

No. 662,589.

Patented Nov. 27, 1900.

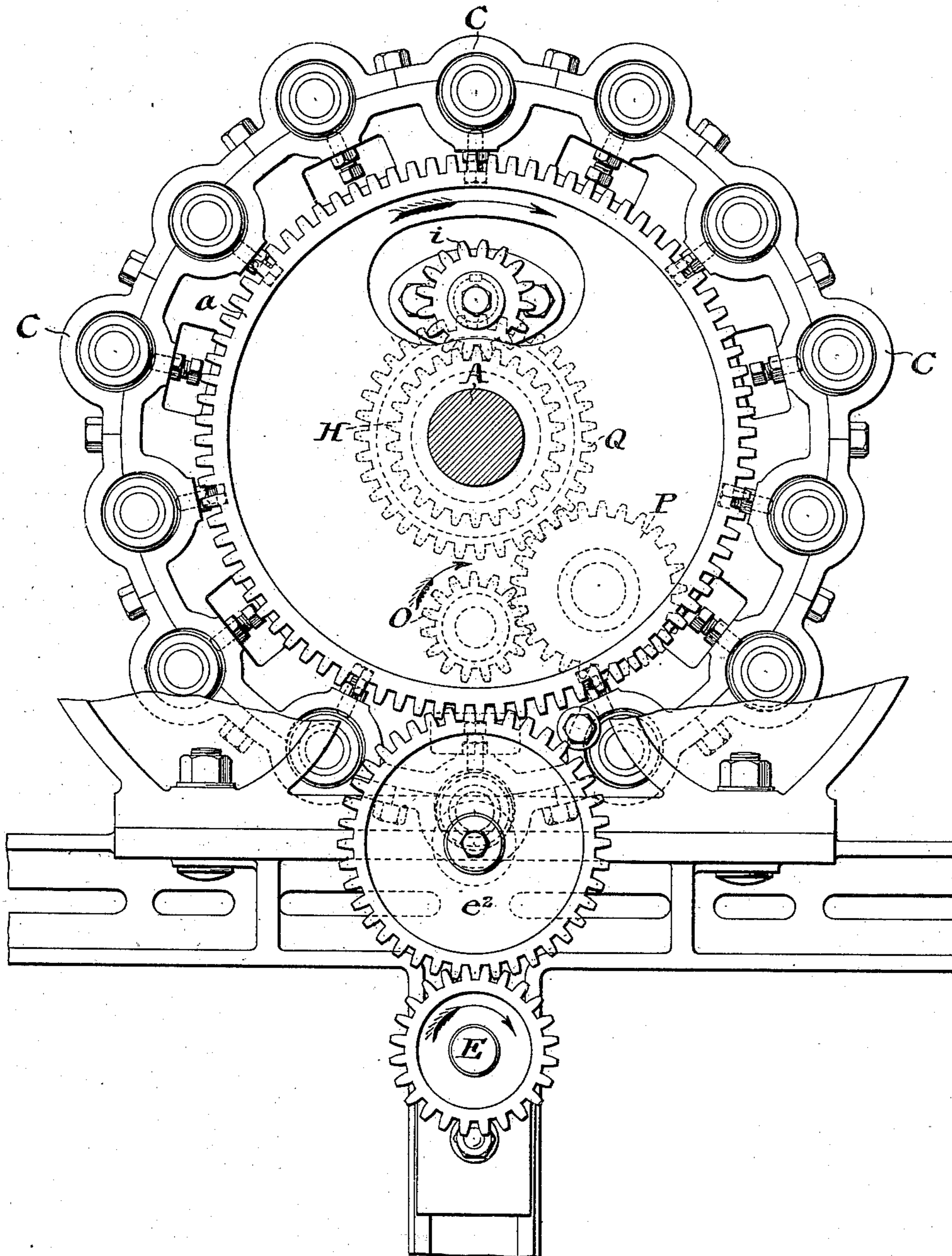
R. C. BORCHERS.  
NAPPING MACHINE.

(Application filed Feb. 8, 1900.)

(No Model.)

4 Sheets—Sheet 1.

FIG. 1.



WITNESSES:

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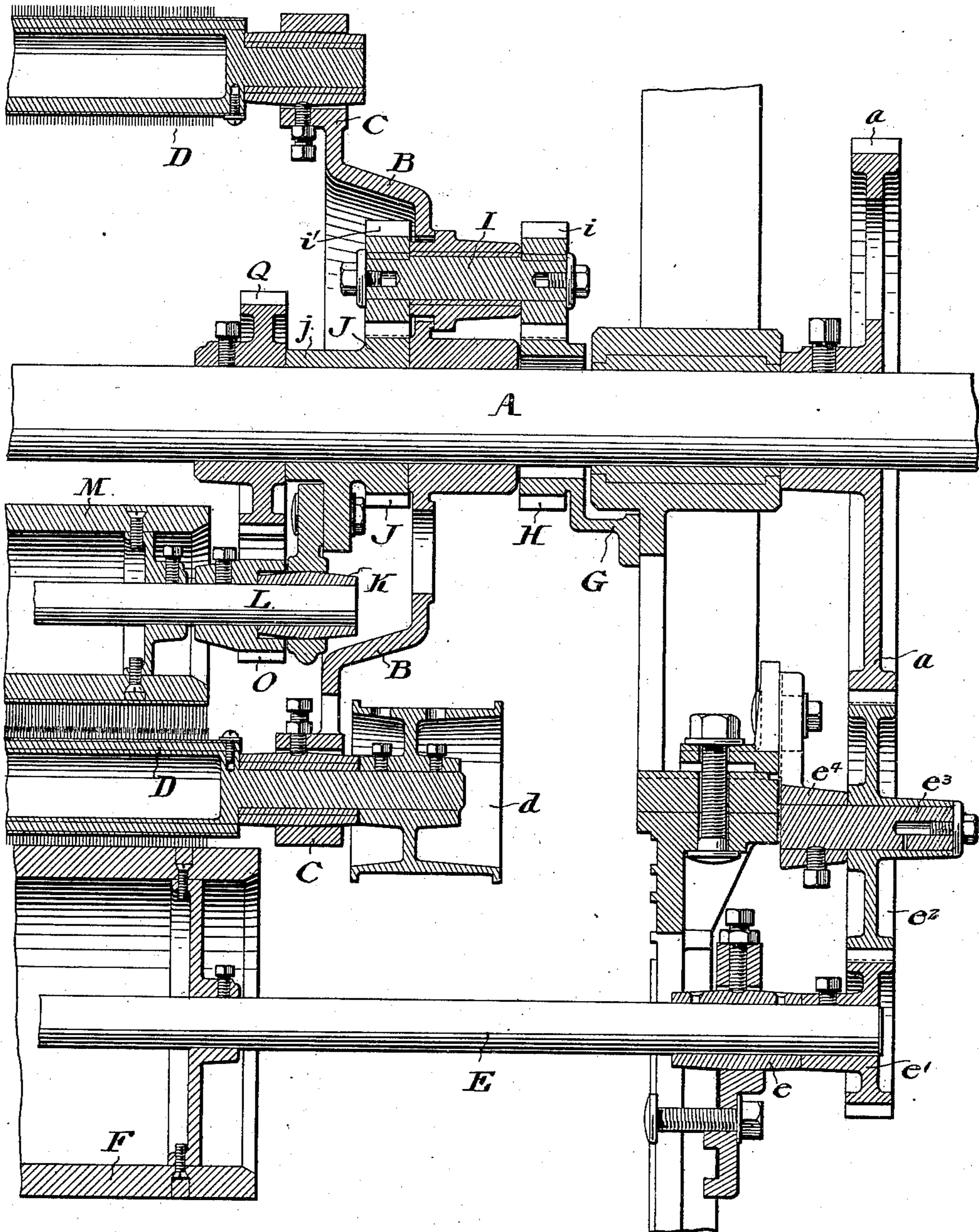
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4 Sheets—Sheet 2.

FIG. 2.



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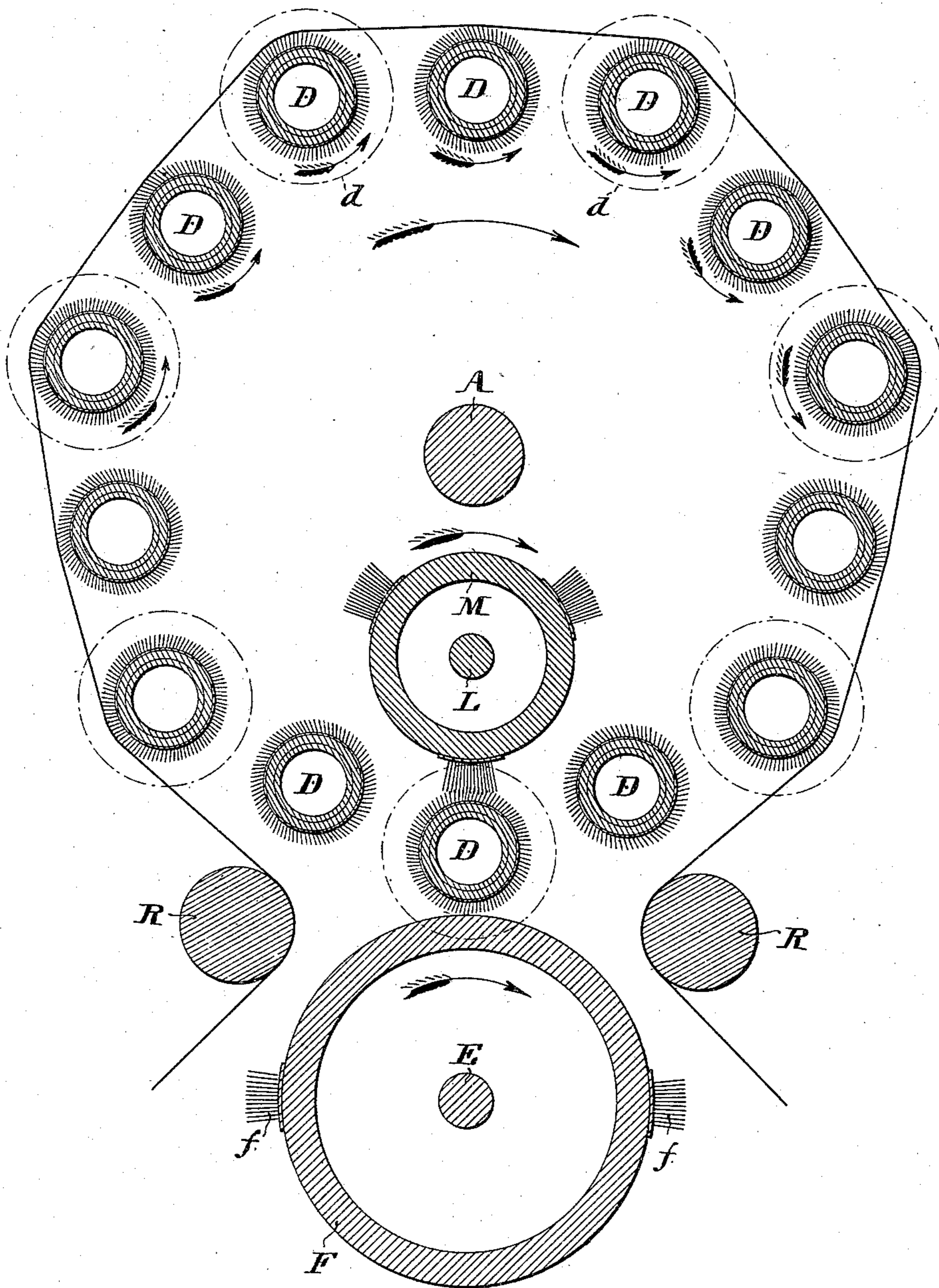
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4 Sheets—Sheet 3.

FIG. 3.



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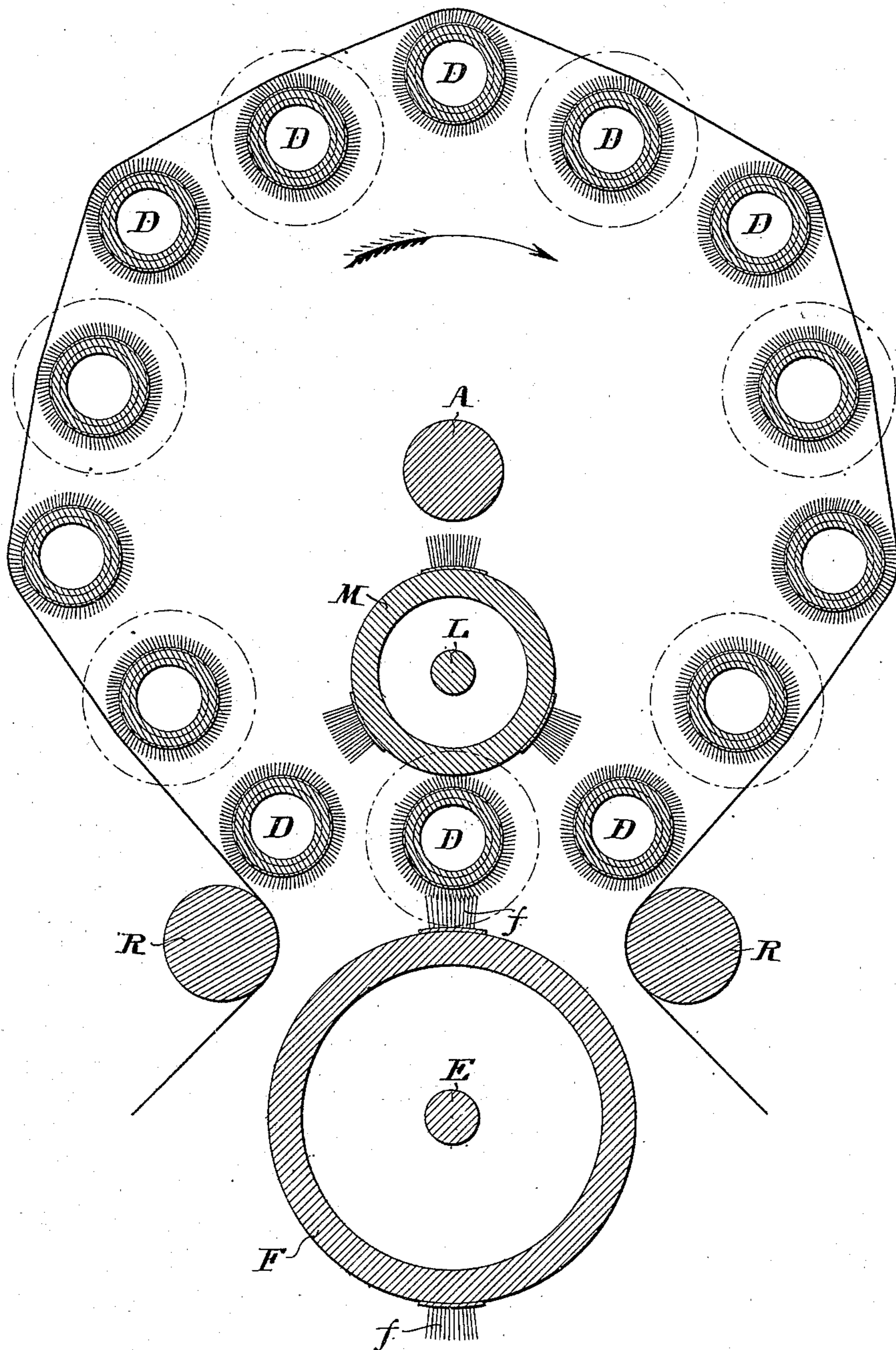
NAPPING MACHINE.

(Application filed Feb. 8, 1900.)

(No Model.)

4 Sheets—Sheet 4.

FIG. 4.



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# UNITED STATES PATENT OFFICE.

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## NAPPING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 662,589, dated November 27, 1900.

Application filed February 8, 1900. Serial No. 4,453. (No model.)

*To all whom it may concern:*

Be it known that I, RICHARD C. BORCHERS, a citizen of the United States, residing at No. 138 West Logan street, Philadelphia, (German-  
5 mantown,) State of Pennsylvania, have invented certain new and useful Improvements in Napping-Machines, whereof the following is a specification, reference being had to the accompanying drawings.

10 My invention is applicable to that class of planetary napping-machines in which a single napping-drum carries around its periphery a number of napping-rollers in a double alternating series. In such machines each  
15 series of napping-rollers is usually actuated independently of the other series, and one series is usually at a greater and the other at a lesser distance from the axis of the drum. For this reason in this specification the two  
20 series are spoken of as the "outer" and the "inner" series of napping-rollers. The advantage of the double alternating series results from the capacity of such a machine to carry and simultaneously operate napping-  
25 rollers having two varieties of clothing, one sort of clothing on each series of rollers, and it is the double function thus given to the napping-drum which most prominently marks the machine. The varieties of napping cloth-  
30 ing are numerous; but for practical purposes the important question is whether the points of the individual wires are directed either forward or backward with relation to the motion, not of the individual rollers on which  
35 the clothing is mounted, but of the napping-drum. If the clothing points forward when referred to the direction of the motion of the periphery of the drum, then its tendency is to hook into the fabric and raise a nap thereon.  
40 If the clothing points backward with relation to the direction of the motion of the periphery of the drum, (and this also includes cases where the wire is adjusted radially,) then the function of the roller is more distinctively to  
45 brush or direct or lay the nap which the other rollers have raised. To make this difference of function effective, it should be the outer series of napping-rollers which carries the clothing the points of which are directed for-  
50 ward, when referred to the direction of the motion of the drum, and the inner series of rollers in which the points of the clothing are

directed in the opposite direction; but such a machine may be constructed with all the rollers at an equal distance from the center, 55 and consequently when I speak in this specification of the "inner series" of napping-rollers I refer to that series (almost always nearer the center of the drum than the other) always having the points of the clothing directed 60 backward, as above defined, and likewise when I refer to the "outer series" I mean that in which the points of the clothing are directed forward. This phraseology is convenient, because although the inner rollers, as 65 thus defined, may in reality be equidistant from the axis of the drum with the other series they can never in practice be farther away from the axis than the other series.

My invention relates more specifically to 70 the arrangement and operation of the cleaning-drums by which such a dual series of napping-rollers is kept clean during its operation. The problem of cleaning such a dual series of napping-rollers is one of considerable per- 75 plexity, as it is necessary, owing to the diversity of their motion, to provide distinct cleaning apparatus for each of the series of rollers. It is possible to solve the problem by arranging the separate cleaning-drums alongside of 80 each other outside of the napping drum, each having longitudinal zones covered with and similar zones free from cleaning-wire. By regulating the rate of revolution of these cleaning-drums to correspond to the rate of 85 revolution of the napping-drum each may be caused to come in contact with only one of the series of napping-rollers. This arrangement, however, has the great objection of considerably lessening the napping efficiency 90 of the machine by reason of the space alongside of the periphery of the drum which is necessarily occupied by the two cleaning-drums and which is consequently withdrawn from the effective napping area. In all nap- 95 ping-machines as large a portion of the periphery of the napping-drum should be available for napping purposes as possible, and therefore as much of the periphery of the drum as possible should be encircled by the fabric to 100 be napped. If there be two cleaning-drums, twice as much free space is necessary and the efficiency of the machine is correspondingly lessened. To avoid the use of two cleaning-

drums alongside of each other, with the disadvantage just explained, it is desirable to place at least one of the cleaning-drums inside the napping-drum itself. The most obvious arrangement of such an inside cleaning-drum would be to assign to it the function of cleaning the inner series of rollers, allowing the outside cleaning-drum to clean the outer series. I have, however, discovered that by reason of the points of the wires of the inner series of napping-rollers being directed in the direction opposite to that in which the napping-drum revolves it is practically impossible to clean this series from the inside of the drum, for to accomplish it the cleaning-drum must revolve at a rate of speed greater than can be practically realized under the limitations which result from supporting and actuating this cleaning-drum in the midst of the rapidly-revolving napping-rollers. Consequently it is necessary to provide mechanism whereby the inner series of rollers is cleansed by the outside drum, while the outer series is cleaned by the inside drum. My invention is directed to the solution of this problem, and I have succeeded by the means which I am about to describe in so arranging and actuating an inside cleaning-drum as to give to it the function of cleaning the outer series of napping-rollers.

I have devised means whereby a cleaning-drum having alternating free zones may be so fixedly supported and yet given positive axial revolution by a gear-drive while within the napping-drum as to be capable of cleaning the outer series of napping-rollers—that is, that series, as above defined, in which the points of the clothing are directed forward with relation to the motion of the napping-drum. My invention differs from all others in having two cleaning-drums, one inside and the other outside the napping-drum, of which that inside the drum cleans the outer series of rollers, while that outside the drum cleans the inner series of rollers. In this way I have been able to make the inside cleaning-drum efficient and accomplish the independent cleaning of the two series of napping-rollers without interrupting the circulation of the cloth around the napping-drum for a greater space than that sufficient to give a single cleaning-drum access to the outside of it.

In the accompanying drawings, Figure 1 is an end elevation of those portions of a napping-machine which embody my invention, including the napping-roller and cleaning-drums and their actuating mechanism. Fig. 2 is a central vertical section through one end of the same parts. Figs. 3 and 4 are diagrammatic views of the relative positions of the napping-rollers and cleaning-drums when in operation.

A represents the main shaft of the machine, which carries two spider-frames, of which the right-hand one, B, is seen in Fig. 2, the other being in all respects identical. Around the

periphery of these spider-frames is mounted a series of journals C, in which revolve with the usual planetary motion the napping-rollers D. There are an even number of journals C in the series and they are placed so that every alternate journal is somewhat more distant from the axis of the napping-drum than the intermediate ones, as a consequence of which every alternate napping-roller is likewise farther from the axis of the drum. These alternating series of rollers are called, respectively, the "outer" series of rollers and the "inner" series of rollers. In Fig. 2 the lowermost roller D belongs to the outer series, and upon the shaft of this roller is mounted a driving-pulley *d*. On the other hand, the uppermost roller D belongs to the inner series. The driving-pulley for the rollers of this series is mounted upon the other end of the machine, and therefore does not appear in the drawings. It will be understood that all the rollers of the outer series are driven from the right-hand end of the machine and all the rollers of the inner series from the left hand. By reason of this arrangement the rate of speed or the direction of independent rotation of the rollers of the two series can be varied at will. Each series is driven by a belt surrounding the entire series of pulleys at the corresponding end of the machine, and this belt is furnished with driving mechanism, which is not shown in the drawings, as it forms no part of this invention and is familiar to those skilled in the art. Likewise the other details of the construction of the napping-drum are not described, as they are such as are found generally in planetary napping-machines. Each napping-roller is fitted with wire-clothing, and it will be seen that the character of the clothing varies in the two series of rollers. The clothing of the inner series of rollers has the points directed backward when referred to the direction of the revolution of the periphery of the napping-drum, while the outer series of rollers has the points of the clothing directed the other way.

I have chosen in order to illustrate my invention to suppose that the rollers are clothed and rotated as indicated in the diagrammatic view, Fig. 3, where it will be seen that all of the napping-rollers are rotated in the same direction as indicated by the arrows. Let it be supposed that the outer series of rollers revolves much more slowly than the inner series. The ratio of the rate of the revolution of the rollers of the two series to each other and to the rate of revolution of the entire drum is such that the net result at any given point of the compound motion of the drum and one of the outer rollers is that its outermost surface is going forward with relation to the direction of the revolution of the drum. On the other hand, the inner rollers are being driven so much more rapidly that the net result of the compound motion

at a given point on the outermost side of one of the rollers of this series is a backward motion with relation to the direction of the revolution of the drum.

5 There are two cleaning-drums, one of them outside of the napping-drum and the other inside of the napping-drum. I will describe them in their order.

Between the machine-standards and considerably below the main shaft A is mounted the shaft E, running from end to end of the machine, the right-hand journal *e* of which is shown in Fig. 2. Upon the projecting end of the shaft is fixed the gear-wheel *e'*, which meshes with a second gear-wheel *e''*, which revolves upon a short fixed pin *e'''*. The gear-wheel *e''* engages with the large gear-wheel *a*, mounted upon the main shaft A, and through this train of gearing the shaft E derives its rotation. Upon the shaft E is mounted the cleaning-drum F, corresponding in length to the napping-drum. A section of this drum is seen in both Figs. 3 and 4, and it will be noted that the greater part of its periphery is free from clothing. At two points opposite each other it carries a small longitudinal zone of brushing-cloth of the character usually called "fancy wire." These longitudinal zones of wire are lettered *f*. The distance of the shaft E from the axis of the napping-drum is such that when passing the cleaning-drum the clothing of the outer series of napping-rollers is not touched or interfered with by the smooth portion of this cleaning-drum, provided this be the portion of the drum presented toward them. On the other hand, the clothing of the zones *ff* is long enough to reach to and through the clothing of the inner series of the napping-rollers. It is therefore necessary that the rate of revolution of the cleaning-drum F with reference to the napping-drum shall be such that the zones *ff*, with their clothing, shall be presented alternately to each of the inner series of napping-rollers as they pass over this napping-drum. This rate of revolution is accurately determined by the number of cogs in the train of gearing. This ratio can only vary in case the second drum F is fitted with a different number of zones *f*. If such a differing cleaning-drum be substituted having, say, three equidistant zones, it is obvious that the ratio of the rate of revolution of the drum to the napping-drum must be changed and can be effected by a change in the train of gearing.

I will next describe the inside cleaning-drum and its method of actuation.

A bracket G, fixed to the standard of the machine, supports fixedly a gear-wheel H, which encircles but otherwise bears no relation to the shaft A. A short auxiliary shaft I is journaled within and runs through the spider-frame B at the point indicated in Fig. 2. This shaft I carries a pair of similar gear-wheels *i i'*, each having the same number of teeth, one at either end. The outside gear-wheel *i* meshes with the fixed gear-wheel H.

The inside gear-wheel *i'* meshes with the gear-wheel J, which is formed upon the collar *j*, which freely encircles the shaft A immediately within the napping-drum. It will be observed that the result of the train of gearing just described is that the collar *j* is held motionless upon the shaft A notwithstanding the shaft's revolution and the revolution of the napping-drum outside of it. The parts G H I *i i'* J *j*, which have just been described, are reduplicated at the other end of the machine, so that there are thus two fixed motionless collars *j* within the revolving napping-drum. From each of these collars depends at the lower side of its periphery an extensible journal K, and between these two journals runs the shaft L, carrying the inside brushing-drum M. The parts thus far described hold the axis of this brushing-drum M in a fixed position within the napping-drum, while the latter revolves outside of it. Axial rotation of this brushing-drum is imparted to it by a train of gearing consisting of the gear-wheel O, mounted on the shaft L, which engages a gear-wheel P, mounted in fixed relation to the collar *j*, which in turn engages the gear-wheel Q, which is fixed to and derives its revolution from the shaft A. The cleaning-drum M is constructed similarly to the cleaning-drum F, in that part of its periphery is without clothing and that it has longitudinal zones at equal intervals furnished with clothing, which zones perform the function of cleaning the napping-rollers with which they come in contact. As before, the rate of rotation of the cleaning-drum M and the position of the clothed zones are such that as the napping-rollers of the inner series pass beneath it the smooth surface of the cleaning-drum only is presented, while as the napping-rollers of the outer series pass beneath it the clothed surface is presented and the cleaning function performed.

In Figs. 3 and 4, R R are rollers which control the position of the fabric which is being napped and maintain it in contact with as large a portion of the periphery of the napping-drum as possible. By reason of there being but one cleaning-drum outside of this napping-drum it will be noticed that it is possible to place these rollers so near together that out of the fourteen napping-rollers shown only one, or at most two, are ever inactive.

Having thus described my invention, I claim—

1. In a napping-machine, the combination of a napping-drum carrying two alternating series of napping-rollers in planetary relation to the drum, the rollers of one series being differently clothed from those of the other series; two cleaning-drums situated the one outside and the other inside of the napping-drum, and each fitted with longitudinal zones of card-clothing; and positive actuating mechanism whereby each of the said cleaning-drums is positively rotated in such relation to the rotation of the napping-drum that

the outside cleaning-drum comes into contact with and cleans the inner series of napping-rollers, while the inside cleaning-drum comes into contact with and cleans the outer series of napping-rollers, substantially as described.

2. In a napping-machine, the combination of a napping-drum carrying two alternating series of napping-rollers in planetary relation to the drum; a cleaning-drum situated on the inside of the napping-drum and having alternating zones which are clothed with or free from wires; means whereby the axis of this cleaning-drum is held immovably not-

withstanding the revolution of the napping-drum outside of it; and means, substantially as described, whereby positive axial rotation is imparted to this cleaning-drum, the rate of this positive rotation being so related to the rate of rotation of the napping-drum as to compel the clothed zone of this cleaning-drum to come into contact with and clean only one of the two series of napping-rollers, substantially as described.

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Witnesses:

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