



# UNITED STATES PATENT OFFICE.

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## IMPROVEMENT IN NAPPING-MACHINES.

Specification forming part of Letters Patent No. 129,895, dated July 30, 1872.

*To all whom it may concern:*

Be it known that I, CALVIN P. LADD, of Bloomfield, county of Essex, State of New Jersey, have invented certain new and useful Improvements in Napping-Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawing making part of this specification, in which—

Figure 1 is a side elevation of so much of my machine as is necessary to illustrate the invention. Fig. 2 is a detached view of a novel gearing which I employ to drive the card-cylinder. Fig. 3 represents one of the vibrating carrying-arms with a portion of a napping-roller attached; and

Similar letters of reference denote corresponding parts in all the figures.

My invention has for its object, first, to do away with the necessity of attaching the cloth to a traveling apron and rollers; second, to prevent injury to the goods by untwisting or pulling out the threads; third, to avoid unduly stretching the cloth; fourth, to leave the cloth open to inspection during the process of napping; fifth, to enable the operator to run any desired number of pieces of cloth through the machine at will by merely sewing their ends together, so as to make a continuous strip; sixth, to nap the cloth upon both sides without removing it from the machine; and, seventh, to raise a heavy or light nap, as the kind or condition of the cloth may require.

In the drawing, A A' represent a framework, of any usual or approved construction, upon which the operative parts of my machine are mounted, the only particular feature of construction being the semicircular arch A', the advantages of which will be hereinafter explained. C is the card-cylinder or drum, clad with card-cloth or its equivalent. It is mounted loosely on a shaft, *c*, which is supported in suitable bearings on the frame A, and is driven by some convenient power. C<sup>1</sup> is a cogged disk, secured centrally to the end of drum C. C<sup>2</sup> is an internally-cogged wheel, of a little greater diameter than disk C<sup>1</sup>. The arms of wheel C<sup>2</sup> are attached to one side of the cogged rim, so that said rim is overhung, and can be placed against the end of the drum outside of disk C<sup>1</sup>, and in the same ver-

tical plane, in such manner that they shall mesh with each other, as shown in Fig. 4. Gear-wheel C<sup>2</sup> is mounted upon a cam, *c'*, on shaft *c*. This cam cannot be seen in Fig. 1, as it is directly behind another cam, *d*, which will soon be described. It has also a pendent arm, C<sup>x</sup>, Fig. 2, the lower end of which is slotted, and secured to the frame by a pin or bolt, in such manner that said internal gear C<sup>2</sup> cannot revolve with cam *c'*, but is moved by the cam in a circular path about shaft *c*, which is the axis of drum C and gear C<sup>1</sup>. Hence the rotation of cam *c'*, and the consequent movement of cogged rim C<sup>2</sup> in the direction indicated by arrow, causes drum C to revolve slowly in the opposite direction, as will be readily understood by all who are familiar with the operation of this class of differential gears. D D' is a spider, consisting of five radial arms projecting from a central hub mounted on a cam, *d*, which is keyed to shaft *c*. The four arms D are employed to operate the napping-roller, the fifth one, D', serving merely to maintain the others in a proper working relation, it being slotted at its lower end, and confined to the frame by means of a pin, *d'*, which permits the spider to be actuated by the cam *d*, but prevents it (the spider) from rotating with said cam.

I usually employ four napping-rollers, with corresponding feed-rolls and actuating devices, although I have shown but two; and, as they are all substantially alike in their construction, I will describe but one of them. E is a carrying-arm, pivoted to and sliding on the arch A' through a slot, *e*, at the outer end. E<sup>1</sup> is the napping-roller, supported at each end in a hub or boss, *e*<sup>1</sup>, at the inner free end of arm E, there being a spider, D D', and a duplicate of arm E at each end of the drum. *d*<sup>2</sup> is a bar or rod running through the end of arm D to its counterpart at the other side of the machine, and passing through the slot *e*<sup>2</sup> at the inner end of each of the carrying-arms E.

From this description it will be seen that when the cam *d* revolves it imparts to the outer ends of arm D and bar *d*<sup>2</sup> a corresponding circular motion. If bar *d*<sup>2</sup> were pivoted to arm E roller E<sup>1</sup> would also receive a corresponding motion, but, on account of the slots *e*<sup>2</sup>, roller E<sup>1</sup> travels in the path of an ellipse,

having its longer axis in a plane at right angles to arm E, for a reason which will soon be explained.  $e^3$  is a bearing-block arranged in the inner end of slot  $e^2$  and adjusted by a set-screw,  $e^4$ . The throw of bar  $d^2$  is uniform at every stroke, but it is apparent that by adjusting the position of block  $e^3$  (which is interposed between said bar and the end of the slot) the nearness of the approach of roller  $E^1$  to drum C may be regulated at will. The cloth is moved forward by the action of three feeding-rollers mounted on shafts  $f^1 f^2 f^3$ , these rollers being connected with each other and operated simultaneously by means of spur-gears keyed to their respective shafts, the center shaft carrying, in addition to a spur-gear, a ratchet-wheel, the arrangement of the gearing being plainly shown at  $F^1 F^2$ . The ratchet-wheel  $F^1$  is actuated by a pawl,  $f^3$ , mounted on the projecting end of shaft  $f^1$  and operated by means of slotted lever  $f^4$  and link  $E^2$ , attached, at one end, to a rod,  $d^2$ , and arm D of the spider. In practice I usually apply a spring-pawl and ratchet to the opposite end of the middle feeding-roller, and, when preferred, any or all of said rollers may be provided with short spurs to assist them in feeding. G is a receiver or table, upon which the cloth is placed in either rolls or folds, as may be most convenient. H is a guiding-roller. There may be as many of these rollers arranged in such positions as convenience may require. I is a cleaning-roll mounted in a proper working relation to the card-drum, and driven from shaft  $c$  to clean or sharpen the card, as will be readily understood without further explanation.

In the drawing I have represented the machine as having two sets of napping devices, for the purpose of illustrating the manner in which a piece of cloth may be napped upon both sides without removing it from the machine and by a continuous operation.

The cloth, represented by dotted lines, is placed in the lower receiver G and the end passed between the feeding-rolls on shafts  $f^1 f^2$  of the first or lower napper, thence around napping-roller  $E^1$  from the lower side, and then out between the feeding-rollers on shaft  $f^1 f^2$ . From this point it is carried to the second or upper napper and passed through in a reverse direction—that is, it is fed in above the central feed-roll, instead of below it, and passed around the napping-roll  $E^1$  from the upper instead of from the lower side, by which means the opposite side of the cloth is presented to the card-drum. When it is desired to nap but one side of the cloth it may, after leaving the first set of devices, be carried to any suitable place of deposit and a separate piece be operated upon by each set of devices. In practice I usually employ four of these sets, one to each of the arms D of the spider. It will be observed that in the lower set the cloth is fed forward intermittingly by means of pawl  $f^3$ , lever  $f^4$ , and link  $E^2$  at the time that the napping-roll  $E^1$  is being withdrawn from the

card-drum, while in the upper set the feed takes place as said napping-roll is made to approach the drum. If preferred, the feed in the upper set may be timed to correspond with that in the lower set by transferring the feeding mechanism to the opposite side of the machine. The amount of "bite" of the cloth upon the card may be regulated at will by adjusting the block  $e^3$ , and the amount of feed imparted to the cloth at each vibration of the spider can be varied by moving the arm  $E^2$  in the slot in lever  $f^4$ .

An additional reason for slotting the inner end of arm E is this: If the napping-roll  $E^1$  had the same extent of throw upon a line radial to the shaft C that the end of arm D has, it would slacken and tighten the cloth at each stroke to such a degree as to keep it vibrating and flapping in a very objectionable manner. It is apparent that when a piece of cloth is introduced to the machine it should have sewed to it a leader of such length as will reach from roll  $E^1$  to the withdrawing feed-rolls, so that the entire length of the new piece shall be napped.

From the above description it will be seen that my machine possesses the following advantages: First, that as many pieces of cloth may be napped at the same time as there can be different sets of devices arranged around a card-drum; second, that the motion of the cloth when acted upon by the card-drum is in circular lines, and therefore closely resembles the operation of an ordinary hand-card, thus avoiding pulling out or breaking the threads; third, the feed is very uniform in its action, thus avoiding undue stretching of the cloth; fourth, the arrangement of the parts is such as to leave the cloth open to inspection at all stages of the operation, and to regulate the amount of bite upon the card-drum and the rate of feed; fifth, to enable the operator to nap any desired length of goods by merely sewing their ends together; and, sixth, to nap cloth upon both sides without removing from or stopping the machine.

Although I have described devices which I consider to be best adapted for carrying out my invention, and for producing the results sought to be attained, yet it is apparent that many other methods may be adopted of mounting napping-rollers around the periphery of a card-drum and of imparting a vibrating motion thereto, of feeding the cloth past such napping-rollers, of rotating the card-drum so as to constantly present fresh surfaces to the cloth, and of making the various adjustments which may be required without departing from the spirit of my invention, or substituting anything beyond well-known mechanical equivalents for the devices which I have employed.

I do not wish to be confined to running the card-cylinder in the direction described, particularly when teasels are employed, because they do not break the threads, as wire card is apt to; nor do I wish to be limited to the use of a card-cylinder and the arrangement on ra-

dial lines of the several devices for manipulating cloth and bringing it into proper contact with the card, as the card-cloth may be secured to a plain, flat surface, and substantially the same movement imparted to the cloth, whereby some of the advantages of my construction may be derived—as, for instance, the inspection of the cloth, and napping it upon both sides at one operation.

It will, of course, be understood that cleaning the card of flock and guiding it cannot both be done with the same roller, but that such a roller must be employed at I as is adapted to the work required of it.

Instead of using the separate roller E<sup>1</sup> the entire system of feed-rollers might be arranged in close proximity to the card, and have a rapid vibratory movement imparted to it; but I regard the construction shown as being preferable.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The feed-rollers and gearing F F<sup>1</sup> F<sup>2</sup> for

the purpose of moving cloth continuously without fastening to either roller, in combination with a napping-card or its equivalent.

2. The combination of the roller E<sup>1</sup> and the arm E and spider D, for the purpose and in the manner substantially as described.

3. The combination of the feed-rollers and gearing F F<sup>1</sup> F<sup>2</sup> and the arm E and roller E<sup>1</sup>, for the purpose and in the manner substantially as described.

4. In combination with spider D D' and napping-roller E<sup>1</sup> the cam d, substantially as set forth.

5. In combination with the card roller or drum C, two sets of napping-rollers and feeding devices, arranged substantially as described, whereby both sides of the cloth may be napped at one and the same operation, as set forth.

CALVIN P. LADD.

Witnesses:

A. G. SAYRE,  
A. THOMPSON.