No. 652,843. Patented July 3, 1900.

N. H. GROSSELIN.

NAPPING MACHINE.

(Application filed Nov. 26, 1895.)

(No Model.) 6 Sheets—Sheet 1.

Fig. 1.

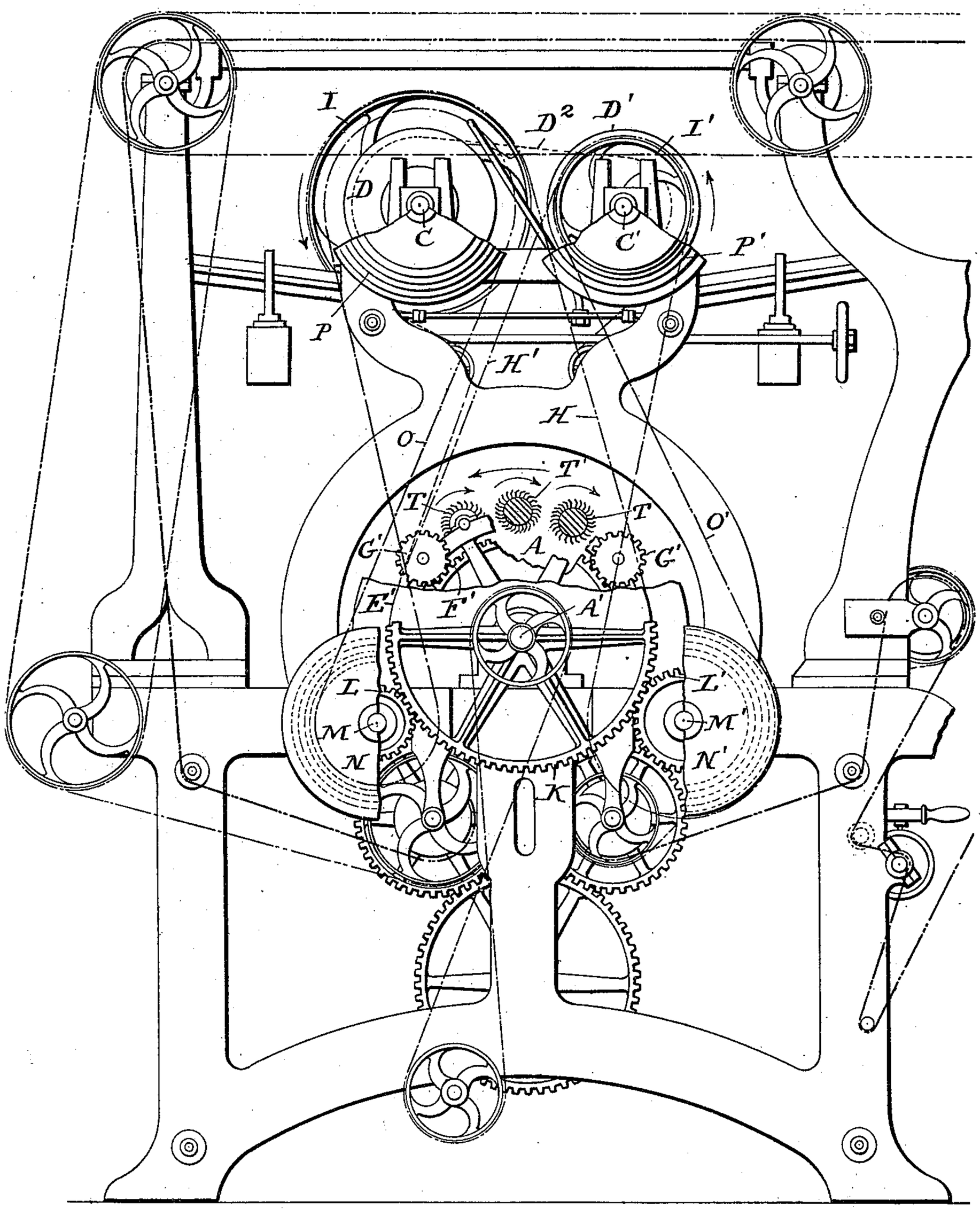

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Fig. 2.

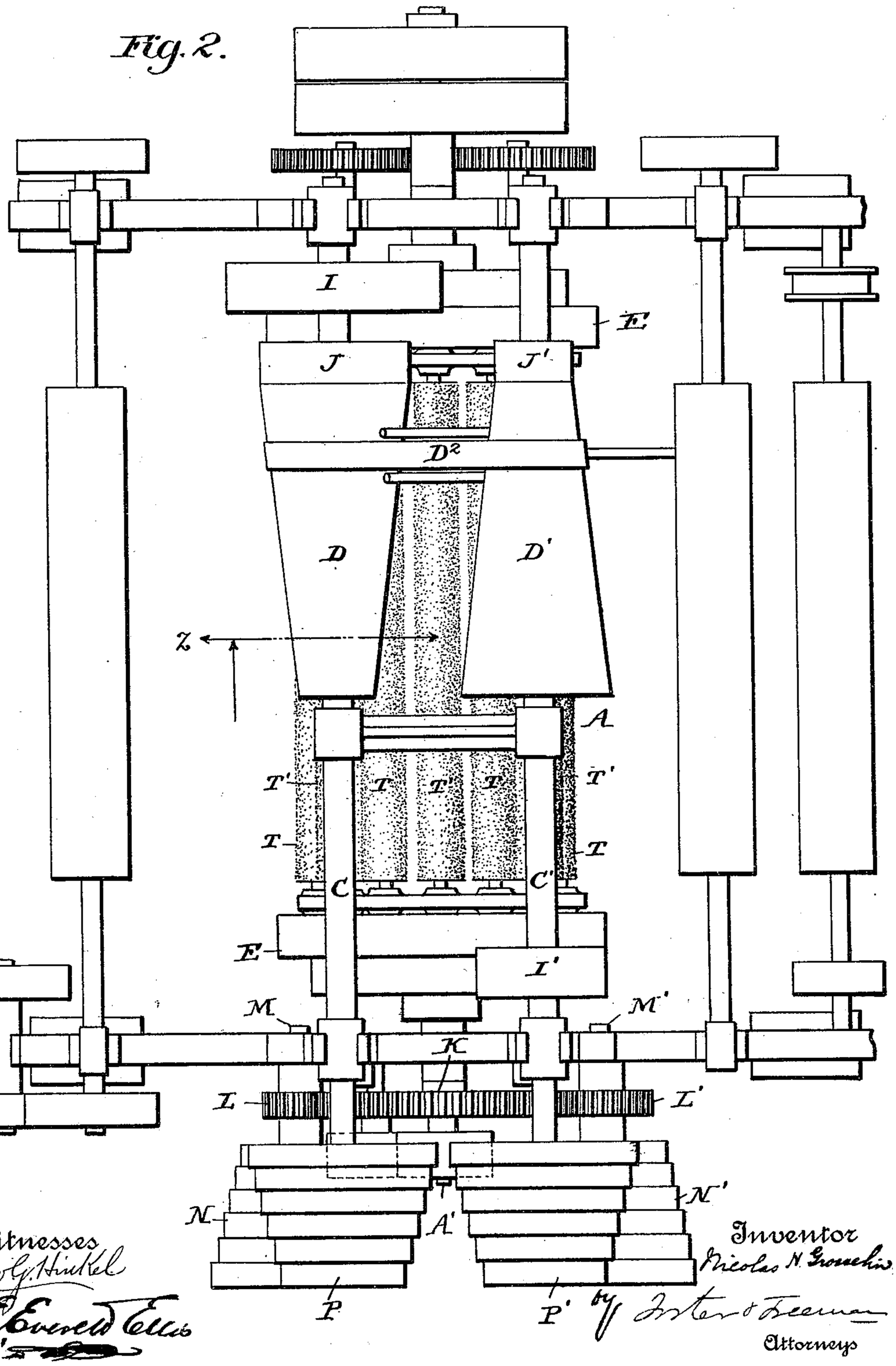

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Fig. 3.

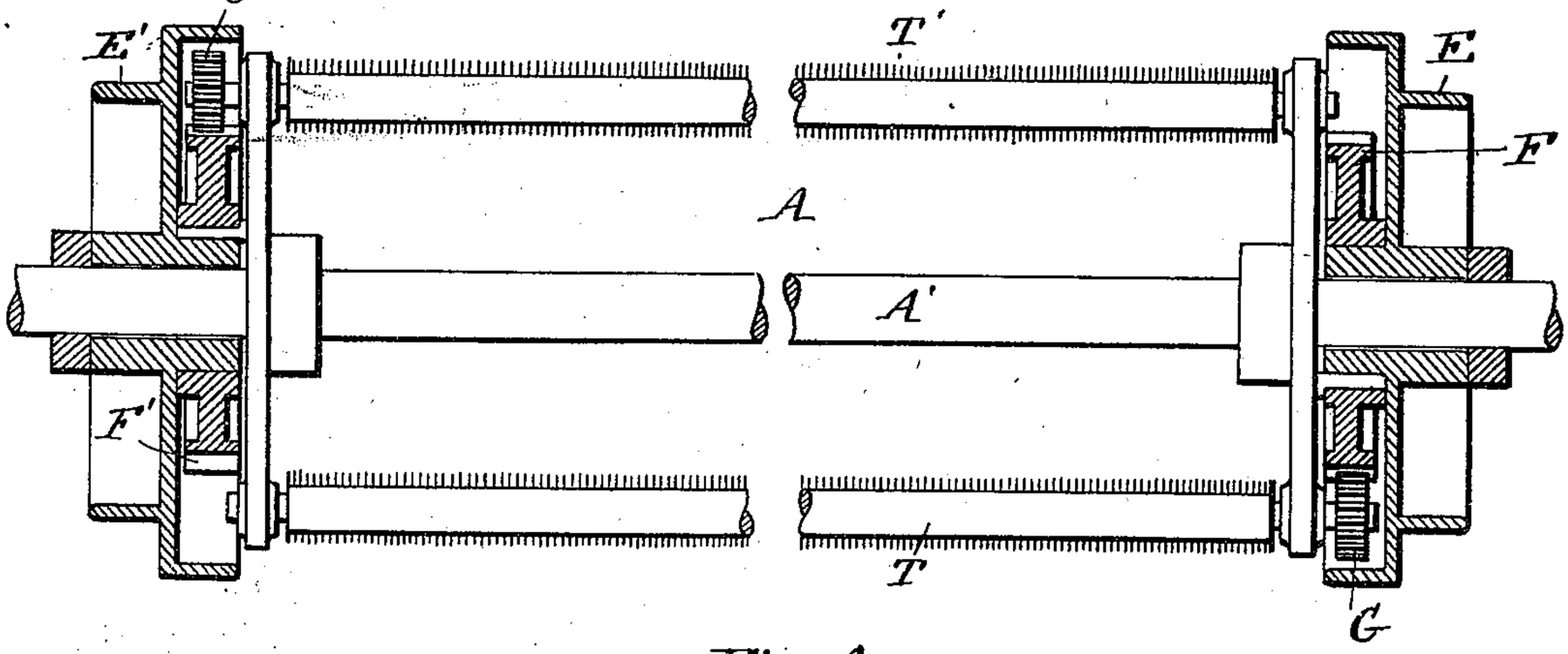

Fig. 4.

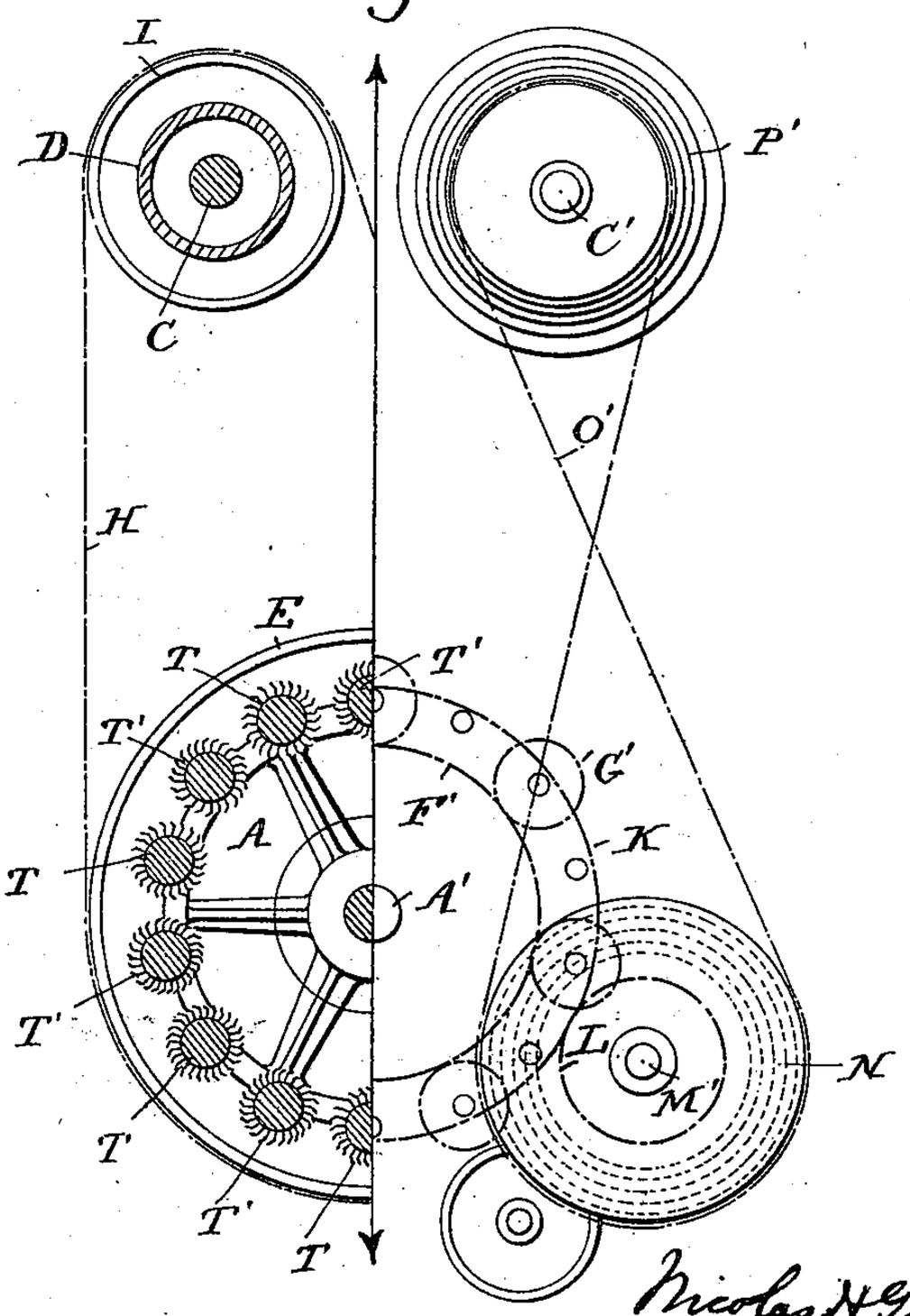

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Fig. 6.

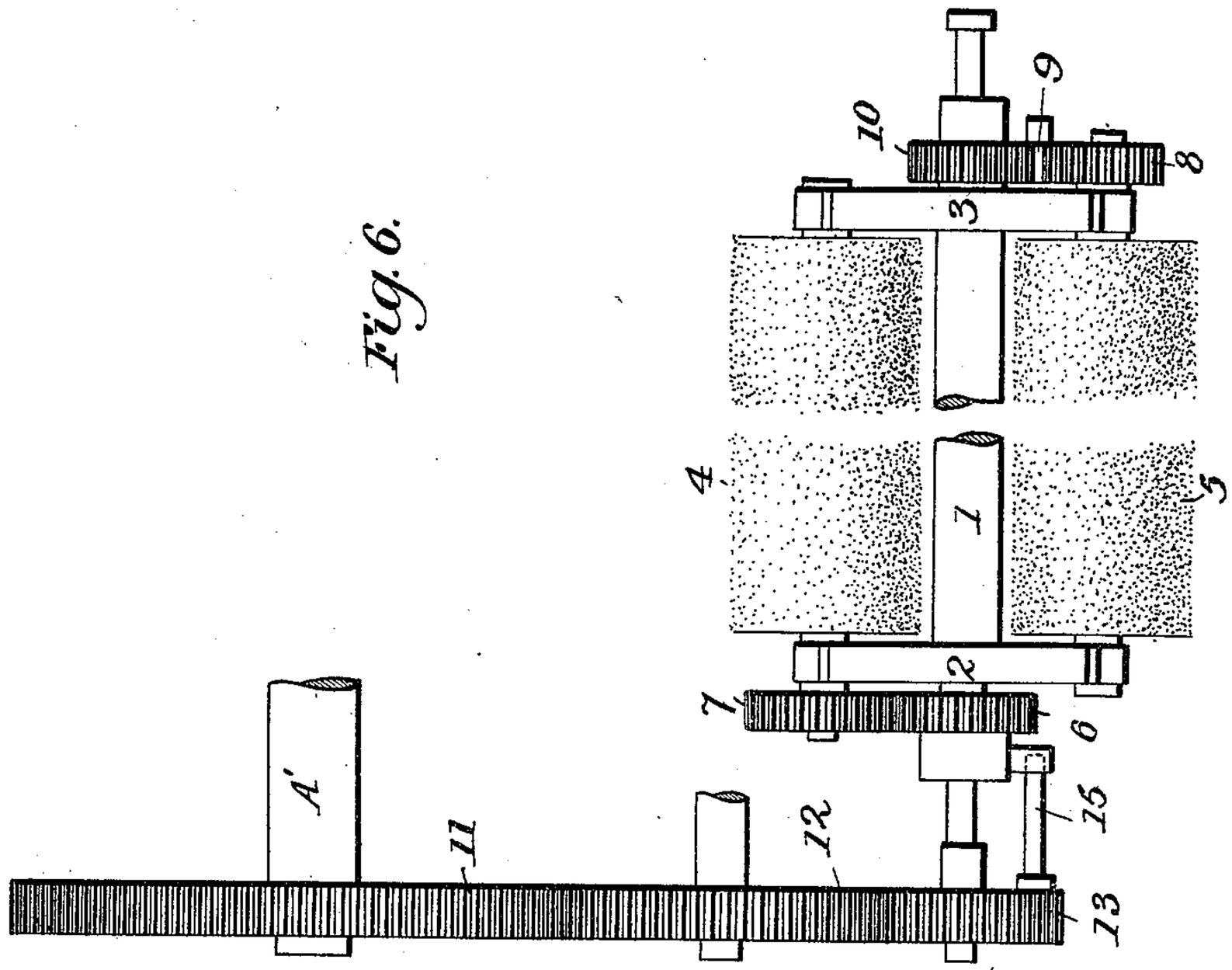
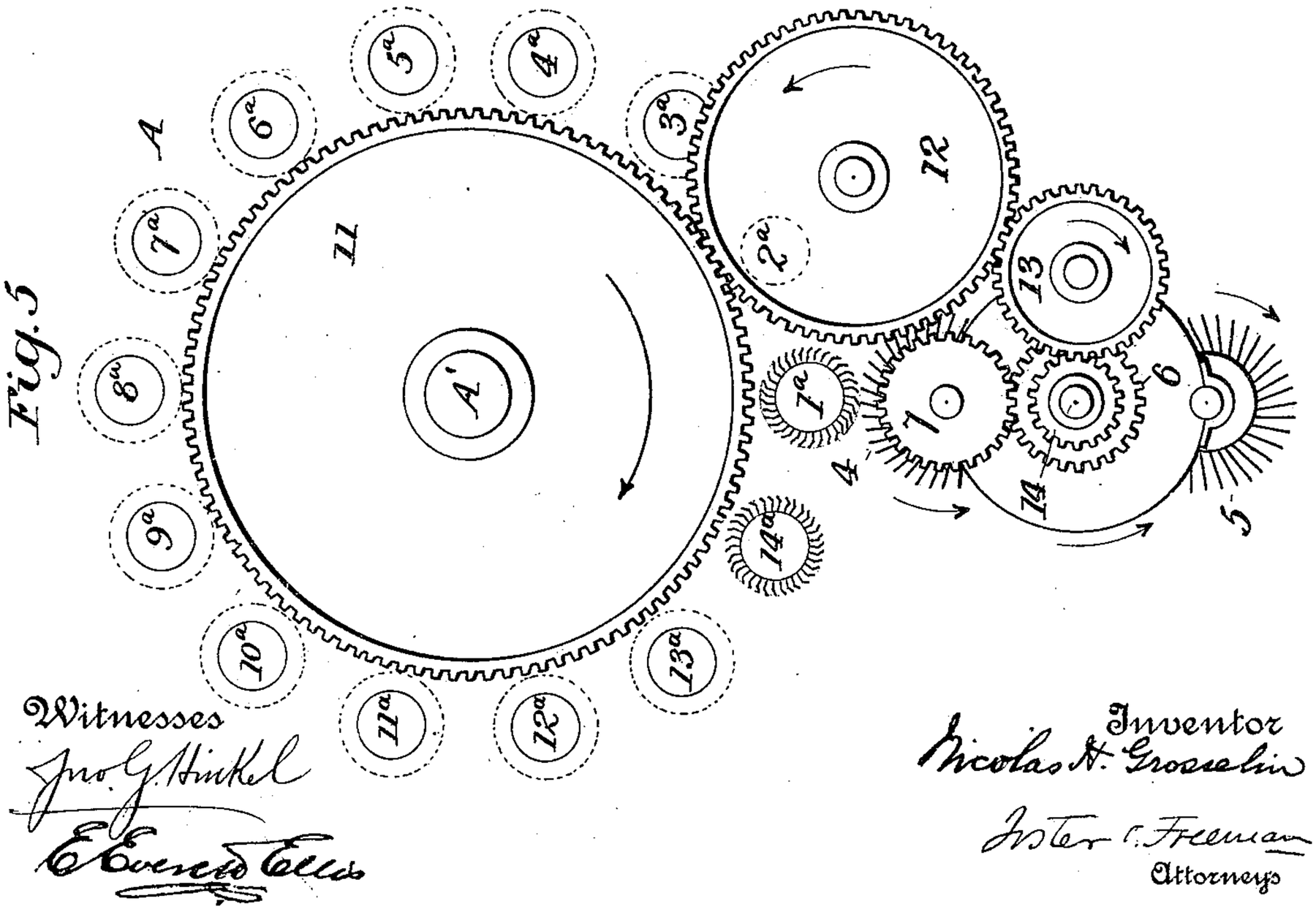


Fig. 5



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(No Model.) 6 Sheets—Sheet 5.

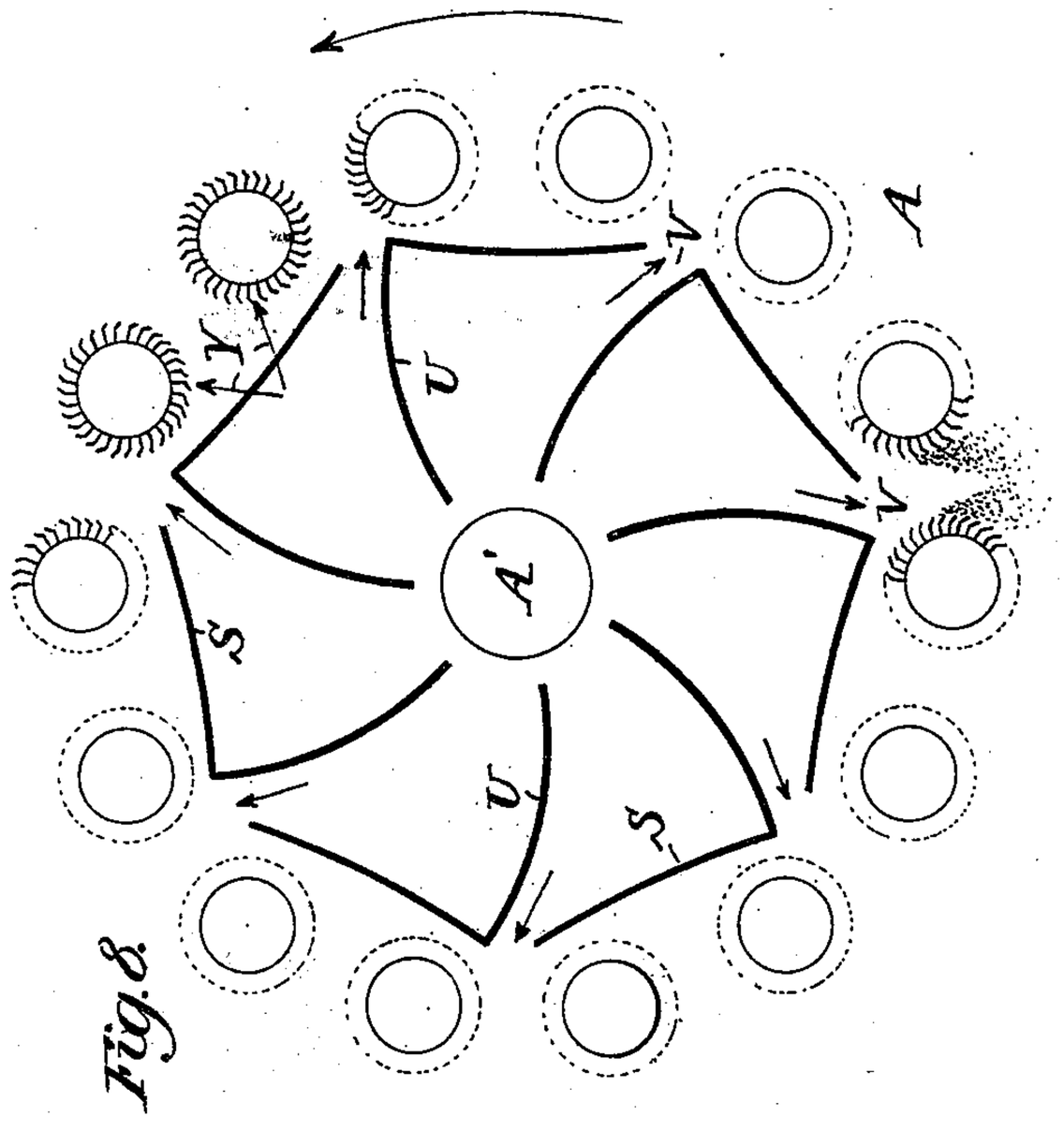


Fig. 8.

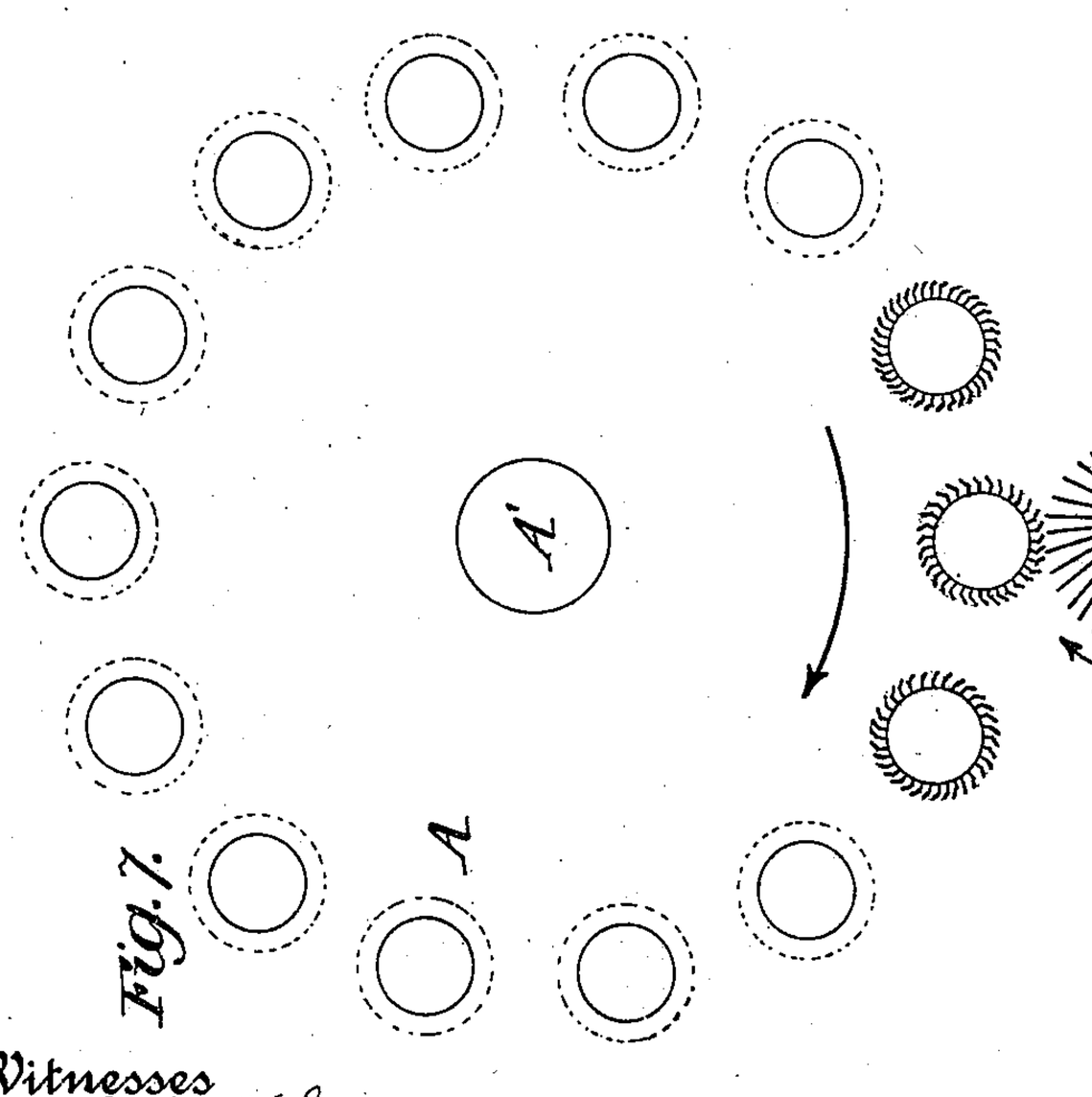
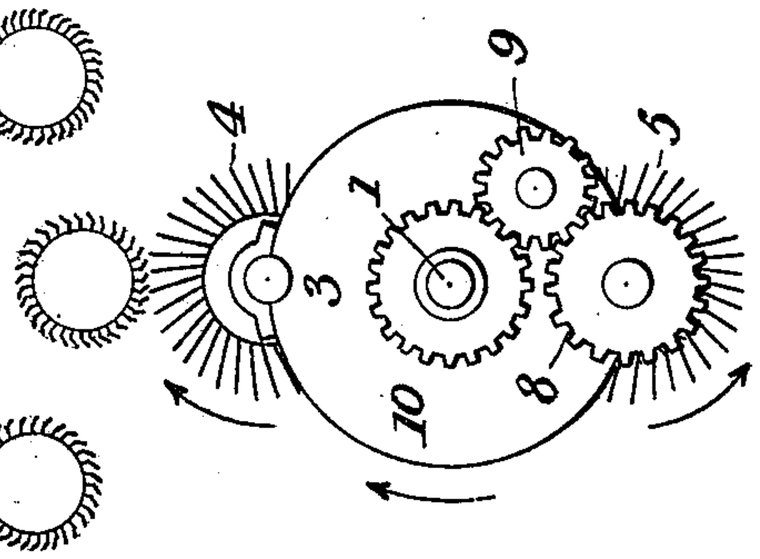


Fig. 7.



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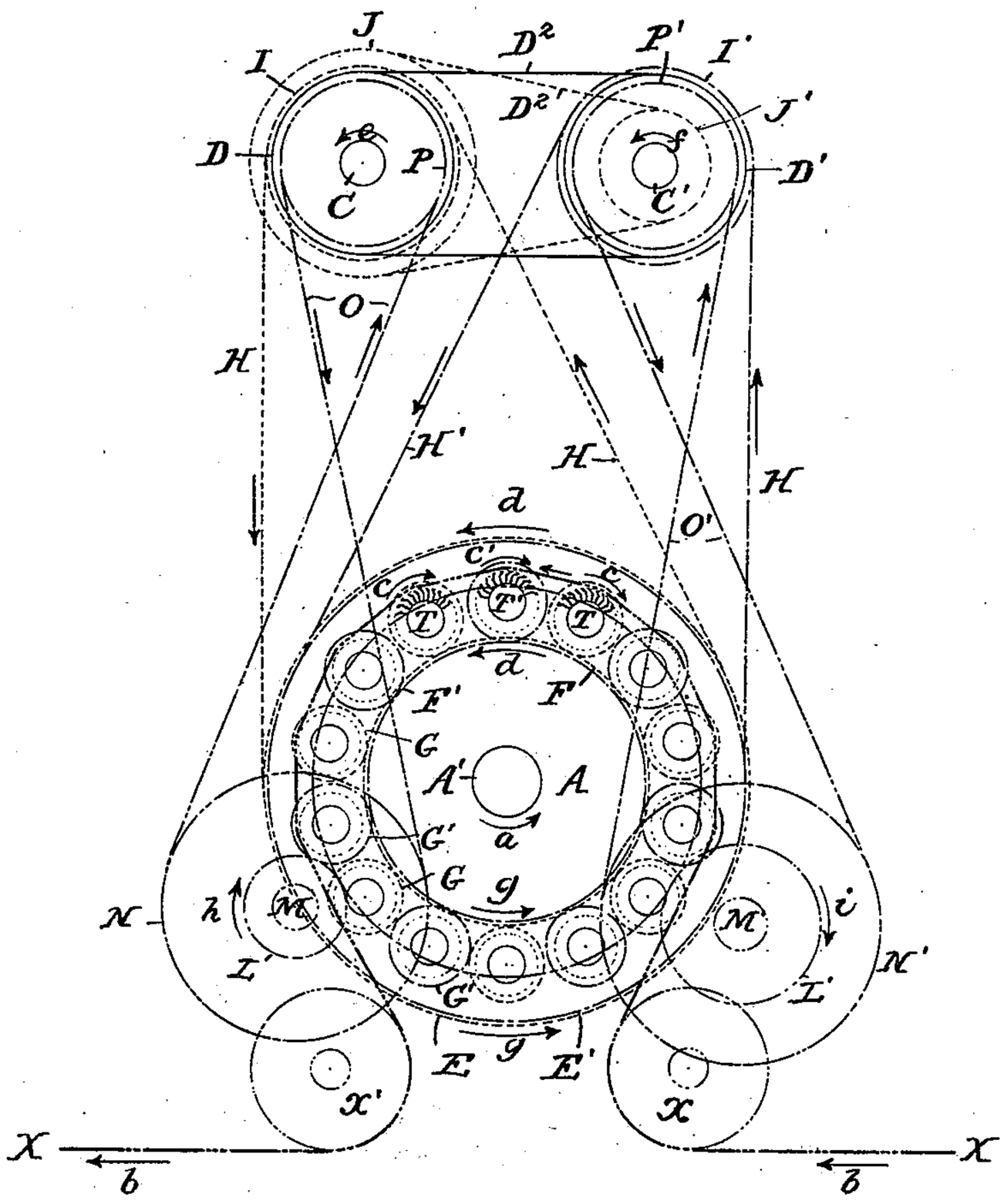
(No Model.) 6 Sheets—Sheet 6.

Fig. 9.



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UNITED STATES PATENT OFFICE.

NICOLAS HENRY GROSSELIN, OF SEDAN, FRANCE, ASSIGNOR TO CHARLES HEAP, OF ROCHDALE, ENGLAND.

NAPPING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 652,843, dated July 3, 1900.

Application filed November 26, 1895. Serial No. 570,171. (No model.)

To all whom it may concern:

Be it known that I, NICOLAS HENRY GROSSELIN, a citizen of the French Republic, residing in Sedan, France, have invented certain new and useful Improvements in Napping-Machines, of which the following is a specification.

My invention, for which application for a French patent was filed April 20, 1895, the patent numbered 246,945, has for its object different improvements which I have made relating to napping-machines having rotating heads carrying working rollers; and my invention consists, first, in the combination, in one and the same machine, of napper-rollers of different working energies, so as to effect with one and the same machine a result which heretofore has required the passage of the fabric through several different machines, and, second, in the application of a continuous rotating cleaning-drum acting successively in reverse directions.

The two principal systems of driving or regulating actually employed in rotary napping-machines in which the cards are arranged on the same drum to effect the simultaneous napping with and against the nap, are—

First. The direct driving—that is, that in which the speed of rotation of the working rollers is regulated by an arrangement of mechanical parts, belts, gears, pulleys, &c., which is dependent on the rotation of the drum and independent of the adhesive force of the fabric on the surface of the cards.

Second. The driving by dragging—that is, that in which the speed of rotation of the working rollers is exclusively dependent on the adherence of certain of the cards to the fabric. This adherence to the fabric causes a group of working rollers to turn, which group transmits a speed of more or less accelerated rotation to a second group.

Each of the two driving systems has its advantages and disadvantages well known in the art and on which it is superfluous to enlarge.

My object is to unite at will in one and the same machine the advantages of the two systems of driving, which renders it possible to nap certain fabrics without passing successively through several machines, as has generally been done. The machine thus modified naps the fabric either by direct action or by dragging without changing the machine. The ease with which one can pass from one kind to the other makes it possible to change the kind of work during each passage. The action of a group of working rollers may also be omitted at will, while preserving the action of the other group never heretofore effected.

Referring to the accompanying drawings, Figure 1 is a view in side elevation of a napping-machine operating either by dragging or by direct driving according to my invention; Fig. 2, a plan view of the same; Fig. 3, a section of the drum; Fig. 4, a half-section on line *z z*, Fig. 2, and half side elevation; Fig. 5, a side elevation of the brush-cleaning devices; Fig. 6, a front elevation of the brush-cleaning devices; Fig. 7, an opposite side elevation of the brush-cleaning devices; Fig. 8, a transverse section illustrating the pneumatic cleaner; Fig. 9, a diagrammatic view illustrating the gearing in connection with the head and two sets of napping-rolls.

A is the napping-drum with fourteen working rollers T T′, seven (T) turning with the nap and seven (T′) against the nap, and C C′ are the counter-shafts for modifying and regulating the speed of rotation of the working rollers. I arrange these counter-shafts C C′ so that either one is driven from the other or that they may be independent of one another and may be driven in different ways, according as the dragging or direct action may be employed. The small pulley on the end of the shaft A′, Fig. 1, is belted to a pulley below, which drives the gears shown to impart motion to the drums over which the fabric passes and by which it is driven as usual in this class of machines. The counter-shaft C receives its action from a loose friction wheel or pulley E, attached to a toothed gear F on the drum-shaft A′, driven by a belt passing to the usual belt-pulley on one end of the shaft, which gear F engages the pinions G of the rollers T, working with the nap. A belt H transmits the movement from the loose wheel or pulley E (which is on one side of the machine) to a pulley I, fixed on the counter-shaft C. The counter-shaft C transmits its movement to the counter-shaft C′ by means of the reverse smooth cones D and D′ and the belt D^2 or by other adjustable

connections by which the speed of the shaft C′ may be varied at will with relation to the speed of the shaft C. The counter-shaft C′ transmits its movement by means of a pulley I′ and a belt H′ to a second loose wheel or pulley E′, placed at the other extremity of the drum, which wheel or pulley is attached to a toothed wheel F′, which gears with all the pinions G′ of the rollers T′, working against the nap. Under these conditions the rollers T′, working against the nap, may therefore receive from the rollers T, working with the nap, a movement of rotation in the same direction as the latter; but they are driven by intermediate adjustable gearing with a more or less accelerated speed.

Suitable means are provided whereby at will to throw out of action the counter-shaft C with relation to the counter-shaft C′, so that both sets of rollers T T′ may be independently but positively driven, but so as to work one set with a different energy from the other. Thus I arrange on the counter-shaft C, beyond the smooth cone D, a fixed pulley J of about the same diameter as the extremity of the cone D, with which it is connected. The shaft C′ carries opposite the pulley J a smaller loose pulley J′ in such a way that it is only necessary to shift the belt D^2, which connects the two cones D and D′, onto the fixed and loose pulleys J and J′ in order that the two counter-shafts may then become independent of each other. The counter-shafts C and C′ being thus rendered independent of each other, a known movement of rotation having a determined and variable speed may be communicated to either or both of these counter-shafts, which movement of rotation is transmitted from the shaft A′ of the machine by means of a toothed wheel K on the shaft A′, which gears with two toothed pinions L and L′ of different diameters, respectively, fixed on shafts M and M′, and cone-pulleys N and N′ on shafts M M′ transmit their rotation by means of belts O and O′ to the cone-pulleys P and P′, respectively, fixed on the counter-shafts C and C′, which allows the independent regulation of the speed of rotation of the working rollers T and T′. It will be evident that any other mechanical movement, such as friction-gear, &c., connecting, on the one hand, the drum to the counter-shafts and, on the other hand, the two counter-shafts together, will perform the same office under the condition that both are arranged so as to be thrown out of action at will either by shifting the belts or by disengaging the friction plates or gears.

The fabric passes around suitable guide-rolls, as indicated by the broken line, Fig. 1, and these rolls are driven from a small pulley on the shaft A′ and through suitable gears arranged back of the gears L L′, the general arrangement being common in this class of machines and indicated in Fig. 1 and not required to be further described.

The second improvement consists in a means of cleaning the rollers which utilizes the action of metallic or other brushes and which differs from those employed till now by its mechanical arrangement, permitting the cleaning to be effected outside of the drum by means of a continuous rotating apparatus turning in a single direction, the working rollers having their card-teeth alternatively pointed in two different directions—that is, with and against the nap—no matter what is the position of the axis of the working roller with relation to the center of the drum. To attain this result, as is shown in the drawings, Figs. 5, 6, and 7, I place below the napping-drum a cleaning device consisting of a shaft 1, on which are slipped two brackets 2 3, which have bearings for two or more metallic or other brushes 4 5, revolving around the shaft 1 and rotating in opposite directions around their proper axis by means of gears 6 7 and 8 9 10, respectively. The shaft 1 carrying the brackets 2 3 is actuated in any suitable manner—for instance, from the napping-drum A′—by means of gears 11 12 13 14, as shown in Figs. 5 and 6, so that the shaft 1 makes a half-rotation, while the napping-drum will be rotated a quarter-revolution. In other words, the napping-drum having fourteen rollers, seven with and seven against the nap, if the cleaning-drum only carries two brushes this drum must make seven revolutions for each revolution of the napping-drum. If the napping-drum had sixteen working rollers, eight with and eight against the nap, four brushes might be grouped on the cleaning-drum, whose speed would thus be reduced one-half. The cleaner will only make four revolutions to one revolution of the drum. It is equally possible to reduce the speed of rotation of the cleaning-drum by establishing a relation between the toothed wheel fixed on the napping-drum and the corresponding wheel fixed on the cleaning-drum, calculated in such a way that each of the two brushes will not act successively on all the working rollers of the same group at each revolution of the drum. Assuming a napping-drum having fourteen rollers, Fig. 5, numbered 1^a to 14^a, all the rollers working with the nap bear odd numbers. Those against the nap bear even numbers. The brush 4 of the cleaner being supposed to be in contact with the working roller 1^a, the speed of the cleaning apparatus will be calculated so that the brush 5 will only touch the working roller 4^a, the brush 4 after a complete revolution of the cleaning-drum will encounter the working roller 7^a, and so on. The working rollers will thus be cleaned in the following order:

1^a	4^a	7^a	10^a	13^a
2^a	5^a	8^a	11^a	14^a
3^a	6^a	9^a	12^a	1^a

and so on. All the working rollers will therefore be cleaned when the napping-roller has made three complete turns. During this same time the cleaning-drum will have made seven

turns. The speed of this cleaning-drum will therefore be very slow, since it hardly doubles the speed of the napping-drum. The speed may be still more reduced by establishing the relation of the gears in such a way that the cleaning-drum will only accomplish a single revolution while the napping-drum passes from the working roller 1^a to the roller 11^a. All the working rollers will therefore be cleaned when the drum has made five complete turns. During this time the cleaning-drum will have made seven turns, which represents a very moderated speed, and which may be still more reduced in case of need, as has been explained above. It is therefore necessary to regulate the speed of the cleaning-drum, its position, (with relation to the napping-drum,) the number of the brushes, their direction of rotation according to the napping-drum, the way in which each brush comes successively and regularly into contact with the corresponding working roller, brushing it in the desired direction.

The cleaning-drum may be vertically adjustable and preferably will turn in the direction opposite to that of the napping-drum, so that the duration of the contact of the brushes with the working rollers will be longer, and consequently more efficacious.

To communicate movement of rotation to the two brushes 4 5, any suitable devices may be employed. Thus on one side of the cleaning-drum the brush 4 carries, as set forth, a pinion 7, which gears with an immovable toothed wheel 6, adjusted to have a slight friction on the shaft of the drum and stopped by a pin or abutting catch 15. The toothed wheel remaining immovable, the pinion will be drawn in the same direction as the rotation of the cleaning-drum and the brush will turn on itself, multiplying in this way the circumferential development of the brushes on the exterior of the drum. The wheels the numbers of whose teeth are first between them will be chosen first, so that the same part of the brush will not always be used. To actuate the brush 5, I employ the same arrangement, but by slipping an intermediate pinion 9, Fig. 11, between the pinion 10 of the brush 5 and the gear 8, fixed on the shaft 1. The brush will turn in a direction opposite to the direction of rotation of the cleaning-drum with a circumferential speed greater than the circumferential speed of this drum. This speed may be increased at will by causing the toothed wheel to turn by some appropriate driving means transmitted by the shaft of the napping-drum. The whole of the apparatus of the drum therefore turns in a single direction with a continuous circular movement, and the brushes act and turn alternately in two opposite directions, which cleans the cards mounted in different directions. It is easily understood that this principle may be equally applied to the napping-drums, in which the number of rollers working with the nap is greater than that of the rollers working against the nap.

It will be evident that there may be on the cleaning-drum three or more brushes, some turning in one direction and the others in another, the essential point being to group these brushes so that they will come in contact with the corresponding working rollers of the drum and that they turn in the direction contrary to the inclination of the teeth of the cards of these working rollers with which they contact.

With the drum-head I may, if desired, combine a pneumatic cleaner. The construction and operation of this arrangement will be easily understood on reference to Fig. 8 of the annexed drawings. In the interior of the drum A are arranged a series of any suitably-shaped metal plates U. As shown, each plate has a curved and a straight section, the whole constituting a fan having centrifugal action. The air contained in the interior would tend to escape under the action of this fan by all the interstices or slits left between the working rollers T and T'. The air thus driven out of the drum is replaced by the air which enters the drum at its two ends. In order to obtain a proper effective cleaning action, the air must only be allowed to escape from the drum by the interstices or slits V, which are between the two cleaners at the places where the teeth of both the adjacent cards have their ends directed toward the exterior. For instance, if the air was to escape in the direction of the arrows Y the action of the current of air would be quite contrary to what was desired, since, on account of the direction of the teeth of the cards at these places, dust, flock, &c., instead of being lifted or torn from the teeth, would be firmly pressed into the teeth against the working rollers. It is therefore necessary in order to obtain a useful effect to arrange metal plates S inside the drum A, which plates are arranged around the periphery in such a way that the air can only escape by the longitudinal slits placed opposite the interstices or slits V left between the two adjacent working rollers at the places where their carding-teeth have their ends directed toward the exterior. In addition to this arrangement of pneumatic cleaner completing the action of the cleaner having brushes above described it also has the advantage of giving in certain cases an improved result in the napping itself. Thus the difference of pressure which exists in the interior and exterior of the drum does not allow the cloth to press with its usual tension on, but lifts it from the working rollers, which causes a difference in the force with which the teeth engage the fabric and in the napping action thereof.

I am aware that cleaner-brushes have been combined with heads having two series of napping-rolls, the purpose being to have each cleaner-brush operate with one set of rolls;

but in prior apparatus no means were adopted to insure this action, and in time the relation of the parts would change, defeating the operation. By the use of positive gearing I insure absolute precision and maintain the relation of the parts.

Without limiting myself to the precise construction and arrangement shown, I claim—

1. The combination in a napping-machine, of a revolving head, two sets of napping-rolls carried thereby and adjustable driving-gearing between the sets of rolls whereby they may be connected to drive one by the other or disconnected and separately and positively driven, substantially as described.

2. The combination in a napping-machine, of a revolving head, two sets of napping-rolls carried thereby, and adjustable gearing whereby the sets of rolls may be connected to drive one by the other, or disconnected and separately and positively driven, and means for varying the speed of each set of rolls, substantially as described.

3. The combination with the revolving head and its shaft A′, of a napping-machine, of two sets of napping-rolls constructed to act with different working energies, arranged upon said head, two counter-shafts, and means whereby to connect each counter-shaft with the shaft A′, and means for connecting and disconnecting said counter-shafts, substantially as set forth.

4. The combination in a napping-machine of a revolving head carrying two sets of rolls with their teeth set in opposite directions, two counter-shafts connected, one with one set of rolls, and the other with the other, reverse cones upon the counter-shafts and a belt adjustable upon said cones to vary the relative rotations of said shafts, substantially as set forth.

5. The combination with a revolving head of a napping-machine, of two sets of napping-rolls and means whereby they are caused to operate with different degrees of working energy, loose gears at opposite ends of the head connected each to drive one set of rolls, independent means for driving the gears, and means for connecting the said driving means and for disconnecting the same, substantially as set forth.

6. The combination in a napping-machine of the revolving head and two sets of napping-rolls carried thereby, gears at opposite ends of the head, one for operating each set of rolls, separate driving devices for driving the said gears, including two counter-shafts connected to operate said driving devices, and means for connecting and disconnecting the counter-shafts and means for driving either counter-shaft positively substantially as set forth.

7. The combination in a napping-machine of the revolving head and two sets of napping-rolls carried thereby, gears at opposite ends of the head, one for operating each set of rolls, separate driving devices for driving the said gears, including two counter-shafts connected to operate said driving devices, and means for connecting and disconnecting the counter-shafts, and means for varying the driving action and means whereby either shaft may be connected with a driving-shaft, substantially as set forth.

8. In a napping-machine, a drum carrying two series of rolls, one set for acting with and the other set against the nap, and means for either driving each set of rolls independently of the other and of the cloth, or for connecting the rolls to permit one set driven by the cloth to drive the other set, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

NICOLAS HENRY GROSSELIN.

Witnesses:
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EDWARD P. MACLEAN.