arm S' is provided, (see Figs. 16, 17, and 18,) having a cap or collar end w , which fits over the upper end y of an upright post a' , secured to the plate H', a spiral spring b' surrounding the post and bearing against the under edge of the cap or collar w and the plate, the spring-arm S' being secured in place by a screw d' , screwing through the cap end into the top of the post, the spring-arm being bent up and extending over the top of the bobbin and having secured to it on its under side by a screw T' a plate or washer e' . This washer rests on the top of the bobbin and is secured to the spring so it can have free movement thereon, but not to turn with the bob-

bin. The screw has a flat head f' , which fits in the central opening of the bobbin, and next to it a portion g' , square in cross-section, (see Fig. 19,) on which it cannot turn. The spring-arm has an opening h' , which passes freely over the screw-threaded portion of the screw and bears upon the shoulder of the square portion, leaving the washer comparatively free, and screwing onto the screw T' is a check-nut m' , which, being screwed down tightly, holds the screw T' firmly to the arm, preventing by its square portion the turning of the washer, the shoulder, however, leaving the washer otherwise free practically. The tension on the bobbin can be increased or diminished by turning in or out the screw d' on the post, which forces down the spring-arm S' or allows it to rise from the action of the spiral spring b' , which holds the spring-arm up against the screw-head at all times, or the tension can be regulated by bending up or down the spring-arm itself.

U' is a lever or arm pivoted by one end to a standard n' , secured to the outer edge of the lower ring-plate K , and pivoted at r' to the lever is a rod t' , connected to an eccentric w' on a horizontal shaft V' , turning in bearings v' on the ring-plate K and having on its inner end a vertical bevel gear-wheel W' , which engages with the horizontal bevel gear-wheel R , by which as the bevel gear-wheel is revolved the shaft V' is revolved, and at each revolution the lever, from its eccentric connection therewith, will be moved or swung up and down on its pivot r' , for purposes hereinafter described.

The thread A'' from each lower bobbin Z passes over a hook w' , then under a hook y' of the standard n' , thence upward over a wheel a'' , pivoted to the upper end of the standard along the lever U' through a longitudinal open slot in a stud d'' on the free end of a flat spring e'' , secured by its other end to the side of the lever at f'' , and thence through an opening g'' in the end of the lever to the center of the machine.

The thread B'' from the upper bobbin F' passes through an opening h'' in a stud m'' , secured to the bobbin-plate H' , and then lies or is disposed in an open slot n'' in the upper end of the bent-up portion or arm r'' of a horizontal lever C'' , pivoted at t'' to a lug u'' of the bobbin-plate, and from thence to the center of the machine, where the threads from all the bobbins meet, and are then braided together, either by themselves or round about a core of any suitable material, the threads as braided together being fed up through a horizontal guide-ring D'' , secured to a horizontal cross-bar E'' of the uprights F'' F'' of the frame by a feeding device, the construction and mode of operation of which will now be described.

On the driving-shaft C is a gear-wheel G'' , engaging with a gear-wheel H'' , arranged to turn loosely on a short shaft v'' , turning in bearings in posts w'' and y'' of the bed-plate.

Secured on one end of a short shaft a''' , turning in bearings of the gear-wheel H'' , is a gear-wheel J'' , engaging with a gear-wheel K'' , rigidly fixed to post w'' , and rigidly secured on the other end of the shaft a''' on the other side of the gear-wheel H'' is a small gear-wheel L'' , having sixteen teeth, which engages with a gear-wheel M'' , having fifteen teeth, rigidly secured on the shaft v'' , the gear-wheels J'' and K'' having sixteen teeth each. On the outer end of the shaft v'' on the opposite side of post y'' is a vertical bevel gear-wheel N'' , engaging with a horizontal bevel gear-wheel P'' , secured to the lower end of an inclined shaft Q'' , turning in bearings b''' of the frame and having on its upper end rigidly secured to it a horizontal bevel gear-wheel R'' , which engages with a vertical bevel gear-wheel S'' , secured to a journal-pin c''' , turning in bearings on a bar or stud e''' of upright F'' , the pin c''' having a gear-wheel T'' secured to it, which engages with a gear-wheel U'' . Gear-wheel U'' turns on a pin or stud d''' of an arm V'' , pivoted to and adapted to swing on the pin c''' and to be guided in its movements and secured in position by a screw h''' , having a head and passing freely through an elongated circular slot n''' , concentric with the pivot of the arm V'' in a plate Y'' , secured to the upright F'' , the screw having a thumb-screw nut r''' to secure the arm firmly in place against the plate Y'' .

The gear-wheel U'' engages with a gear-wheel A''' , detachably secured on the end of a horizontal shaft B''' , without danger of accidental detachment therefrom, by a thumb-screw nut s''' , the shaft B''' turning in bearings t''' of the horizontal cross-bar E'' and carrying the feed-roller C''' .

As the gear-wheel H'' revolves, it carries the two gear-wheels J'' and L'' around with it, and the travel of the gear-wheel J'' around the fixed gear-wheel K'' revolves the gear-wheel J'' , consequently revolving the shaft a''' and gear-wheel L'' . In each revolution of the gear-wheel L'' the gear-wheel M'' revolves the distance of one tooth, because the gear-wheel M'' has one less tooth than the gear-wheel L'' , and in fifteen revolutions of the gear-wheel L'' the gear-wheel M'' and its shaft v'' will revolve once round, turning the bevel gear-wheel N'' , engaging with the bevel gear-wheel P'' of the inclined shaft Q'' , once round, by which the speed of the feed-rollers is very much reduced, which is desirable in braiding-machines. This arrangement takes the place of the usual worm-gearing of braiding-machines.

The object of the swinging arm V'' , carrying gear-wheel U'' , is to permit of changing the speed of the feed-roller shaft B''' when desired, which is accomplished by removing the gear-wheel A''' and putting in its place one smaller or larger, according as it is desired to turn the shaft B''' faster or slower, which is done by loosening the thumb-screw nut r''' , swinging the arm V'' down to disen-

gage the gear-wheel U'' from the gear-wheel A''' , removing the gear-wheel A''' from its shaft B''' by unscrewing the thumb-screw nut s''' , putting in its place on the shaft B''' a gear-wheel of the desired size, swinging up the arm V'' to engage the gear-wheel U'' with the new gear-wheel on shaft B''' , and then screwing up the thumb-screw nut r''' to secure the arm V'' in place.

To automatically stop the machine when in operation in case any of the threads break or become loosened, so that the machine will then cease to operate until it is attended to by the operator, the following means are provided:

On the thread A'' from a lower bobbin between the two guide-hooks w' and y' hangs a wire u''' by its hook v''' , said wire extending down therefrom through a guide-opening in the part y''' of the standard, its lower portion a''' being square in cross-section to prevent its turning, and extending down through a guide-opening in a part d''' of the standard and projecting below the same a short distance, it being free to move up and down in the guide-openings. Pivoted on a vertical pin or rod rigidly secured to an arm e''' of the bed-plate is an arm E''' , extending horizontally therefrom, in the form shown in Fig. 4 more particularly, and so adjusted as to be just below the horizontal plane in which the lower ends a''' of the rods u''' travel when held up by the threads and carried round by the machine in its operation, and high enough that if the rod should drop down from its position at such time as far as its hook will allow it, it then resting on its guide-bearing part y''' , its lower end a''' will then be below the horizontal plane of the arm E''' , and in the operation of the machine such rod u''' as it approaches the arm E''' (the arm being horizontally the same relative distance from the central axis of the machine, except that its angular outer edge f''' is a greater distance, sufficient for the proper working of the arm by the rod) will bear against the outer edge of the arm and swing the arm on its pivot to the left into position shown in dotted lines in Fig. 4. Secured to the lower end of the bearing of the arm E''' is another horizontal arm F''' , projecting therefrom a little more to the left than the arm E''' , as shown in plan in Fig. 4.

Pivoted at g''' to the arm h''' of the bed-plate is a bar or lever G''' , arranged to swing vertically on its pivot and having one end extending to the left and its other end toward the clutch-lever F , so that the clutch-lever when moved into position to connect the clutch with the driving-pulley will abut and rest against the end m''' of the arm G''' , and be there held from backward movement. The under side of this locking or latch lever G''' is beveled or inclined downwardly from its front edge backward, as shown at n''' in Fig. 5, and the said latch-lever has a flat spring r''' , bearing by its free end against its under side and secured to the arm h''' to hold the latch-lever

up in its position of lock or engagement with the clutch-lever when not otherwise acted upon.

Moving the clutch-lever to the right in Fig. 1 engages the clutch with the pulley, and when the lever is moved past the end m''' of the latch-lever the spring r''' presses the latch up for such end to be in position for the clutch-lever to then abut against it, holding the lever in such position and the clutch to its engagement with the pulley so long as the lever remains so locked.

A thumb-piece II''' , secured to the top of the latch-lever, extends over the clutch-lever F , the pressing down of which thumb-piece when the clutch is locked swings the latch-lever on its pivot and its end m''' from its bearing on the clutch-lever, when the bearing-spring J''' , secured to the lever F and the bed-plate, returns the clutch-lever to its normal position, disengaging the pulley from the shaft.

When the machine is in operation, the thread from a bobbin of the lower set is kept under a state of tension in passing from the bobbin to the center of the machine, where it is braided with the others by the friction on the bobbin and the pull of the feed-rollers upon the braided cord, and such tension is sufficient to hold the rod u''' high enough for its lower end to be above the horizontal plane of the latch-operating arm E''' , so that as it is carried round in the operation of the machine it will then pass over and not touch the arm; but if the thread breaks or becomes loosened the rod u''' will fall by its gravity, so that its lower end will then be below the horizontal plane of the latch-operating arm E''' , and as it approaches the arm in the movement of the machine it will strike and bear against its edge f''' and swing it in its continued movement sufficiently inward for the lower arm F''' to move or ride under the inclined part n''' of the latch-arm G''' , raising the same and swinging it on its pivot, so as to lower its other end m''' sufficiently for the clutch-lever to be free thereof and be swung back by its spring J''' , so as to move the clutch from the pulley, and consequently stopping the machine. After the rod u''' has passed by the outer end of the arm E''' the latter and arm F''' are then free to return to their normal position, it being actuated by a spring g , wound around its journal-pin and connected to its journal or support by one end and bearing by its other end against the lower arm F''' , and in such position the lower arm rests against a stop or shoulder g''' , secured to the arm e''' of the bed-plate, to hold the arm E''' in proper position to be operated by the rod u''' , as before. To operate the clutch in case any of the threads of the upper set of bobbins become broken or loosened, the following means are provided, which are shown more particularly in Figs. 17, 27, and 28:

K''' is a vertical arm pivoted at t''' to the frame and having a crank-arm L''' , which is

connected by a rod M''' to one end of a bar P''' , pivoted at Q''' to an arm R''' of the frame, its other end S''' resting on a clasp T''' (loosely surrounding the standard N) of a lever U''' , pivoted at V''' to a lug of the bed-plate and extending therefrom in position for its other end W''' to be under the end Y''' of the latch G''' .

Pivoted on the outer end of the horizontal lever or bar C''' of the bobbin-plate H' is a round pin A''' , which passes down through an opening v''' in the bobbin-plate, in which it has free movement up and down.

The upper end of the stop-arm K''' is in a horizontal plane just below the horizontal plane of the lower end of the bar-pin A''' and is the same distance radially from the central axis of the machine. The tension on the thread B'' , passing from the bobbin F' to the guide-ring, holds down the inner end of the bar C'' , and thus its outer end, with the pin A''' , high enough so that in its travel round the pin will pass above and free of the arm K''' , but the instant the thread breaks or becomes loose, there being then no resistance to the bar, its end u''' falls by its greater gravity, lowering its pin so that the pin will then, as it is carried round, strike against the arm K''' , swing it on its pivot, and by its connection with the bar P''' cause its end S''' to press down the clasp end T''' of the lever U''' , raise its other end W''' , and thus move the latch-lever, and consequently release the clutch-lever, as before described, and stop the machine. Each one of the lower threads has a gravity-rod and each one of the upper threads has a gravity-lever, so that whichever thread breaks or becomes loosened its respective rod or lever will be released and stop the machine.

The feeding of the material after it is braided is accomplished as follows: The various threads from all the bobbins pass up through the guide-ring D'' , being then braided, to and between the feed-rollers C''' and D''' , the one C''' on the shaft B'' and the other D''' on a short shaft B''' in bearings in a small frame C''' , resting on the cross-bar E'' , the two shafts being connected together by gear-wheels D''' D''' , and the frame being arranged to slide back and forth on and across the bar, so that its feed-roller D''' can be moved to and from the other feed-roller, the frame being secured from detachment by a screw w''' , passing through an elongated slot y''' and screwing into the bar E'' , as shown more particularly in Figs. 13 and 25.

E''' is a horizontal screw, which screws through a right-angular downward extension a^5 of the feed-roller frame in front of the bar E'' and in position to bear against the front end of a horizontal pin F''' , having a head b^5 and arranged to slide back and forth in a socket d^5 on the underside of the bar. This screw has a check-nut e^5 on it, which, after the screw is set, is turned up to its bearing to hold the screw firmly in place.

The pin F''' has a spiral spring f^5 , which

bears against the shoulder g^5 and pin-head b^5 , pressing by its tension the pin outward and through the screw E''' pressing the frame carrying the feed-roller D''' forward to cause feed-roller D''' to bear against the other feed-roller C''' , or the braid or cord when placed between their peripheral grooves h^5 to feed it from the machine. In a slot m^5 in the end of the pin is a lever-arm G''' , pivoted therein at n^5 , which, when swung across the bearing, holds the pin from forward movement, as shown in Figs. 13 and 15, and when swung for its end r^5 to bear against the plate or cap t^5 over the end of the bearing, as shown in dotted lines, Fig. 15, pulls the pin back against its spring, moving it away from the screw E''' , so that then the frame, with the feed roller D''' , can be easily moved back from the other feed-roller for the insertion between them or removal therefrom of the braid. This arrangement enables the feed-rollers to be easily separated for the purpose stated without altering the adjustment of the set-screw E''' .

In operating the machine, power being applied to the pulley and the clutch engaged therewith, the lower set of bobbins will be carried round in one direction to the right and the upper set of bobbins in the opposite direction to the left, and each bobbin being supplied with its thread, the several threads are passed through their respective hooks and guides to the central guide-ring, up which all are carried by hand, and the machine being set in operation the several threads are braided together and are passed between the feed-rollers, the one D''' first being moved back from the other, as described, for the easy insertion of the cord or braid, and after the latter has been placed in position the feed-roller D''' is moved back and secured in place, the feed-rollers then feeding the braid as fast as braided to a spool, and on which it can be wound by being connected by belt to the pulley F''' on shaft B'' for the turning of the same. In the travel of the bobbins the threads from the upper set of bobbins pass continually round to the left in a horizontal or substantially a horizontal line; but each thread of a lower bobbin passes to the right and over one of the upper threads and its bobbin and under the next bobbin and its thread, over the next, and then under the next, and so on continually, which braids the threads all together. The delivery end g'' of each thread-lever U' moves up and down, as described, sufficiently for its respective thread A'' when the lever is highest to pass over, and when lowest to pass under freely and easy an upper bobbin and its plate. To accomplish this the tubular or ring end P' of each radial shaft Q' , which engages with an upper bobbin-supporting plate, is cut away at one side, as shown at u^5 in Figs. 14, 20, 21, 22, 23, and 24. The revolutions of the radial shafts Q' are so timed in relation to the travel of the upper set of bobbins and

the travel and the up-and-down movements of the levers U' that when the delivery end of each lever moves down it passes below the horizontal plane of the upper ring-plate J' , as shown in Fig. 20, carrying the thread with it, the thread passing through an opening v^5 cut through the upper ring-plate J' and into a vertical opening w^5 , in continuation of the opening v^5 in the upright connecting two adjacent ring-plates, and as the thread reaches the under part of the bobbin-plate H' and near to or about its lowest point the radial shaft then next thereto and carrying the bobbin-plate, under which the lever-thread is then to pass in its movement round the central axis of the machine, will have reached such thread and have revolved on its own axis sufficiently for the opening w^5 in its tubular end P' to be in position for the thread to pass into or enter such opening and between it and its connecting-block of the bobbin-plate on one side, as shown in Fig. 21, and in the continued rotation of the radial shaft and the movements of the thread and radial shaft toward and past each other the thread will pass down into the opening w^5 at its lowest point, as shown in Figs. 22 and 24, through and out at the other side of the opening, as shown in Fig. 23, and thus under and free and clear of the bobbin-plate to which the radial shaft is connected, as shown more fully in Fig. 24, and then by the upward movement of its lever the thread will be carried upward between the last bobbin and the next approaching, and at its highest point the next bobbin will pass under the thread and the thread over it in their continued movements, when the lever and thread will then be moved down again under the next bobbin and the thread through the opening in the tubular end of its radial carrying-shaft up again and over the next bobbin, and so on continually alternately under and over a bobbin in the upper set.

The under parts of the bobbin-plate, the top of the radial shaft bearing nearest its tubular end, and the upper-edge of the bevel gear-wheel W are cut away sufficiently to allow the thread free movement between and by them, so that it will not touch them when passing under the bobbin-plates, all as shown particularly in Fig. 24, which shows the thread in line from the delivery-eye of the lever at its lowest point to the guide-ring D'' as it passes through the opening w^5 in the tubular end of the radial shaft and below and under the bobbin-plate.

The cutting away of a portion of the tubular end of the radial shaft for the opening w^5 is not so much but that some part of the tubular portion is within the circular slot in the bobbin-plate block to insure at all times its connection therewith to properly carry the bobbin around on the upper ring-plate.

The travel of the lower and upper ring-plates and the lower bobbins in a circular direction to the right is at the same speed as

the upper bobbins travel to the left. The levers U' in the present machine are arranged to all move upward and downward together with their respective threads, but they can be arranged to move in such manner that while every other one is moving upward the others are moving downward, and vice versa, or in any suitable order. In order that the tension on the threads of the lower set of bobbins, so far as the movements of the delivery ends of the levers are concerned, shall not be irregular, but be equal and uniform through their full movements, and that the threads shall be delivered alike at all times, the pivots on which the delivery-levers swing or rock are arranged in the same horizontal plane or substantially the same horizontal plane of the under side of the guide-ring D'' at the center of the machine, so that throughout the full length of their up-and-down movement the delivery-eye g'' of such lever will be practically the same distance from the guide-ring.

The gear-wheel G'' on the driving-shaft has a bevel gear-wheel G''' on its side, which engages with a horizontal bevel gear-wheel H''' , rigidly secured to the lower end of an upright shaft J''' , turning in bearings of supports K''' , attached to the uprights F'' , its upper end being adapted to receive a crank-handle, (not shown,) by which the machine can be operated by hand when desired.

The radial shafts connect with the upper bobbins to carry them round on their supporting-ring plate, and for such purpose alone their connection with the plates or supports for the bobbins can be arranged in any suitable manner, but for the purpose also of having the threads from the lower set of bobbins pass under the upper set of bobbins each shaft must be cut away at its intersection with its bobbin-plate, substantially as described or in any equivalent manner.

In braiding round a wire or cord for a core it is passed up through the tubular stem M and the threads braided round it as it enters the guide-ring, the stem being hollow throughout its length, as shown, for such purpose.

The gear-wheel H'' need not be made in the form of a gear-wheel, as it can be of a plain disk shape, or simply a bar, or of any shape that will carry the gear-wheels J'' and L'' and can be operated or revolved in any suitable manner.

z^5 is a stop-pin secured to the support R''' for the lever P''' to bear against when in its normal position to keep it and its operating-bar K''' in position to be acted upon by the pin A''' when a thread of an upper bobbin breaks or becomes loosened.

The gear-wheels J'' , K'' , and L'' can have a more or less number of teeth, all, however, having an equal number, and the gear-wheel M'' can have more than one less tooth, as described, and in such case the gear-wheel M'' would correspondingly revolve the faster.

Having thus described my invention, what I claim is—

1. The combination, with the oppositely-moving gear wheel or plate and ring-plate, of a radial shaft mounted in bearings on the former, means for imparting rotation to said shaft in its bearings, and a bobbin-carrier mounted on the ring-plate and engaged by the end of the shaft, the threads above which the bobbin-carrier moves passing successively between the bobbin-carrier and the end of the shaft.

2. The combination, with the oppositely-moving gear wheel or plate and ring-plate, of a radial shaft mounted in bearings on the former and having a longitudinally-projecting tubular-shaped end, one portion of which is cut away, means for imparting rotation to said shaft in its bearings, and a bobbin-carrier mounted on the ring-plate, having a segmental circular groove to engage with the tubular end of the shaft, the threads above which the bobbin-carrier moves passing successively between the bobbin-carrier and the end of the shaft.

3. The combination, with the oppositely-moving gear wheel or plate and ring-plate, of a radial shaft mounted in bearings on the former, means for imparting rotation to said shaft in its bearings, and a bobbin-carrier having a groove on its under side to fit and by which it is guided on the ring-plate and engaged by the end of the shaft.

4. The combination, with a ring plate or support and a series of bobbin-carriers mounted thereon, of a revolving plate, a series of radial shafts mounted in bearings thereon and each engaging at its outer end with one of the bobbin-carriers, the gear-wheels R' , carried by said shafts, and the revolving gear-wheel W in engagement with said gear-wheels R' , the outer ends of the shafts being constructed to permit the passage of braiding-threads between them and the bobbin-carriers.

5. The combination, with a bar or rod u''' , having a hook v''' , a plate or support for a bobbin, having guideways in which said bar or rod is arranged to slide up and down, and a rotating carrier, of an arm E''' , pivoted to a suitable support and having an arm F''' , a latch or locking arm, and the clutch-operating lever.

6. The improved stopping mechanism for acting in case of the failure or breakage of one or more of a series of braiding-threads, comprising, in combination, pivoted arm K''' , adapted to be engaged by a moving projection under the control of each thread, a lever P''' , connected to the said arm, a lever U''' , operated from said lever P''' , and a latch-lever G''' for locking the clutch of the driving-shaft of the machine.

7. The combination, with an arm or rod having a longitudinal groove in its side secured to a bracket or support, of a washer on said rod adapted to engage with said groove, and a spring on said rod bearing against the bracket and washer, for the purpose specified.

8. The combination, with an arm or rod hav-

ing a longitudinal groove in its side secured to a bracket or support, of a washer on said rod adapted to engage with said groove, a screw-nut, and a spring on said rod bearing against the screw-nut and washer, for the purpose specified.

9. The combination, with an arm or rod having a longitudinal groove in its side, of a washer on said rod adapted to engage with said groove, a spring on said rod bearing against the bracket and said washer, a washer on the outer end of said rod, and a piece pivoted to said rod to hold the washers and spring upon said rod, for the purpose specified.

10. The combination, with an arm or rod having a longitudinal groove, of a washer on said rod adapted to engage with said groove, a spring on said rod bearing against the bracket and washer, a washer on the outer end of the rod, the end of the rod being shaped in cross-section to prevent its turning thereon, and a piece pivoted in a slot in the end of the rod, substantially as and for the purpose specified.

11. The combination, with a post or support a' , secured to a suitable base, of a spring-arm S' , a screw securing said spring-arm to said post or support, and a spring to bear against said arm and hold it up against said screw.

12. The combination, with a post or support a' , secured to a suitable base, of a spring-arm S' , having a cap or collar on one end to fit over said post or support, a screw securing said arm to said post or support, and a spring to bear against said arm and hold it up against said screw.

13. The combination of a gear-wheel H , a support for one set of bobbins carried by said gear-wheel, a sleeve or bearing L , to which said gear-wheel is secured, a support around which said sleeve revolves, a central standard N , a stationary gear-wheel V on or of said standard, a gear-wheel U , engaging with said stationary wheel, a vertical shaft T , to which said gear-wheel U is secured, arranged to revolve in suitable bearings on said bobbin-support, a gear-wheel S on said shaft, a gear-wheel Q , engaging with said gear-wheel S , a bevel gear-wheel R , secured to gear-wheel Q , radial shafts Q' , turning in bearings on said gear-wheel R , supports for another set of bobbins, a ring-plate on which said latter bobbin-supports are supported and travel, each radial shaft arranged to connect with a support for the latter bobbins, a gear-wheel R' on each radial shaft, and a gear-wheel W , with which each radial-shaft gear-wheel engages and which is secured to said sleeve, by which the two sets of bobbins are carried round in concentric paths in opposite directions.

14. The combination of a gear-wheel H , a support for one set of bobbins carried by said gear-wheel, a sleeve or bearing L , to which said gear-wheel is secured, a support around which said sleeve revolves, a central standard N , a stationary gear-wheel V on or of said

standard, a gear-wheel U, engaging with said stationary gear-wheel, a vertical shaft T, to which said gear-wheel U is secured and arranged to revolve in suitable bearings on said
 5 bobbin-support, a gear-wheel S on said shaft, a gear-wheel Q, engaging with said gear-wheel S, a bevel gear-wheel R, secured to gear-wheel Q, a series of shafts V', gear-wheels W' on said shafts engaging with the bevel gear-
 10 wheel R, eccentrics on said shafts V', and thread-delivery levers U', connected to said eccentrics, for the purpose specified.

15. The combination of a gear-wheel H, a ring-plate K, supported and carried by said
 25 gear-wheel and on which one set of bobbins is supported, a sleeve or bearing L, to which said gear-wheel is secured, a support around which said sleeve revolves, a central stand-
 20 ard N, a stationary gear-wheel V on or of said standard, a gear-wheel U, engaging with said stationary gear-wheel, a vertical shaft T, to which said gear-wheel U is secured and ar-
 25 ranged to revolve in suitable bearings, a gear-wheel S on said shaft, a gear-wheel Q, engaging with said gear-wheel S, a bevel gear-wheel R, secured to gear-wheel Q, radial shafts Q', turning in bearings on said gear-wheel R, supports for another set of bobbins, a ring-
 30 plate on which said latter bobbin-supports are supported and travel, a gear-wheel R' on each radial shaft, a gear-wheel W, with which each radial-shaft gear-wheel engages and which is secured to said sleeve, by which the two sets of bobbins are carried round in con-
 35 centric paths in opposite directions, a series of gear-wheels W', engaging with the bevel gear-wheel R, a shaft V' for each gear-wheel W', having an eccentric, and thread-delivery levers connected to said eccentrics, for the
 40 purpose specified.

16. The combination, with a thread-delivery lever U' for carrying the thread from a bobbin to be delivered to the proper place in a braiding-machine, of a shaft V', carrying an eccentric and connected to said thread-de-
 45 livery lever for operation thereof, for the purpose specified.

17. The combination, with feed-rollers C''' and D''', the feed-rollers C''' being arranged to revolve in bearings in a frame C''', ar-
 50 ranged to be moved forward and backward on a suitable support provided with a set-screw E''', of a bearing or rest F''' for the set-screw to bear or rest against, arranged to move back and forth in a suitable guideway, 55
 a spring f⁵, and a cam-lever G''', pivoted to said bearing or rest and arranged to bear upon the support for said bearing or rest, for the purpose specified.

18. The combination, with feed-rollers C''' 60 and D''', the feed-rollers C''' being arranged to revolve in bearings in a frame C''', arranged to be moved forward and backward on a suitable support, and a set-screw E''' on said support, of a pin F''', having a head b⁵ 65
 for the set-screw to bear or rest against, arranged to move back and forth in a suitable guideway, a spring f⁵, and a cam-lever G''', pivoted to the pin and arranged to bear upon the support for said bearing or rest, for the 70
 purpose specified.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

JAMES TREGURTHA.

Witnesses:

EDWIN W. BROWN,
 HENRY A. CLARK.

It is hereby certified that the name of the last-mentioned assignee in Letters Patent No. 447,262, granted February 24, 1891, upon the application of James Tregurtha, of Malden, Massachusetts, for an improvement in "Braiding-Machines," was erroneously written and printed "Thomas A. Johnson," whereas said name should have been written and printed *Thomas A. Johnston*; and that the said Letters Patent should be read with this correction therein that the same may conform to the files and records of the case in the Patent Office.

Signed, countersigned, and sealed this 11th day of August, A. D. 1891.

[SEAL.]

CYRUS BUSSEY,
Assistant Secretary of the Interior.

Countersigned:

W. E. SIMONDS,
Commissioner of Patents.