(No Model.) 4 Sheets—Sheet 1.

# C. RÜDIGER.

## WOOL CARDING ENGINE.

No. 300,284. Patented June 10, 1884.

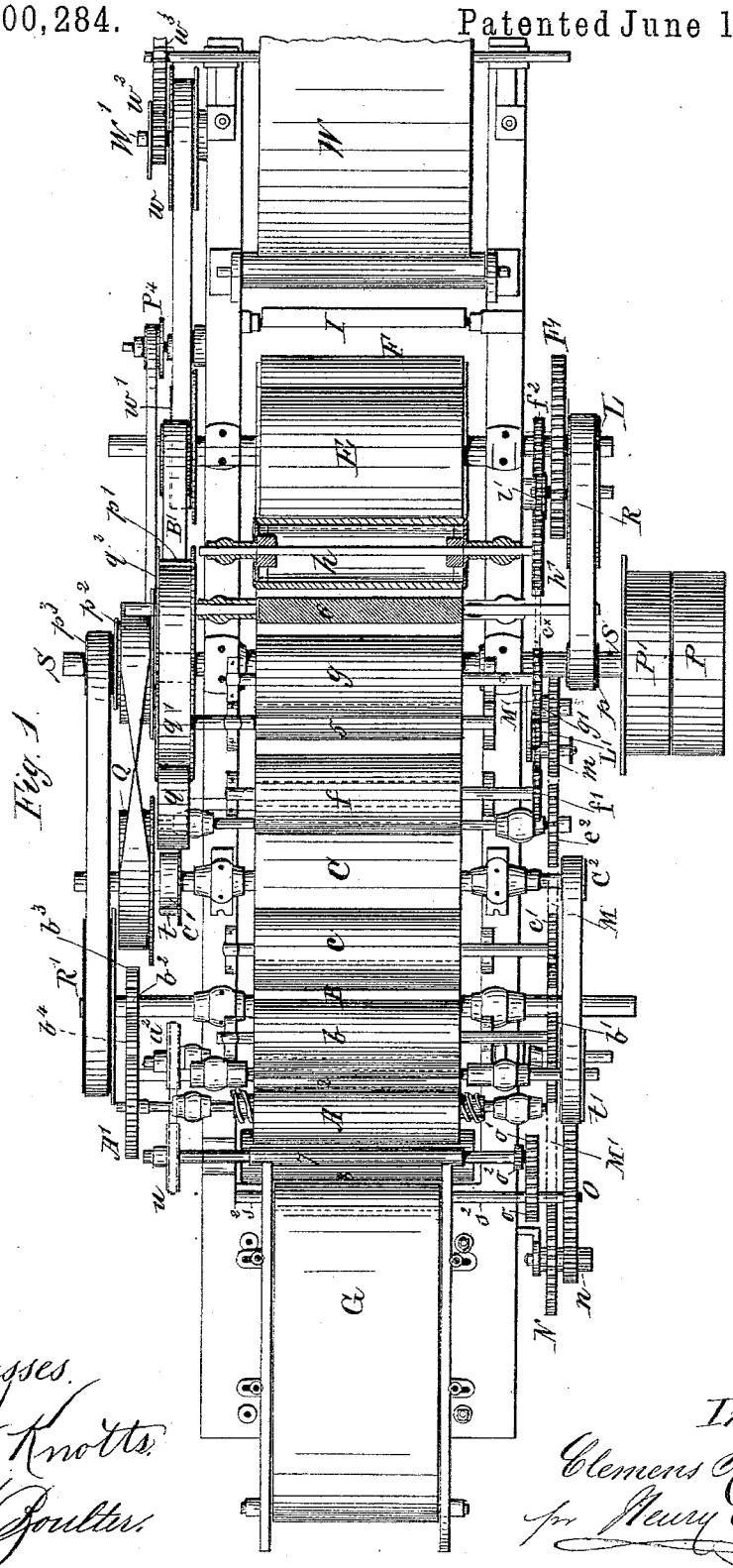


Fig. 1.

Witnesses.
G. W. Knotts.
W. E. Foulter.

Inventor
Clemens Rudiger
per Henry Orth
his att'y

N. PETERS. Photo-Lithographer. Washington, D. C.

(No Model.) 4 Sheets—Sheet 2.

# C. RÜDIGER.

## WOOL CARDING ENGINE.

No. 300,284. Patented June 10, 1884.

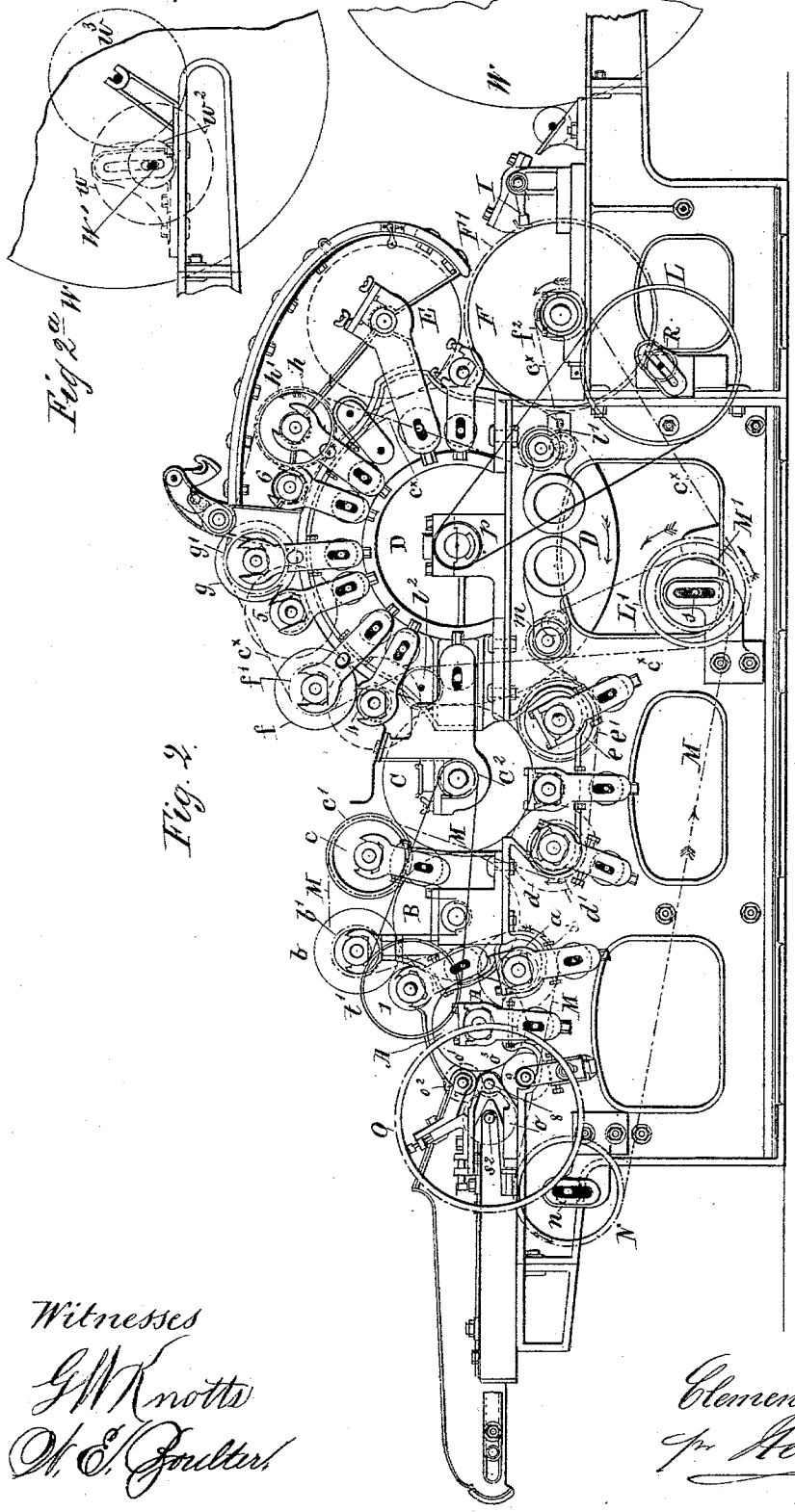


Fig. 2.

Witnesses
G. W. Knotts
M. E. Goulter

Inventor
Clemens Rüdiger
per Henry Orth
his att'y.

N. PETERS, Photo-Lithographer, Washington, D. C.

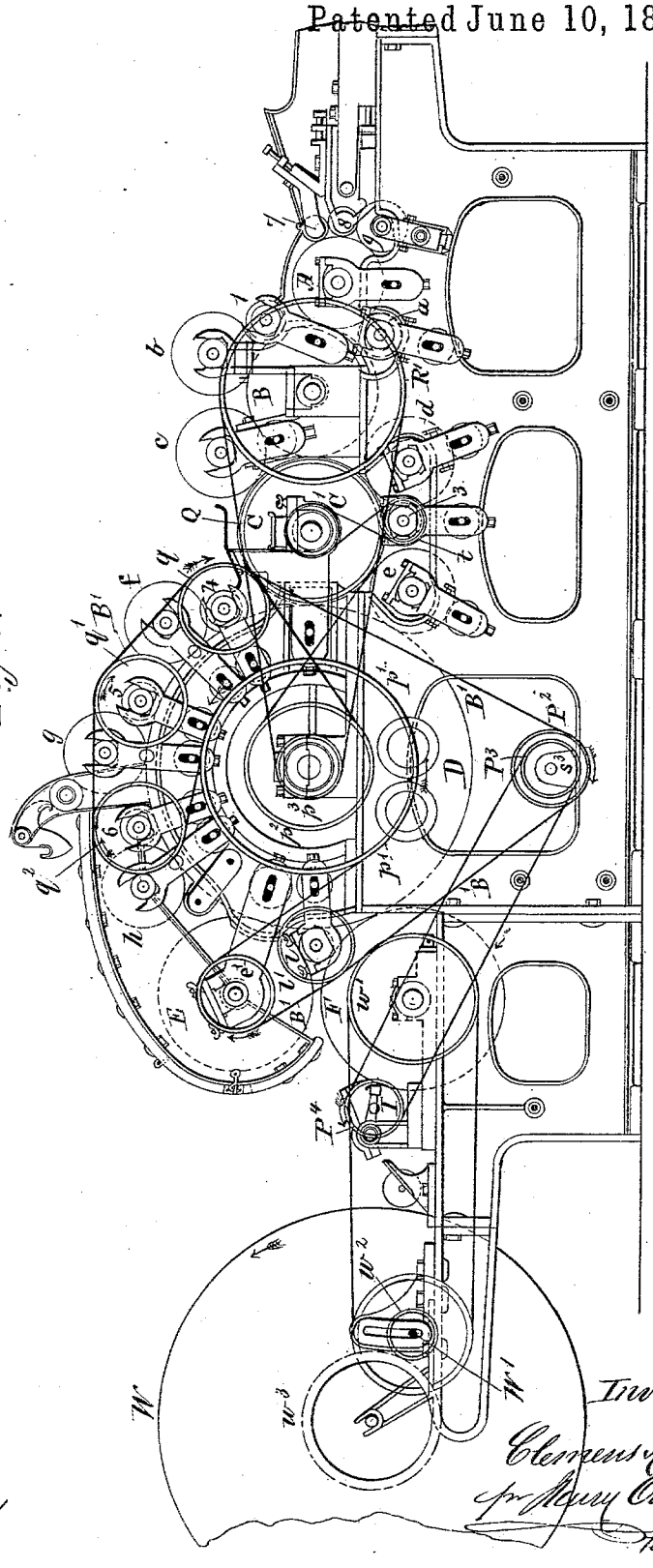
(No Model.) 4 Sheets—Sheet 3.

# C. RÜDIGER.

## WOOL CARDING ENGINE.

No. 300,284. Patented June 10, 1884.

Fig. 3.



Witnesses
G. W. Knotts
W. E. Coulter

Inventor
Clemens Rüdiger
per Henry Orth
his atty

N. PETERS, Photo-Lithographer, Washington, D. C.

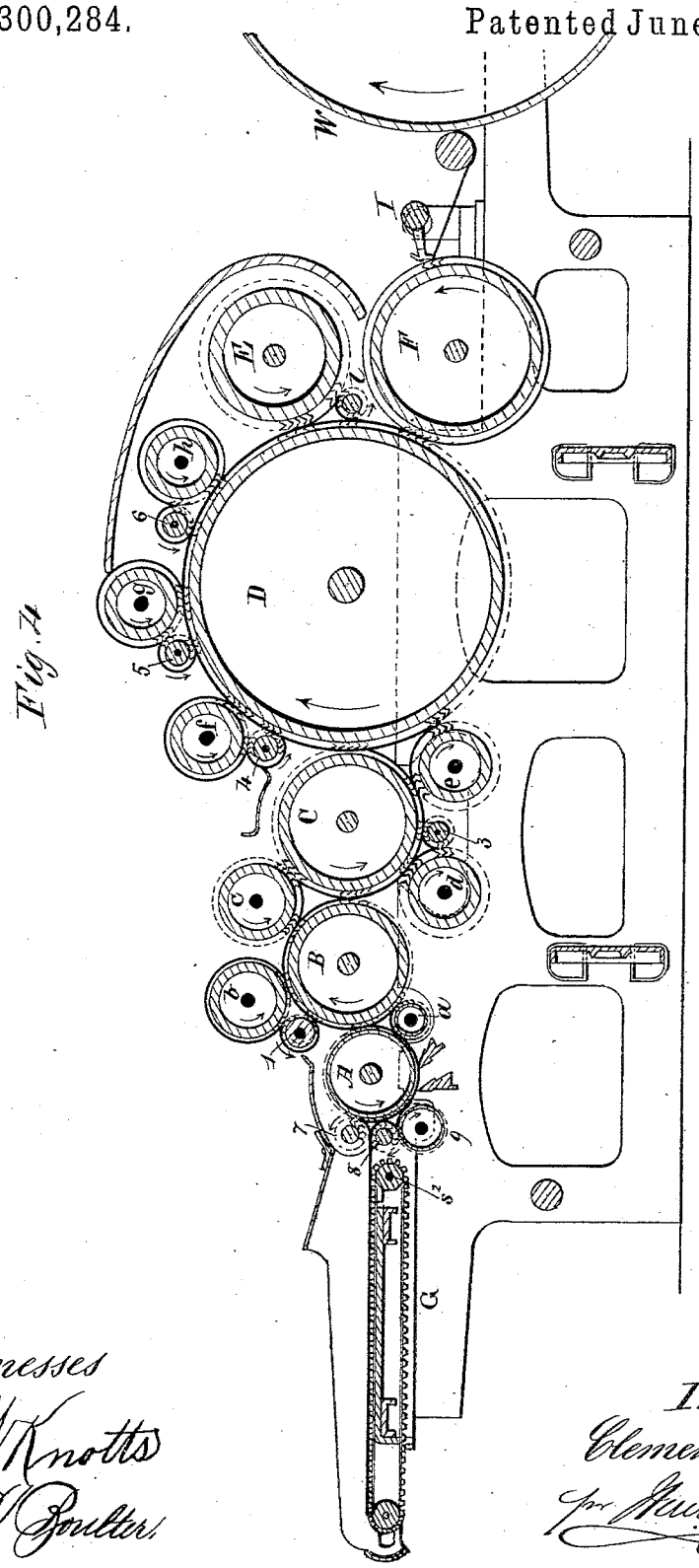
(No Model.) 4 Sheets—Sheet 4.

# C. RÜDIGER.

## WOOL CARDING ENGINE.

No. 300,284. Patented June 10, 1884.

Fig. 4.




Witnesses
G. W. Knotts
W. E. Boulter.

Inventor
Clemens Rüdiger
per Henry Orth
his att'y.

N. PETERS, Photo-Lithographer, Washington, D. C.

# UNITED STATES PATENT OFFICE.

CLEMENS RÜDIGER, OF FORST, PRUSSIA, GERMANY.

## WOOL-CARDING ENGINE.

SPECIFICATION forming part of Letters Patent No. 300,284, dated June 10, 1884.

Application filed August 16, 1882. (No model.) Patented in Germany February 26, 1881, No. 15,717; in England July 22, 1882, No. 3,501; in Belgium July 22, 1882, No. 58,545; in France August 1, 1882, No. 150,403, and in Austria-Hungary July 13, 1883, No. 25,453 and No. 29,632.

*To all whom it may concern:*

Be it known that I, CLEMENS RÜDIGER, a subject of the King of Prussia, residing at Forst, Prussia, German Empire, have invented certain new and useful Improvements in Wool-Carding Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

The object of this invention is to improve the operation of carding wool or other material, and to more intimately mix the fibers of such materials by combining two or more carding-engines and operating the same to prevent all retrograde movement of the material and to transmit such material directly from the carding-cylinder of one engine to that of the other without the intervention of transmitting-rolls, and to operate the several engines from the driving-shaft of the cylinder of one of them.

My improved carding-machine differs from other machines of this class, in so far that each cylinder, with its set or sets of urchins, is capable of working the material into a fleece, which fleece is taken directly from one cylinder by the next succeeding one, and so on throughout the series, each cylinder performing the function of a clearer and transfer-roll for its predecessor.

By means of the described arrangement of carding-cylinders the use of transfer-rolls is avoided, as well as the objectionable retrograde movement or backward feed of the material from one cylinder to a preceding one of the series. Of course, it will be understood that what is meant by "backward feed" is the transfer of the material or a portion of the material from one cylinder to a preceding one, and does not apply to the backward feed or return of the material to the cylinders by their respective workers.

The retrograde movement or backward feed in carding-engines is undesirable for the reason that the card clothing of the first cylinder is coarser than that of the second, and so on, and in the event of such backward feed the fiber of the material would be fed from cylinders containing finer to those covered with coarser card clothing and injured.

I do not wish to be understood as claiming as new the direct transmission of the fleece from one roll to another without subjecting such fleece to a process of carding, as is the case in all machines in which two or more carding-cylinders are employed. I claim, however, that the combination of two or more carding "working" cylinders, provided each with one or more sets of urchins and capable, individually, of working the material into a fleece and transmitting the same directly to one another without backward feed, is new, so far as I know. The arrangement of the working parts of the machine is such that the material, as it is acted upon by each successive carding device, is repeatedly turned, then transmitted without the intervention of transmitting-rolls (as a fleece) to the next carding device, and so on, such transmission being effected without backward feed. The number of sets of urchins co-operating with the carding-cylinders may of course be varied, and in the illustration of my invention I have shown the first carding-cylinder as provided with two workers and a clearer, the second with two workers and a clearer, the third with three workers and three clearers, and a clearer for the fancy-roller. I do not, however, desire to limit myself to the arrangement or number of workers and clearers for each cylinder, as these will depend upon the nature of the material, and the clearer for the flier may be dispensed with.

In the accompanying drawings, Figure 1 is a plan view; Figs. 2 and 3, opposite side elevations; and Fig. 2ª is a part of Fig. 2 in completion of the same where broken off; and Fig. 4, a longitudinal section of my improved carding-machine, the fast and loose pulleys for operating the machine from a prime motor being removed in Fig. 2 for the sake of clearness.

The machine is composed of three distinct carding-engines, combined for co-operating to

work the material into a fleece. B, C, and D are the main carding-cylinders, having successively finer cards, and with each of these are combined for operation two or more workers and clearers. The workers of the cylinders B, C, and D respectively rotate at different speeds. For instance, the worker *b* of cylinder B rotates faster than the worker *c* of said cylinder. The worker *d* of cylinder C rotates faster than the worker *e* thereof, and the worker *f* of cylinder D rotates faster than the worker *g*, and the latter rotates faster than the worker *h* of said cylinder D. In other words, the workers *b d f* of cylinders B C D respectively rotate fastest and at about the same rate of speed. The worker *g* of cylinder D rotates slower than these, and the workers *c e h* of said cylinders B C D respectively rotate also at about the same rate of speed, but slower than *g f d b*. In this manner the first worker (*d* or *f*) of the cylinders C or D rotates faster than the last worker (*c* or *e*) of cylinders B or C, the cylinders themselves rotating at a successively-increasing speed—that is to say, D rotates faster than C, and the latter faster than B. This difference in the speed of the workers and cylinders is imparted thereto by means of driving-gear of different diameters. The workers are operated by means of toothed or sprocket wheels, and the clearers by means of pulleys and belts, as is the case in most machines of this class, and said devices, as well as all the other operating mechanism of the machine, are driven from the shaft of the cylinder D, as will be more fully described hereinafter. The material is fed to the working parts of the machine by the usual feed-apron, (indicated by the letter G,) from which it is taken up by feed-rolls 7 8 9 and transferred to the licker-in A and subjected to a first process of carding or turning by the worker *a* before it reaches the cylinder B, by which it is taken up and subjected to the action of said cylinder, the workers *b c*, and the clearer of worker *b*. As shown, the cylinder B is here provided with one clearer and two workers, of which more may be employed, if desired, and the material while being worked into a fleece is alternately turned and carded before it is taken up by the cylinder C, which has also two workers, *d e*, and one clearer, 3. Here the material is again subjected to a process of alternate carding and turning. The teeth of the cylinder C being finer than those of the cylinder B, the said material is more thoroughly operated on and mixed before it is taken up by the third cylinder, D, whose teeth are still finer than those of cylinder C. The cylinder D is provided with three workers, *f g h*, and three clearers, 4, 5, and 6, and the material is here again subjected to a process of alternate carding and turning before it reaches the fancy-roller E and the doffer F. In practice I prefer to interpose between the flier and doffer a clearer, *l*, to clear the material from the teeth of the flier, though this is not absolutely necessary. The function of the fancy is the same as in other machines of this class where such is employed—namely, to lift from between the teeth of cylinder D the material laid between said teeth by the operation of the workers of said cylinder to enable the doffer to take it off more readily, as is well understood. From the cylinder D the fleece is taken by the doffer F, and thence by a knife, I, and passes to the usual receiving-drum or other receiving appliances.

As hereinafter stated, the workers of each cylinder are rotated at a successively-decreasing speed, the first workers, *b*, *d*, or *f*, of said cylinder rotating faster than the second worker, *g*, of cylinder D, and this latter worker rotates faster than the second workers, *c e*, of cylinders B C, respectively, and the third worker, *h*, of cylinder D, while the cylinders themselves rotate, on the contrary, at a successively-increasing speed. The object of this relative arrangement of and speed in the several sets of carding devices is to more thoroughly mix the material without affecting it injuriously and prevent the retrograde movement thereof.

It will be observed that the transfer of the material from one set of carding devices to the other is a direct one—that is to say, the transfer of the fleece takes place without the intervention of the usual transfer-rolls from the working parts of one set to the working parts of the next succeeding set. The course of the material through the machine is shown by a heavy black line in Fig. 4 of the drawings, and during the operation of carding between the cylinders and workers a portion of such material adheres to both of them, the clearers being employed to return to the cylinders that portion which adheres to the workers. The workers *a c e* need no clearers, the cylinders B C D acting as such by directly taking up the material adhering to them. The material adhering to worker *c* is taken up by the cylinder C and mixed with that taken from cylinder B, and again combed and turned by workers *d* and *e*, that portion of the material adhering to *d* being stripped by clearer 3 and returned to cylinder C, while the material adhering to *e* is stripped therefrom by cylinder D and mixed with that taken from cylinder C, said material being then subjected to the action of workers *f g h*, the clearers 4, 5, and 6 of which operate to return the material adhering to said workers to cylinder D. As the material is taken up by one cylinder directly from a worker and the preceding cylinder, the return of the material to a preceding cylinder cannot take place, as is the case in many machines of this class. It will of course be understood that the workers and clearers rotate at a less speed than the cylinders, and that the clearers rotate at a greater speed than the workers, as is the case in all carding-engines. The operating parts of the machine are driven from the shaft S of the drum D, which shaft carries the fast and loose driving-pulleys P P', driven from any suitable prime motor. Said

shaft carries also a belt-pulley, $p$, belted with a pulley, L, the shaft of which is mounted in the lower part of the machine, and carries also a pinion, R, that meshes with a toothed wheel, F', on the doffer-shaft. The latter shaft also carries a sprocket-wheel, $f^2$, from which and the toothed wheel L' and idlers $l' l^2$ the workers $f g h$ of the drum D are driven by means of an endless chain, $c^\times$, said chain starting in one direction from doffer sprocket-wheel $f^2$ to wheel L', thence over idler or guide pinion $l^2$ to sprocket-wheel $f'$ of worker $f$, thence over sprocket-wheels $g'$ $h'$ of workers $g$ $h$, respectively, over idler or guide pinion $l'$ to doffer-pinion $f^2$. The shaft $s$, that carries the sprocket-wheel L', also carries a sprocket-wheel, M', from which workers $e$, $d$, $c$, $b$, and $a$ are driven by means of chain M and idler or guide pinion $m$, said chain passing also over a sprocket-wheel, N, from which the feed-apron G and the rolls 7 and 8 are driven. The sprocket-wheel N is mounted in a bracket-bearing, and its shaft carries a pinion, $n$, that meshes with a toothed wheel, O, on the shaft $s^2$ of the feed-apron G. Said shaft also carries a pinion, $o$, that meshes with a pinion, $o'$, on shaft of feed-roll 7, said shaft of feed-roll 7 carrying a pinion, $o^2$, that meshes with a pinion, $o^3$, on shaft of roll 8. The driving-chain M passes from wheel M' to wheel N, thence over sprocket-wheel $a'$ of worker $a$, and over the sprocket-wheels $b'$ and $c'$ of workers $b$ and $c$, respectively, and from these over sprocket-wheels $d'$ $e'$ of workers $d$ $e$, respectively, and over guide-pulley $m$ back to wheel M'.

The above-described driving mechanism is located on one side of the machine, as shown in Figs. 1 and 2, the belting being shown in full lines and the driving-chains (and the sprocket-wheels in the latter figure) in peculiar dotted lines. Fig. 2, as shown, is broken off at the delivery end, the remaining portion thereof being shown in Fig. $2^a$. The remaining driving mechanism, with one exception, as hereinafter stated, is located upon the opposite side of the machine, and is effected by belting and toothed gearing, as shown in Figs. 1 and 3.

Upon the shaft S of the drum D are mounted three belt-pulleys, $p' p^2 p^3$. The pulley $p'$ drives the flier E and the clearers $l$ 6 5 4 of drum D by a belt, B', that passes from pulley $p'$ to pulley $e'$ on the fancy-roller shaft, thence over pulley $l'$ on shaft of clearer $l$ over a pulley, $P^2$, mounted in the lower part of the machine, thence over pulleys $q$ $q'$ $q^2$ on the shafts of clearers 4, 5, and 6, respectively, and back to pulley $p'$. The pulley $p^2$ is belted by cross-belt with a pulley, Q, on the shaft of drum C, and the pulley $p^3$ is belted to a pulley, $R^4$, on the shaft of drum B. The shaft $s^3$, that carries the pulley $P^2$, also carries a belt-pulley, $P^3$, that is belted to a pulley, $P^4$, on the shaft of the comb or knife I. The cylinder C carries on this side of the machine a belt-pulley, C', that drives, by means of a crossed belt, a pulley, $t$, on the shaft of clearer 3, and on the opposite side of the machine said shaft carries a like belt-pulley, $C^2$, that is belted to pulley $t'$ on the shaft of clearer 1 of cylinder B. The cylinder A is driven from cylinder B by a pinion, $b^2$, on the shaft of the latter, the transmitting-gears $b^3$ $b^4$, and a gear-wheel, A', on shaft of cylinder A, as shown in Fig. 1, while the feed-roll 9 is driven from worker $a$ by a chain and sprocket-wheels $a^2$ $u$, Fig. 1, on the shafts of $a$ and 9, respectively. Finally, the receiving-drum W is driven from the shaft of doffer F by a pulley, $w'$, belted to a pulley, $w$, on a shaft, W', and by gear-wheels $w^2$ $w^3$ on the latter shaft and on shaft of drum W, respectively.

Having thus described my invention, what I claim is—

1. The combination of two or more co-operating carding-engines, each composed of a carding-cylinder and suitable urchins, the cylinders of each engine operating to take the material directly from the preceding engine without the intervention of transferring-rolls, and card or comb the material and form the same into a fleece, and mechanism for operating said parts, as described.

2. The combination of two or more carding-engines, each composed of a carding-cylinder and suitable urchins, the workers of each engine or set of carding devices rotating at a successively-decreasing speed, and the cylinders thereof operating to take the material directly from the preceding engine without the intervention of transferring-rolls, and to card or comb the material and form the same into a fleece, and mechanism for imparting the described speed to said workers, as described.

3. The combination of two or more co-operating carding-engines, each composed of a carding-cylinder and suitable urchins, the workers of each engine or set of carding devices rotating at a successively-decreasing speed, and the cylinders of the several engines at a successively-increasing speed, the cylinders of one of said engines operating to take the material from the engine next preceding it without the intervention of transferring-rolls, and card or comb the said material into a fleece, and mechanism to impart the described speed to said workers and cylinders, as described.

4. The combination of two or more co-operating card-engines, each composed of a carding-cylinder and urchins, and adapted to card or comb the material and form the same into a fleece, as described, a feed-apron, feed-rolls, a licker-in, a fancy-roller, a knife or stripping-comb, a receiving-cylinder, and mechanism for imparting to the workers and carding-cylinders the described speed, all operated from the driving-shaft of one of the carding-cylinders, as described, for the purpose specified.

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

CLEMENS RÜDIGER.

Witnesses:
GEORGE LAUBIER,
B. ROI.