No. 724,119. PATENTED MAR. 31, 1903.

J. W. NASMITH.

COMBING MACHINE.

APPLICATION FILED OCT. 5, 1901.

NO MODEL. 5 SHEETS—SHEET 1.

FIG. 2

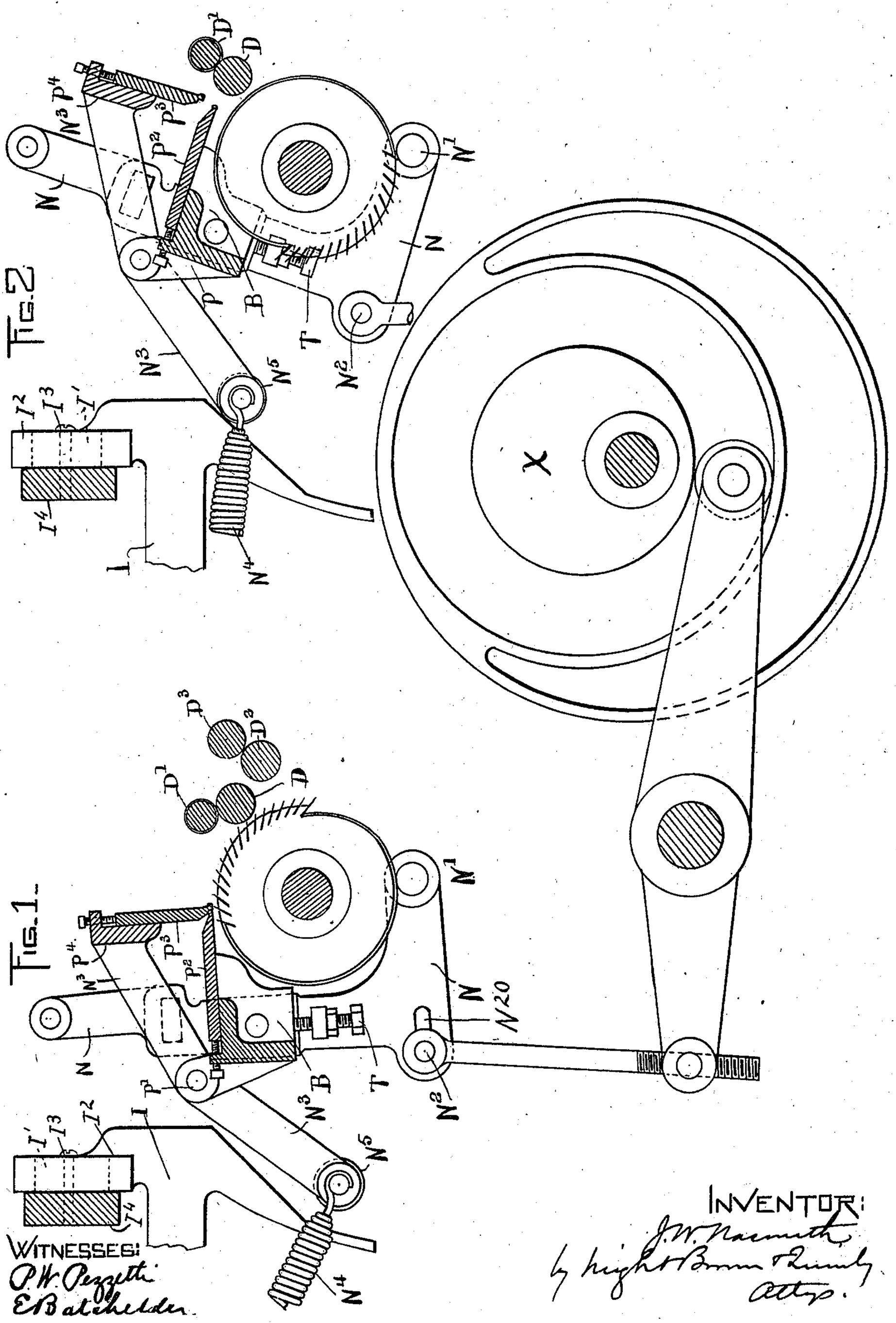

FIG. 1.

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NO MODEL. 5 SHEETS—SHEET 2.

FIG. 3.

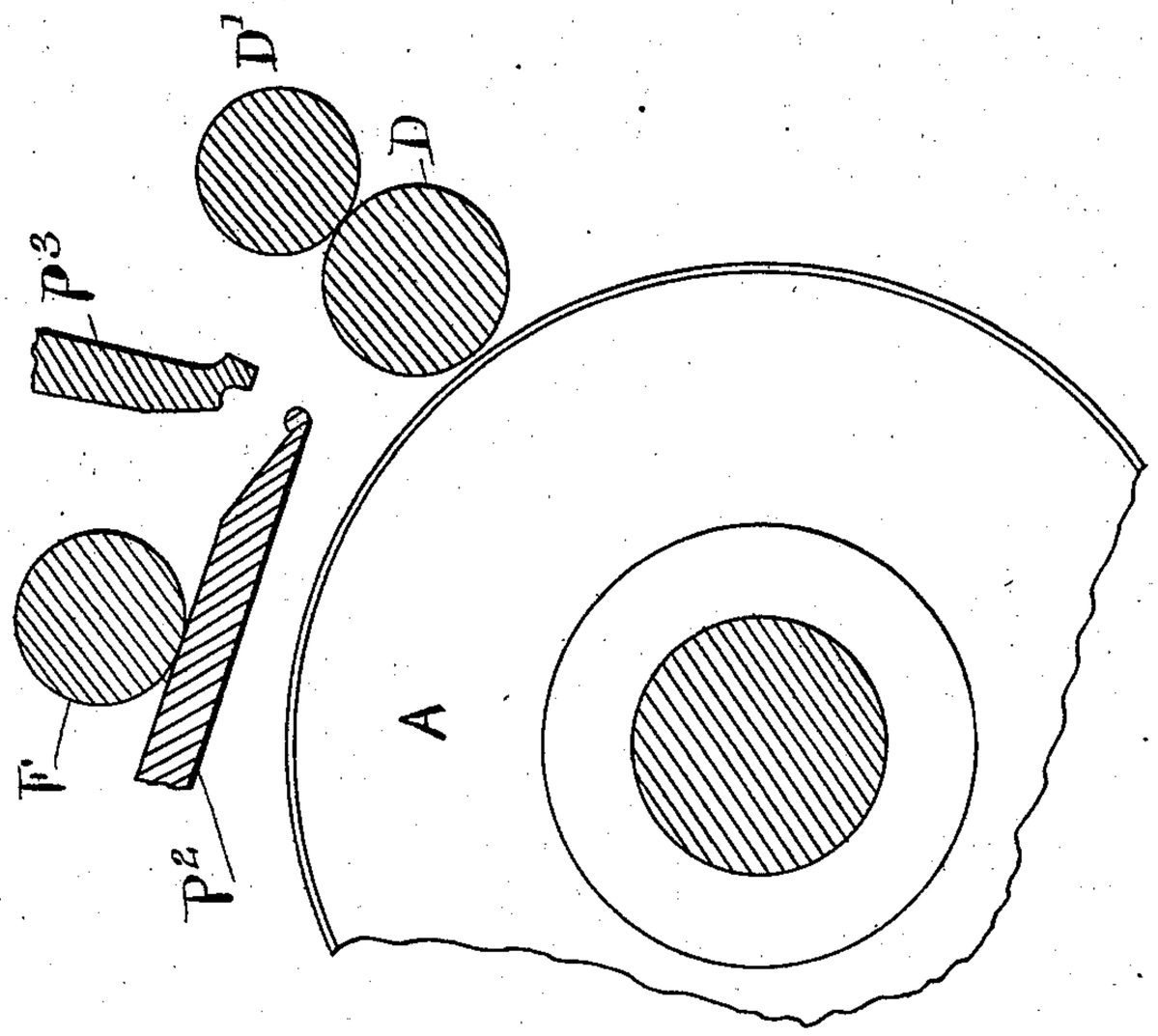
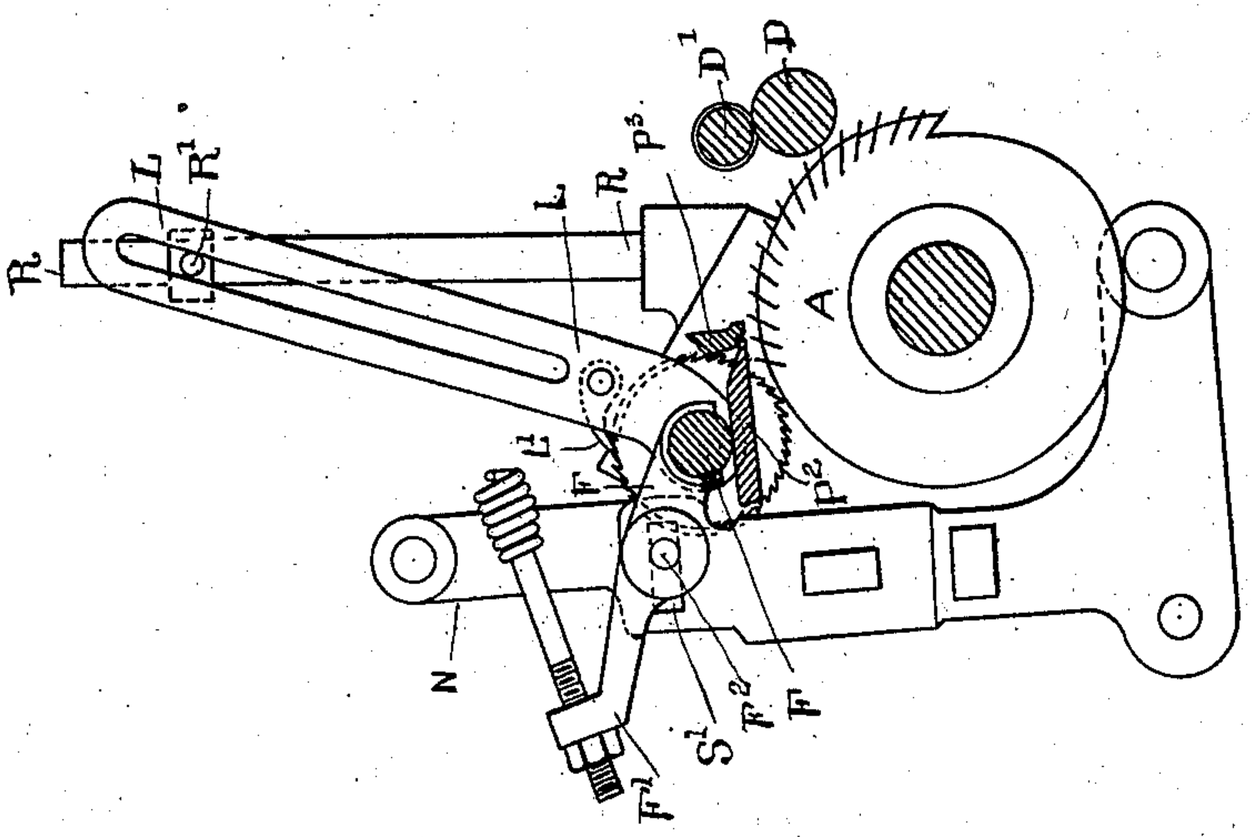


FIG. 3a.



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NO MODEL. 5 SHEETS—SHEET 3.

FIG. 5a.

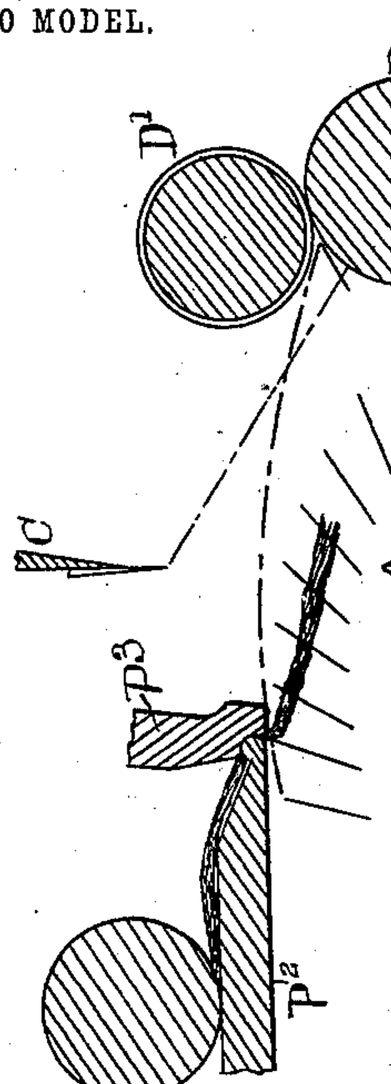


FIG. 5b.

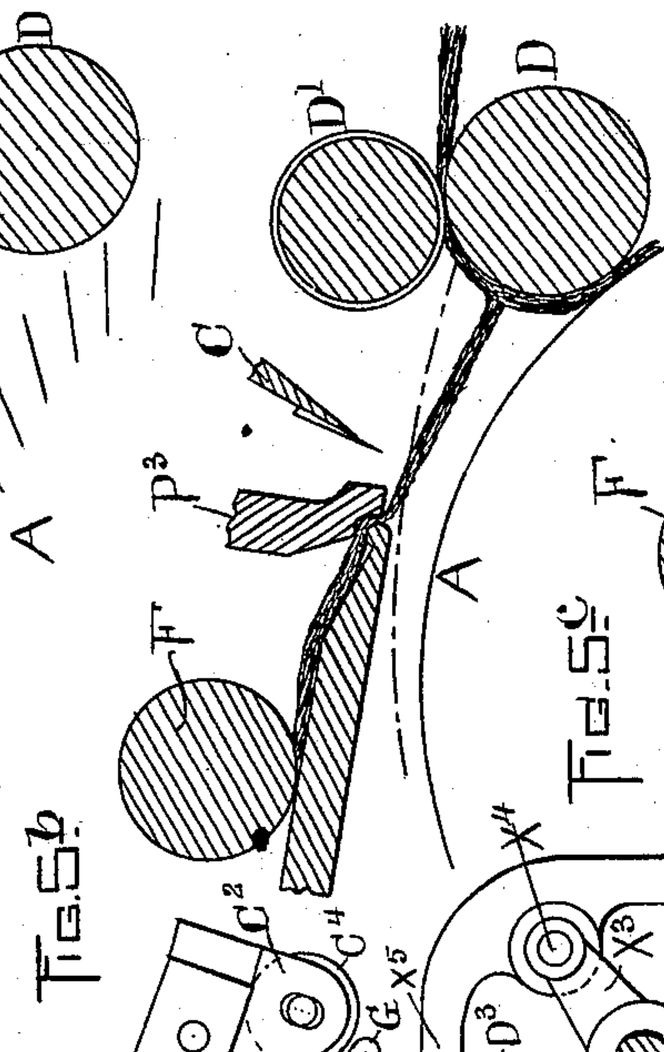


FIG. 5c.

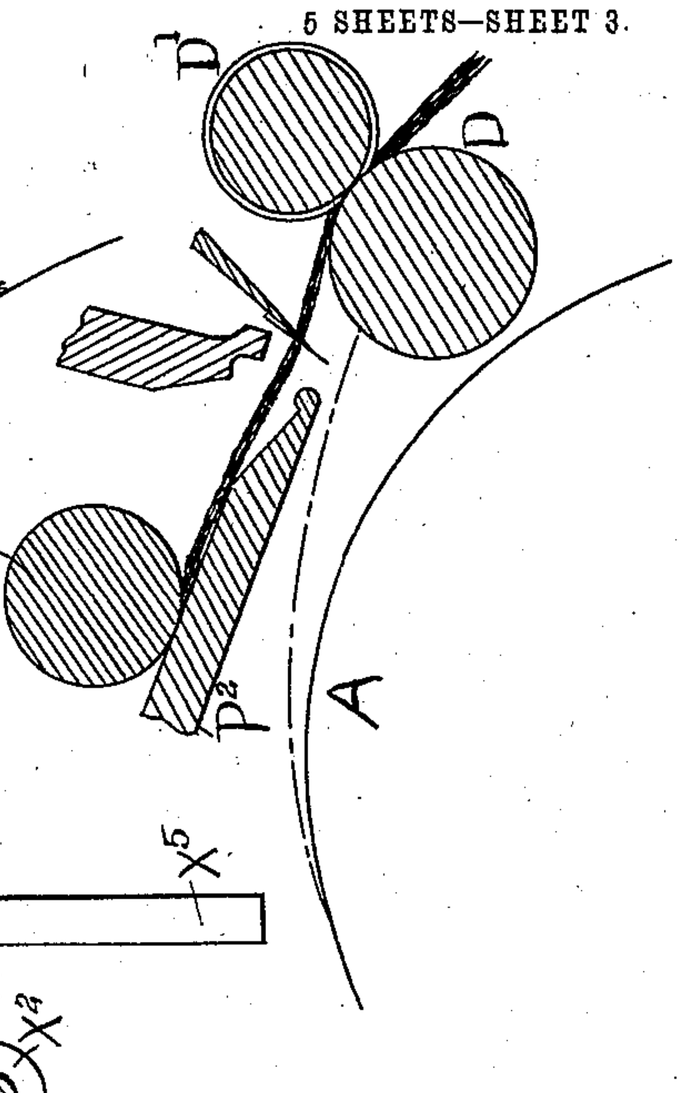
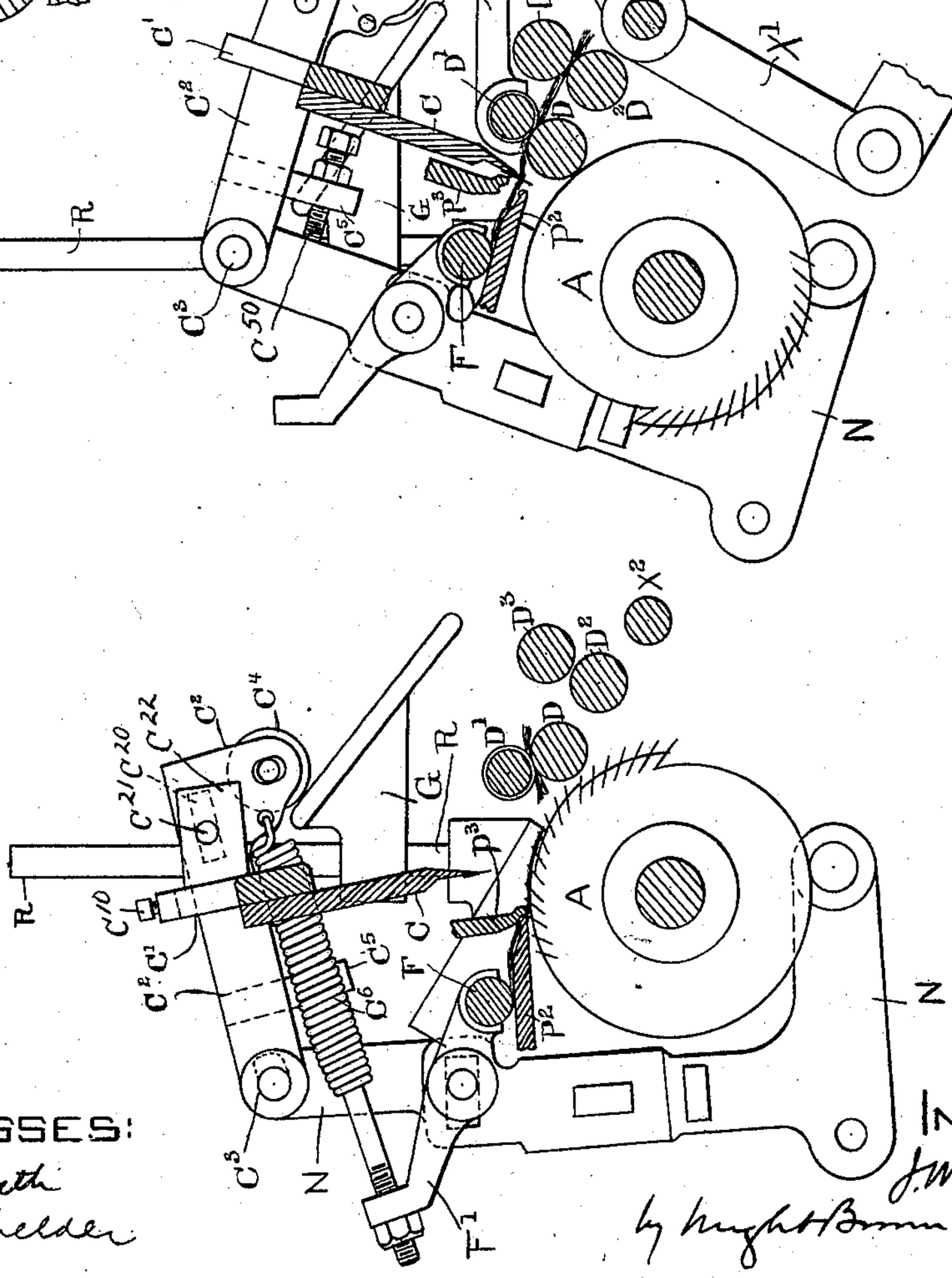


FIG. 4b.

FIG. 4a.



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NO MODEL. 5 SHEETS—SHEET 4.

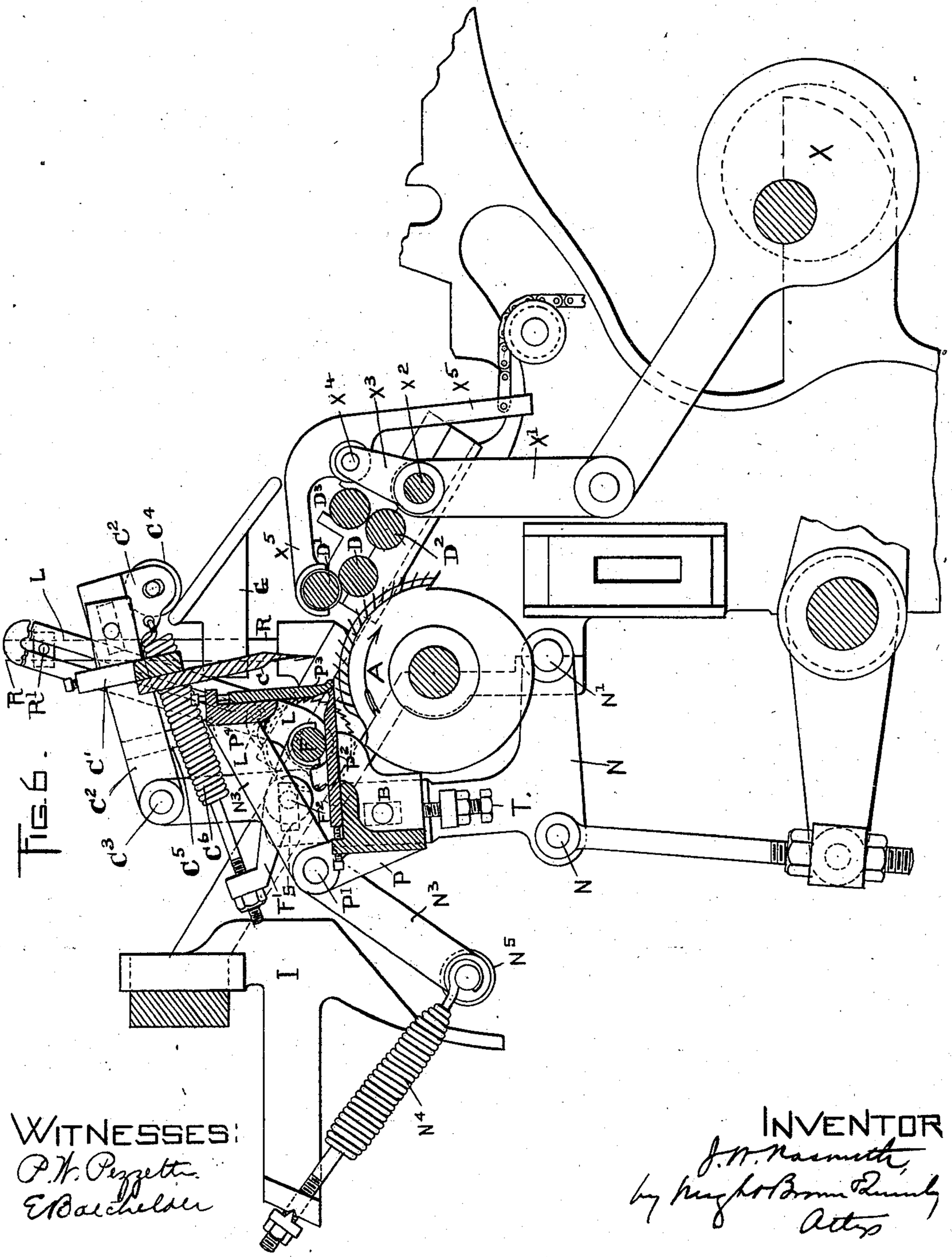

FIG. 6.

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NO MODEL. 6 SHEETS—SHEET 5.

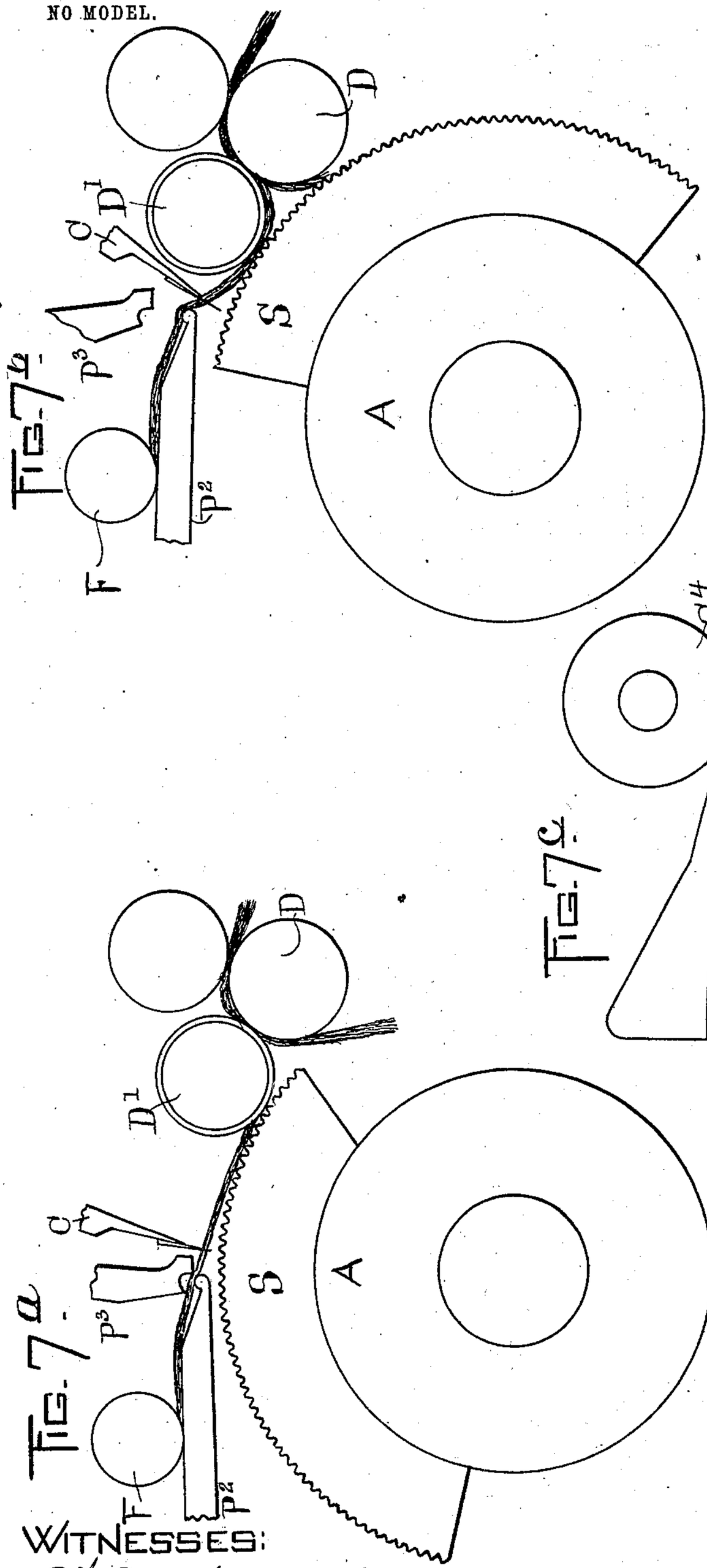

FIG. 7.

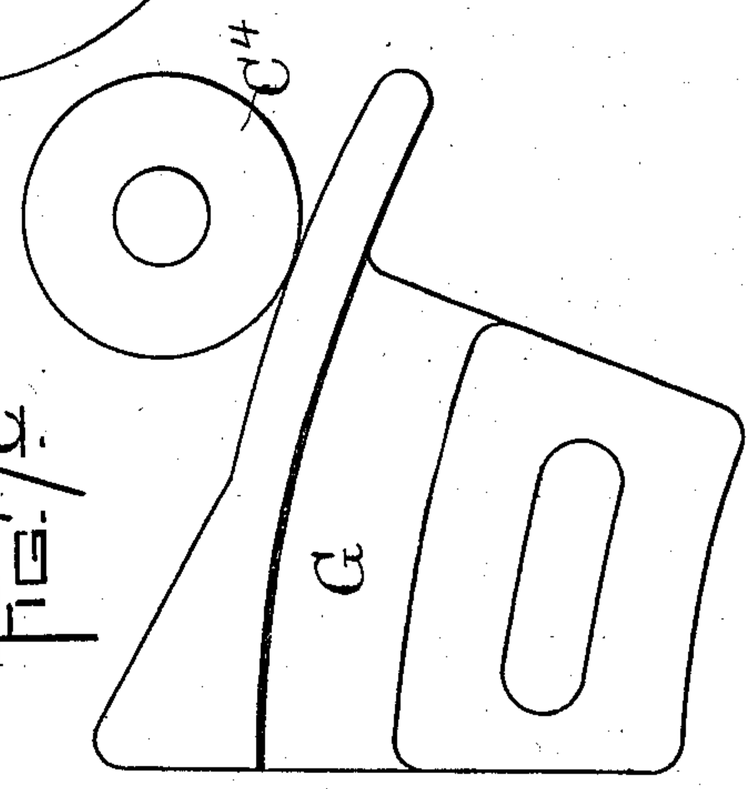

FIG. 7a.

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UNITED STATES PATENT OFFICE.

JOHN WILLIAM NASMITH, OF MANCHESTER, ENGLAND.

COMBING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 724,119, dated March 31, 1903.

Application filed October 5, 1901. Serial No. 77,673. (No model.)

To all whom it may concern:

Be it known that I, JOHN WILLIAM NASMITH, of Manchester, in the county of Lancaster, England, have invented certain new and useful Improvements in Combing-Machines, of which the following is a specification.

As in all combing-machines of the Heilmann type, the present one consists of a revolving comb-cylinder, feed-nipper, and feed-roller, a top comb, and detaching-rollers.

Figure 1 represents some of the parts of my improved machine, partly in side elevation and partly in vertical section, through the middle of the head of the machine, the nipper being closed. Fig. 2 represents a similar view of some of the parts shown in Fig. 1, some of the parts being in the position which they occupy when the nipper is open. Figs. 3^a and 3^b: The former shows the feed-roller mechanism complete in the position occupied by the parts during the combing and the latter figure the main parts in their positions with relation to the detaching-rollers when almost at their nearest point to the same. Figs. 4^a and 4^b show the top comb complete in two positions. Figs. 5^a, 5^b, and 5^c show the feed-roller, nipper-point, top-comb point, and detaching-rollers in three positions. Fig. 6 shows the complete nipper and detaching mechanism in the position most remote from the detaching-rollers. The eccentric which gives the oscillating motion to the nipper is not shown in this figure, but on Fig. 2, and the mechanism for turning the detaching-rollers is not shown at all, as it only differs in dimensions from that now in use. Figs. 7^a and 7^b show the nipper and top-comb point of my improved nipper in connection with the Heilmann detaching-roller, and Fig. 7^c the top-comb support suitable for this combination.

The letters refer in the drawings to the same parts throughout, and all the drawings are sectional through the middle of a combing-head

I will first describe the action of the nipper, feed-roller, top comb and detaching-rollers of the Heilmann comber, which may be taken as the type. I may first observe that the rollers which seize the combed nipper-tuft and draw the fibers composing it through the top comb are sometimes referred to as the "drawing-rollers." In the present specification they are constantly called the "detaching-rollers." In the Heilmann type of machine, some of the parts of which are shown in Figs. 7^a and 7^b, one of the rollers remains for a very brief time in contact with the segment S, and after it is lifted off the rollers continue to turn for a considerable time, so that the separation takes place by this continued motion of the rollers between the feed-roller and the nip of the rollers D and D′, and the movement of the nipper is not a factor in the operation. Other machines have been constructed in which a modified motion has been given to the nipper and top comb; but in all of them the nipper and feed-roller take up a position in front of the detaching apparatus and there remain stationary for a longer or shorter period while the detaching-rollers draw the fibers through the top comb. In most of these machines the distance of the combing-cylinder from the detaching-rollers is too great, necessitating rapid motion of the nipper in passing from one to the other, which disarranges the combed fibers and requires complicated piecing mechanism.

The object of my invention is to modify the motion of the nipper, feed-roller, top comb, and detaching mechanism in the manner which I will now describe.

The nipper frame and plates, Figs. 1 and 2.—N is the nipper-frame, (one at either end of the head, the two forming a pair,) pivoted on fixed studs N′, which are carried on the framing of the machine. These nipper-frames receive an oscillating motion from the eccentric X through a lever and connecting-rods with adjusting-screws in the usual way. The throw of the nipper may be varied by providing slots N^{20} in the nipper-frame to carry the studs N^2. The path followed by the nipper-point is shown in dotted lines in Figs. 5^a, 5^b, and 5^c, to which reference will shortly be made. The transverse bridge B is screwed to a nipper-frame at each end and carries the bottom nipper-plate P^2, which is adjustable on it in the horizontal direction. Cast near each end of the bridge B is a projection P, carrying a stud P′, on which hinge the movable nipper-arms N^3, which are united by being cast together with the transverse bar P^4, to which is screwed the front nipper-

plate P^3. The whole nipper can be adjusted to the proper distance from the needles by the set-screw T. The lower extremities of these nipper-arms carry bowls N^5 and projections, onto which are hooked the springs N^4, whose outer ends pivot on arms of the bracket I, bolted to the back bar. The lower part of the bracket I has an inclined or cam face that intersects the arc described by the bowl N^5 as it oscillates, and the bowl, coming in contact with the incline, is forced to deviate from the arc, and the nipper opens, as shown in Fig. 2. The bracket I is preferably vertically adjustable, as by means of a slot I′ in its foot or base I^2, (indicated by dotted lines in Figs. 1 and 2,) a screw I^3 passing through said slot and entering a suitable part I^4 of the frame. Said bracket I being adjustable in the vertical direction the point of intersection, and consequently the time when the nipper commences to open, can be regulated at will. The pull of the spring is normal to the arc described by the bowl N^5, so that the nipper always tends slightly toward its medial position, and the pull of the spring is partly borne by the cam-face of the bracket I when the nipper is open and by the stud N′ at all times. It will be noticed that the path of the nipper in its passage from the combing-point to the detaching-rollers is almost a direct line and departs as little as possible from the periphery of the combing-cylinder A, whose surface a little beyond the last row of needles, Fig. 6, rises as high or even a little higher than the points of the needles, so that it supports the nipper-tuft in revolving rapidly below it and immediately the nipper opens helps to direct the tips of the fibers of the nipper-tuft exactly to the nip of the detaching-rollers, on the one hand, while it also strokes the tail gently below the bottom detaching-roller D. By thus choosing the path of the nipper and keeping it close to the periphery of the cylinder I am able without any specially-directed air-currents or mechanism of any kind to make an absolutely perfect piecing from the simple motions of the nipper, cylinder, and detaching-rollers combined.

I do not wish to be understood as confining myself to the means shown and described for causing the nipper to move in the path mentioned, as I may substitute therefor any mechanical equivalent thereof.

The feed-roller, Figs. 3^a and 3^b.—The lever F′ is pivoted on the stud F^2, which can be adjusted in the horizontal slot S′, so that the distance of the roller from the front nipper-plate P^3 (and consequently from the nip of the detaching-rollers D and D′ during the separation) can be regulated to suit the length of the fibers to be combed. The said stud F^2 may have its end which projects through the slot S′ threaded and provided with a nut which will enable said stud to be secured in its adjusted position in an ordinary and well-known manner. The easy adjustment of this distance is of great importance, as it affects the quantity of waste made and the distance of the feed-roller from the detaching-roller when at the nearest point must only slightly exceed the length of the longest fibers. The upper end of the lever F′ receives one end of the top-comb spring C^6, Fig. 4^a. The other end of the lever F′, bearing on the neck of the feed-roller, transmits the force of the spring to the roller, so that it presses on the lap of material lying between it and the nipper-plate P^2. Fixed on the end of the feed-roller F is a ratchet-wheel with fine teeth, and freely pivoted on the boss of this wheel is a lever L, slotted for the greater part of its length and carrying the pawl L′. Fixed to the framing of the machine is the vertical rod R, on which is an adjustable pin R′, which engages in the slot of the lever L, and as the nipper moves toward the nip of the detaching-roller prevents the forward movement of the lever at the point where it engages in the slot and causes the pawl to turn the ratchet. The vertical distance of the pin R′ from the roller determines the number of teeth taken at one oscillation and the position of the vertical rod R in relation to the arc of oscillation of the feed-roller is such that the feed is greater per unit of arc the nearer the feed-roller approaches the detaching-rollers. The detaching-rollers D and D′ therefore draw their supply principally from the bodily advance of the tuft projecting from the nipper; but they also obtain a supply due to the turning of the feed-roller while the detaching-rollers are turning forward. The feed-roller is not brought up to a position in front of the detaching-rollers and allowed to dwell there, only turning a little while the detaching-rollers are drawing their supply. It is carried bodily forward directly toward the nip of the detaching-rollers, while at the same time it continues its feed by a partial revolution. There is therefore during the time the detaching-rollers are turning forward the double supply due to the continued revolution and to the continued bodily advance of the feed-roller. The spring connecting the feed-roller and the top comb, Fig. 4^a, is a novel and useful combination.

The top comb, Figs. 4^a and 4^b.—The top comb C is carried on the transverse bar C′, bolted at either end to a top-comb arm C^2, which pivots on the stud C^3, fixed to the nipper-frame N. The transverse bar C′ can be adjusted horizontally on the arm C^2, and the angle may also be varied within the necessary limits. In Fig. 4^a means for obtaining these adjustments are indicated. Said means comprise slots C^{20} in the arms C^2, one slot being indicated by dotted lines in the arm shown in said figure and pins C^{21} projecting outward through said slots from flanges C^{22} at the ends of bar C′. The outer ends of the pins C^{21} may be screw-threaded and have nuts applied to their outer ends. The angular ad-

justment mentioned may be obtained by screws C^{10}, extending through projections at the ends of the bar C′ and bearing on the tops of the arms C^2. The arm C^2 carries at its outer end a bowl C^4 with a slight adjustment and running during a part of the stroke on a guide G, adjustable vertically on the rod R or other convenient support. Cast on the arm C^2 is a projection C^5, tapped for a stop-screw C^{50}, which at any desired moment during the forward movement of the nipper comes against the nipper-frame N, causing the bowl to leave the incline or guide G, arresting its further descent, so that for the remainder of the stroke the top-comb point follows a path parallel with that of the nipper. This permits the moment and depth of penetration of the comb to be regulated at will. (Illustrated in Figs. 5^b and 5^c.) In Fig. 5^b the point of the comb is shown nearly down on the path followed by the under side of the nipper. Without descending much nearer the cylinder it will penetrate the fleece gradually and sufficiently, owing to the latter rising as it is drawn straight between the nip of the feed-roller and detaching-rollers, which straight line is shown by the fibers in Fig. 5^c and lies considerably above the path of the nipper, being highest when the nipper is closest to the detaching-rollers D and D′, owing to the roller D′ rolling over the top of D and to the rise of the feed-roller and nipper as they approach the vertical line passing through the pivot of the nipper, but not shown in the figure. If the path of the nipper be made a straight line, the same effect is obtained by arresting the descent of the top comb at a later point. The position of the top-comb pivot C^3 with relation to the points of the needles is such that the top comb does not fall in a direction parallel to the front nipper-plate, but in a direction which approaches nearer the nipper-plate the lower the comb falls, and I may increase this approach by providing a slot in the nipper-frame N and the top-comb arm C^2, as indicated by dotted lines in Figs. 4^a and 4^b, so as to advance the pivot C^3 nearer to a vertical line drawn through the point of the top comb. This is of considerable importance, especially when the ordinary Heilmann detaching-roller and segment are used, because the comb may be caused to enter the nipper-tuft well in advance of the front of the nipper and still to be close to the nipper when the latter arrives near the detaching-rollers, thus insuring that no part of the tuft shall escape being combed and still no room be lost, the nipper not being prevented by the top comb from approaching as near as required to the detaching-rollers.

I do not wish to be understood as limiting myself to the particular straight inclined form of the guide G illustrated, but may alter the shape and mounting thereof, so as to somewhat vary the described movements of the comb, if desired.

The Heilmann detaching-roller, in connection with my improved nipper, is illustrated in Figs. 7^a and 7^b, where the nipper-point follows its usual path, while the point of the comb follows an arc parallel and close to the segment. A suitable support for the top comb is shown in Fig. 7^c. It is not imperative that the top-comb pivot should be carried by the nipper-frame. It may be carried on an independent arm, which should then have an independent motion imparted to it corresponding approximately in time, direction, and extent with that of the nipper.

The detaching mechanism, Figs. 4^b and 6.—In Fig. 4^b all the parts are shown except the eccentric which oscillates the detaching-roller D′, this eccentric being shown in Fig. 6 to the exclusion of that operating the nipper-frame, which is on the same shaft and is shown in Fig. 2^a. The fluted steel rollers D and D^2 turn in stationary bearings. D^3 is also a metal fluted roller resting on D^2 by its own weight and in stationary guides. The detaching-roller D′ is covered with cloth and leather or other elastic covering and receives a special rolling motion over the top of the roller D for special purposes. In the Heilmann machine this roller rests against the roller D and also rests at each end on an arm of a lever which falls when the segment is passing below the roller and allows the latter to fall on the segment, raising it again when the segment has passed in order to escape the advancing needles. In my arrangement, as in some other machines, I dispense with the fluted segment. I place the roller D′ on the top of the roller D and cause it to roll from a position slightly in front of the imaginary line drawn vertically through the center of the roller D to one slightly behind that line and back again by the following means and for the purposes about to be explained: The rotation of the eccentric X imparts to the lever X′, fixed on the shaft X^2, a rocking or oscillating motion, which is participated in by the forked arm X^3, also fixed on the shaft X^2 and carrying a stud X^4, on which pivots freely the lever X^5, which consequently oscillates with the forked arm X^3. At the lower end of the lever X^5 is attached a chain and weight or spring pulling with a steady pressure, thus causing the upper end of the lever to bear on the end of the roller D′ and press it against the roller D, and this end being forked the roller D′ must also move to and fro with the lever. The object of this displacement of the roller D′ is threefold. First, it is rolled to the back of the roller D in order that when the latter turns backward to deliver its tuft for piecing, the tips of the fibers thus delivered shall be projected against the revolving cylinder A and be stroked underneath the roller D, as seen in Fig. 5^b; secondly, that while in this position or thereabout it may seize the fibers of the nipper-tuft at the earliest possible moment, and, thirdly, it is then withdrawn to the front of the roller D to permit as close an

approach of the top comb and nipper to the nip of the detaching-rollers as possible. In order to draw away the fibers supplied (*a*) by the bodily advance of the nipper and feed-roller and (*b*) by the turning of the feed-roller during that advance, it becomes necessary to greatly increase the forward motion of the detaching-rollers. I propose to retain the backward motion of the detaching-rollers approximately as now used, but to greatly increase the forward motion. In cases where I employ the Heilmann detaching-roller I also increase the circumferential length of the segment and modify the cam for lowering and raising the roller, so as to permit the roller to remain longer in contact with the segment.

Having now described the various parts, I will follow the machine through one complete cycle of its operations. In Fig. 6 the nipper is shown closed and at the point where its forward motion toward the detaching-rollers begins. At this time the fine needles are passing through the nipper-tuft. After the combs have passed the plain part of the cylinder comes under and supports the tuft of the already advancing nipper and by its motion keeps the fibers stroked out toward the detaching-roller. The fibers, owing to their elasticity, will not lie close to the cylinder, but are pointed slightly upward, and immediately the nipper opens they rise still higher, pointing directly toward the nip of the detaching-roller. The opening of the nipper is caused to happen just before the tips of the fibers touch those that have been stroked by the cylinder around the detaching-roller D, which has turned backward in the manner common to this type of machine as the last needles pass below it, and the then overhanging roller D′ projects the fibers against the revolving cylinder, which strokes them under the roller D, as explained. The moment the tip of the nipper-tuft, Fig. 5^{b}, touches the fibers on the roller D (or an instant before) the rollers D and D′ begin to turn forward and the nipper-tuft is instantly seized and drawn straight, coming onto the points of the top-comb needles, which are descending to meet it. Here begins an operation in which my comber differs from every other. The nipper, feed-roller, and top comb continue their forward motion directly toward the nip of the detaching-rollers as long as the latter turn forward, while at the same time the feed-roller continues to feed the lap as long as it moves toward the detaching-rollers and the top comb continues to penetrate deeper into the lap as it advances, partly owing to its further fall on the incline till arrested by the set-screw and partly owing to the rise of the fibers due to the motion of the nipper and the detaching-rollers in my detaching mechanism. Said forward movement of the nipper and other parts improves the feed and prevents pulling apart of the lap. It is not, of course, imperative that the feed-roller should give its feed during this advance of the nipper, but it is better given then than at another period. The nipper having arrived at the forward extremity of its path instantly commences to return, and a brief instant afterward the rollers D and D′ cease to turn forward, the latter having also arrived at its extreme forward position, and holding the fibers firmly between them draw them out of the retiring nipper-tuft through the top comb, making a clean separation. The proximity of the roller at this time in the cycle of operations—namely, when the nipper begins its backward movement—is important. Hence it is made adjustable on the nipper-plate to suit the length of fibers to be combed. When the separation is completed, the top comb rises, and in doing so also moves a little away from the nipper, owing to the position of the top-comb pivot C^{3}. This movement is not enough to leave any fibers in the front of the top comb, but is sufficient to draw backward the seeds and nep engaged therein, so that the comb remains naturally and automatically clean. The closing of the nipper finally throws the fibers out of the comb and into the first rows of coarse needles on the cylinder, which are now meeting the retiring nipper, so that the tuft is thrown well into them by the motion in opposite directions of nipper and cylinder, which, however, ceases before the fine needles reach the fibers, and before the fine needles have passed through the tuft the forward motion of the nipper has again commenced, so that it is moving with the cylinder, preventing the fine needles from roughly tearing or fatiguing the fibers and weakening the yarn to be spun from them. The cycle of operations continually repeats itself as long as material is supplied and motion continues.

It only remains to be observed that the combination of the path of the nipper, its movement, and that of the detaching-roller have been designed so that they may be brought about directly by a crank or eccentric circle or by a cam approximating to either of these well-known and smooth rotary motions—an object never yet attained in any comber. The speed and production of the machine may thus be much increased without noise or undue wear and tear of the parts.

I claim—

1. In a combing-machine of the type indicated, the combination of a movable nipper-frame and means for imparting thereto a reciprocal and continuous motion in a path between the comb-cylinder and detaching-rollers, a lower nipper-plate fixed to the said frame but adjustable thereon, levers hinged to the nipper-frame, an upper nipper-plate secured to said levers, means for operating said levers, a feed-roller mounted upon the lower nipper-plate and adjustable relatively to the detaching-rollers, a pawl-and-ratchet mechanism for operating the feed-rolls, a top or fixed comb, a pair of detaching-rolls, the upper roll being provided with means for im-

parting thereto a rolling motion to and fro upon the lower roll, and a circular combing-cylinder, as set forth.

2. In a combing-machine of the type indicated, the combination with a reciprocally-movable frame, of another frame hinged thereto, a nipper consisting of a lower jaw fastened to the reciprocally-movable frame and an upper jaw fixed to the hinged frame, a stop located in the path of movement of a portion of said hinged frame, whereby the nipper will be opened when it makes its forward movement, a spring normally acting to close the nipper, a pair of detaching-rolls, means for imparting to the upper roll a rolling motion to and fro upon the lower roll, and means for continuously sliding or oscillating the nipper-frame between the combing-cylinder and the detaching-rolls, said means consisting of an eccentric and connecting-levers, the movements of the nipper being timed to cause newly-combed fibers to be attached to those previously combed and fresh fibers to be drawn forward during the period that the top roll is rolled forward, as set forth.

3. In a combing-machine of the type indicated, the combination with levers hinged on the nipper-frame, said levers having forks, of a feed-roll revolving in said forks, adjustable pivots on which said levers are mounted whereby the position of the feed-roll may be adjusted relatively to the front of the nipper, a spring acting upon the rear end of each lever to press the roll onto the bottom nipper-plate, a ratchet-wheel fixed on the end of the roll, a slotted lever hinged on the boss of said ratchet-wheel, an adjustable pin engaging with the slot in the said lever, and a pawl hinged to the said lever and operatively engaging with said ratchet-wheel, as set forth.

4. In a combing-machine of the type indicated, the combination with the nipper-frame, of arms pivoted thereto, said arms having the top comb fastened to them and one of said arms carrying at its forward end a bowl or runner, an inclined adjustable plate located in the path of movement of said bowl or runner whereby the depth and relative time of penetration of the comb into the fleece can be regulated, levers and a feed-roll carried thereby, a stop and screw for limiting the maximum penetration of the comb, and a spring connecting the top-comb arm to one of the feed-roll levers, as set forth.

5. A combing-machine comprising in its construction a combing-cylinder, detaching-rollers, nipper-plates movable toward and from the detaching-rollers, and means for moving the nipper-plates toward the detaching-rollers and continuing said movement after said rollers have seized the tuft to be combed.

6. A combing-machine comprising in its construction a combing-cylinder, detaching-rollers, nipper-plates, feed-roller and top comb, said plates, feed-roller and comb being movable toward and from the detaching-rollers, and means for moving the said plates, feed-roller and top comb toward the detaching-rollers and continuing said movement after the detaching-rollers have seized the tuft to be combed.

7. A combing-machine comprising in its construction a combing-cylinder, nipper-plates, feed-roller, top comb, a pair of detaching-rollers the upper one of which is movable forward and backward in rolling contact with the lower one, means for moving the upper roller forward and backward upon the lower one, and means for moving the said plates, feed-roller and top comb toward the detaching-rollers and continuing said movement after the detaching-rollers have seized the tuft to be combed.

8. A combing-machine comprising in its construction a combing-cylinder, detaching-rollers, nipper-plates movable toward and from the detaching-rollers, a feed-roller adjustably mounted on the lower nipper-plate whereby its distance from the front of the nipper may be varied, and means for actuating the nippers toward and from the detaching-rollers.

9. A combing-machine comprising in its construction a combing-cylinder, detaching-rollers, nipper-plates movable toward and from the detaching-rollers, a feed-roller adjustably mounted on the lower nipper-plate whereby its distance from the front of the nipper may be varied, and means for actuating the feed-roller to cause it to feed the material forward on the lower nipper-plate during its advance with said plate toward the detaching-rollers.

10. A combing-machine comprising in its construction a combing-cylinder, detaching-rollers, a frame carrying nipper-plates and movable toward and from the detaching-rollers, a top comb having a direct pivotal connection with the nipper-frame, and having a bowl or runner, and a guide on which said bowl or runner rests to control the movement or relative time of penetration of the comb.

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

JOHN WILLIAM NASMITH.

Witnesses:
CHAS. F. ASHWORTH,
WM. GRAHAM.