(No Model.) 4 Sheets—Sheet 1.

P. L. KLEIN.

DRAWING AND UNBURRING DEVICE FOR CARDING ENGINES.

No. 318,121. Patented May 19, 1885.

Fig: I.

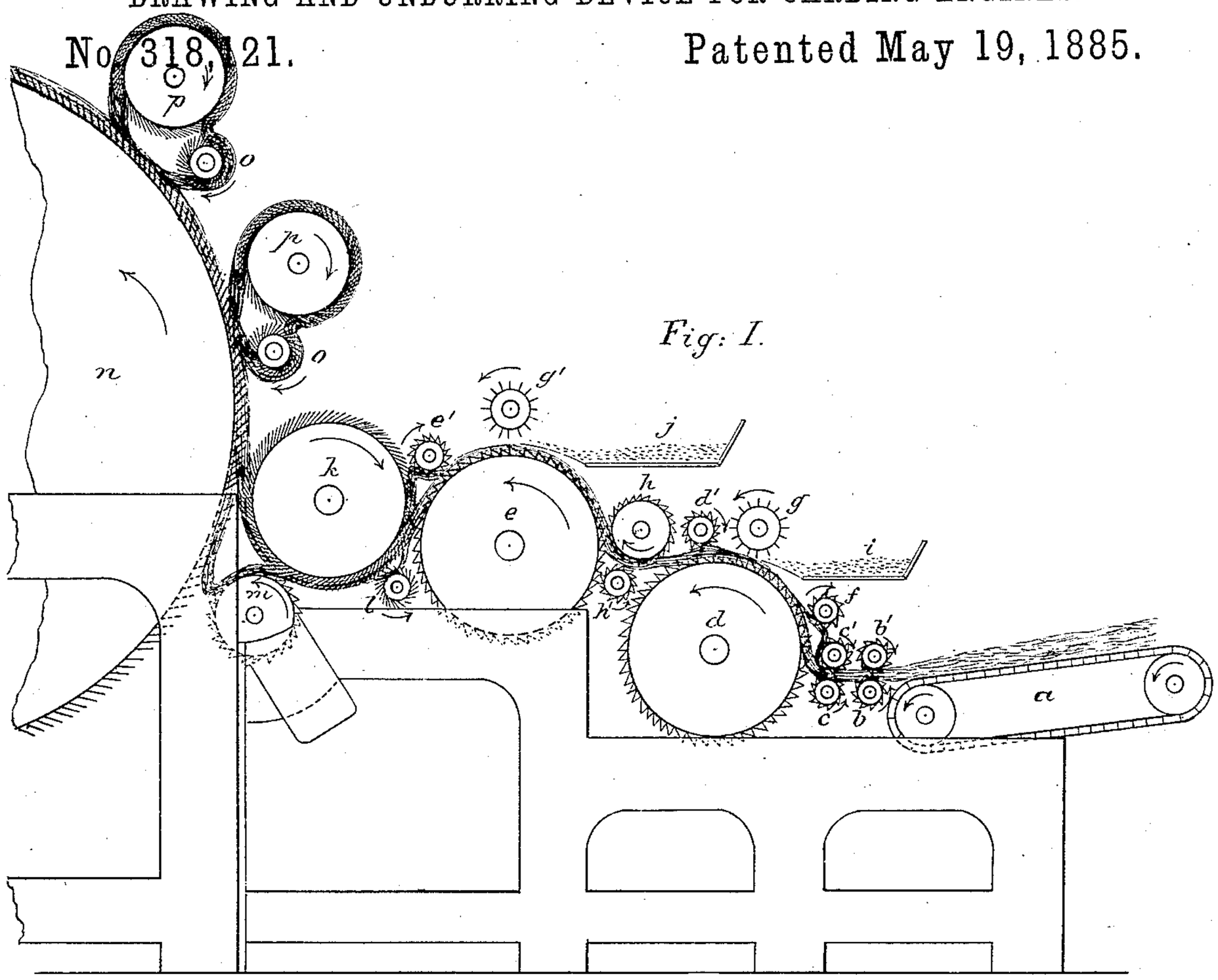


Fig: II.

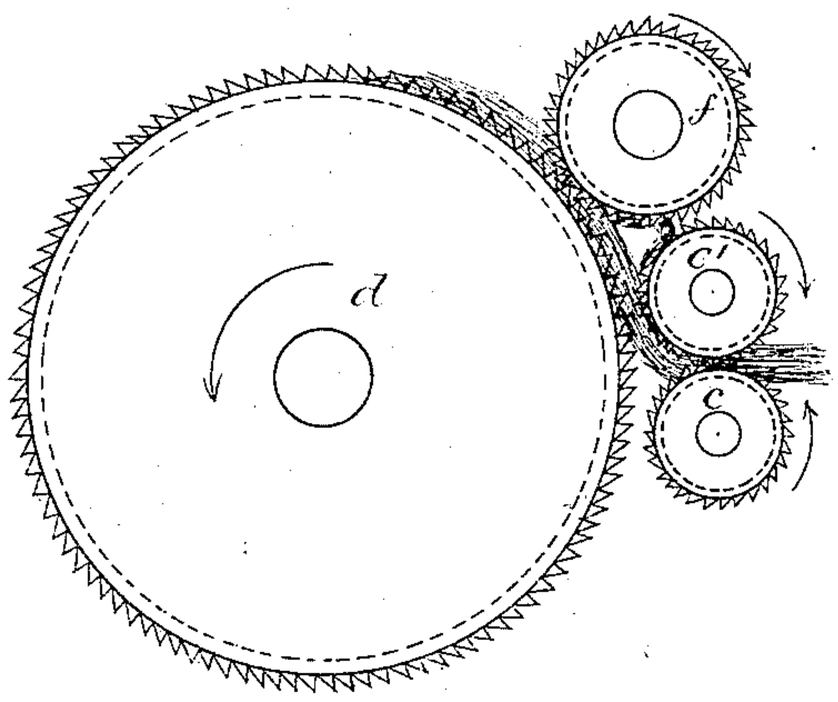


Fig: III.

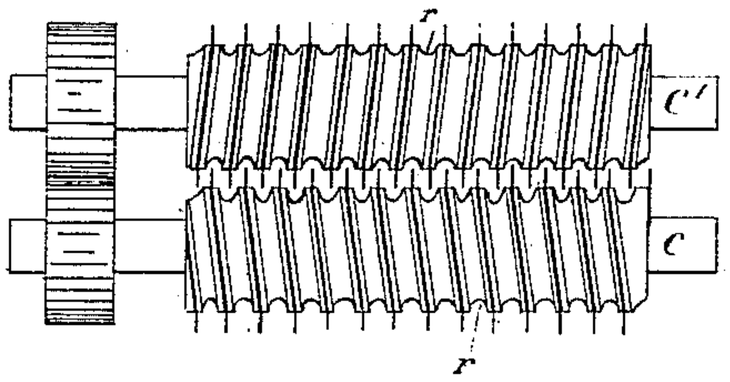
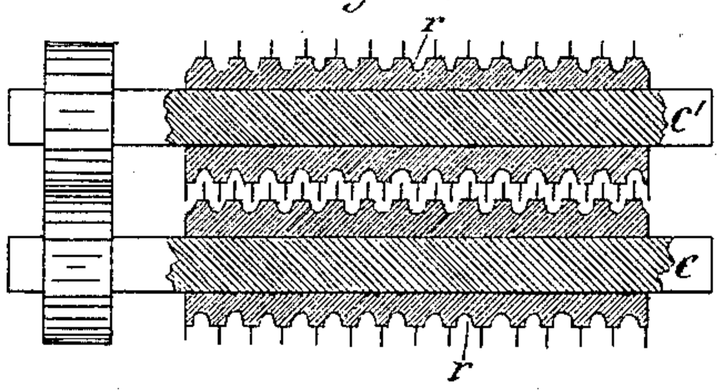


Fig: IV.



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(No Model.) 4 Sheets—Sheet 2.

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DRAWING AND UNBURRING DEVICE FOR CARDING ENGINES.

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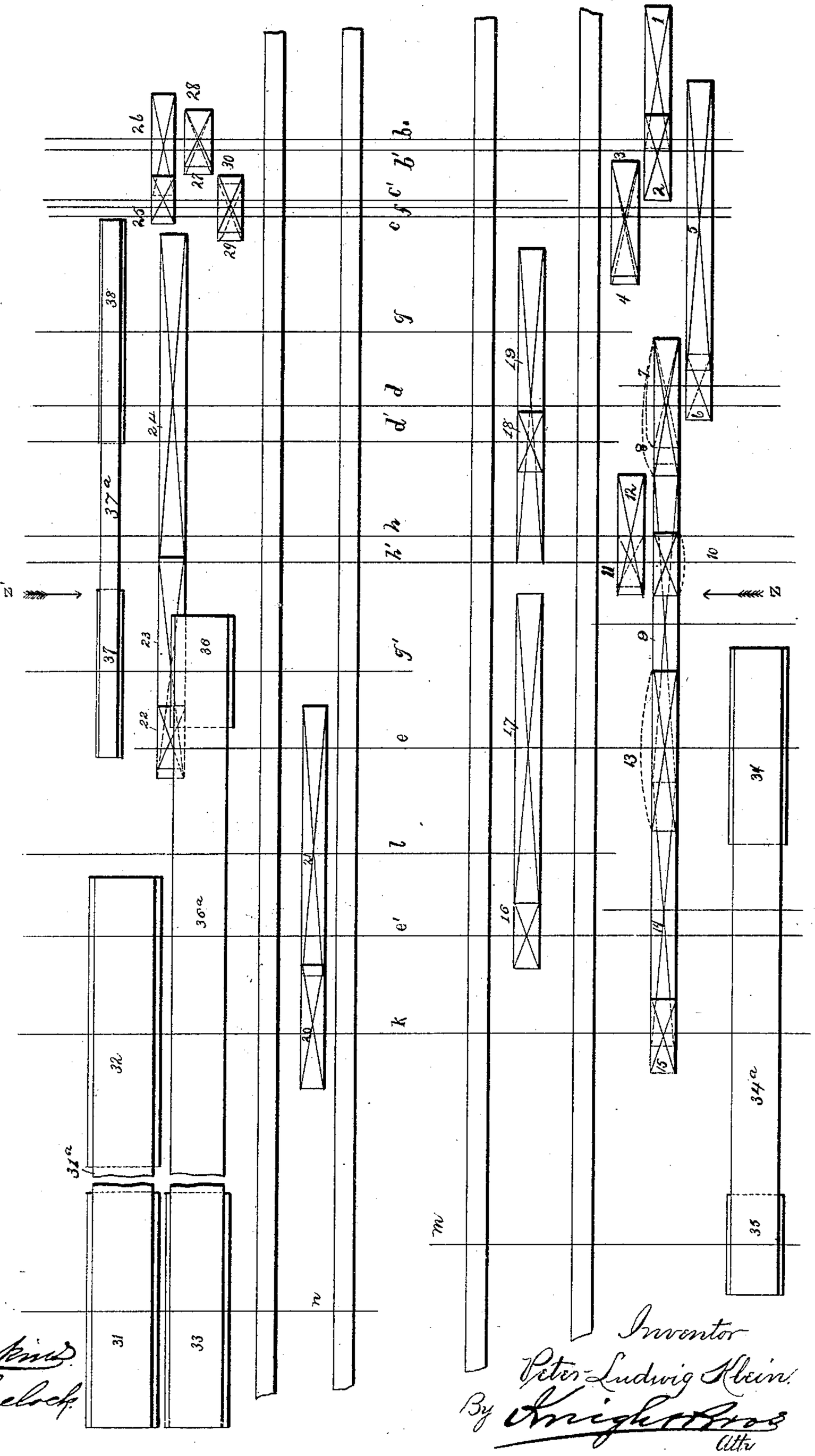
Fig. V



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DRAWING AND UNBURRING DEVICE FOR CARDING ENGINES.

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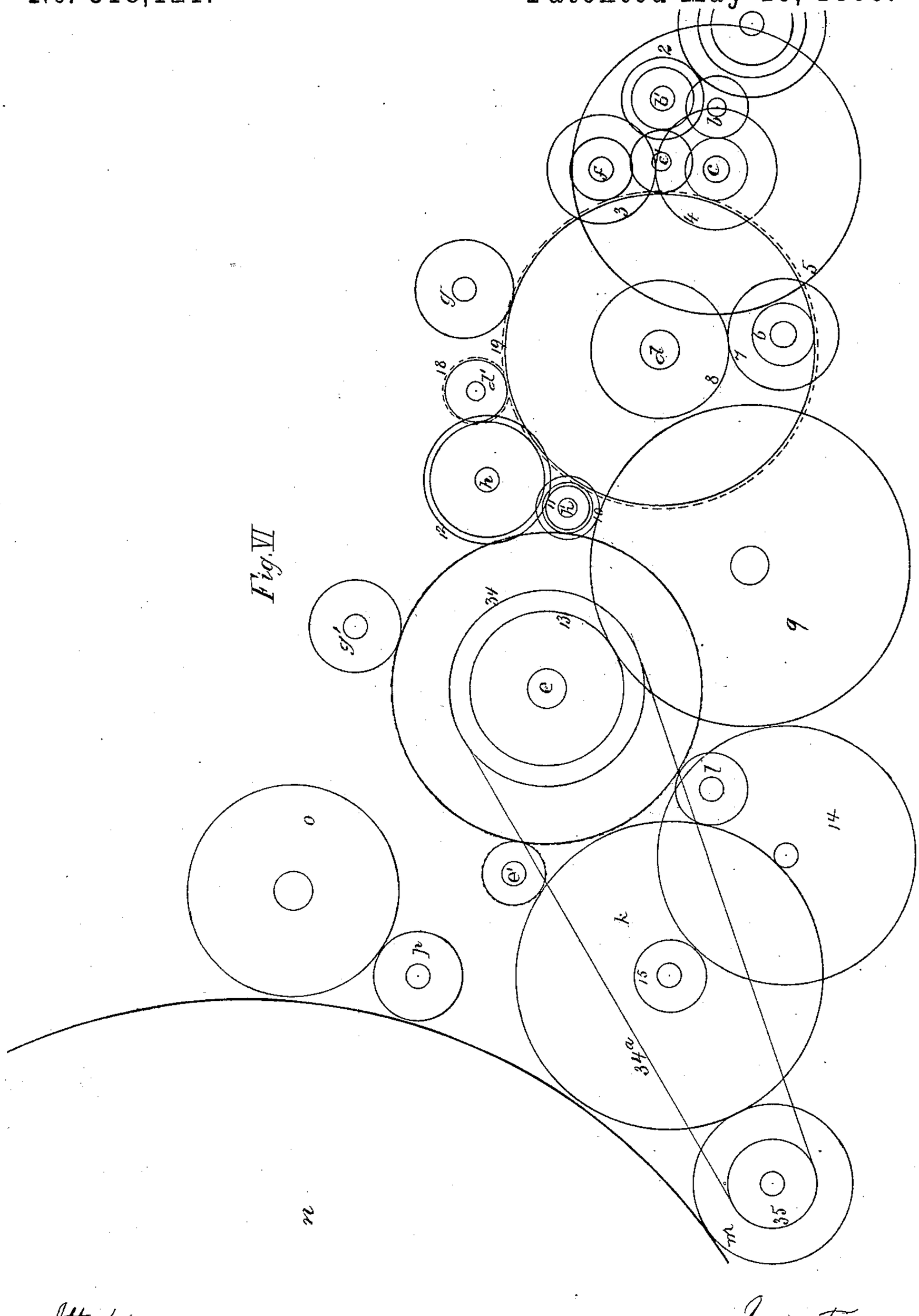
Fig. VI



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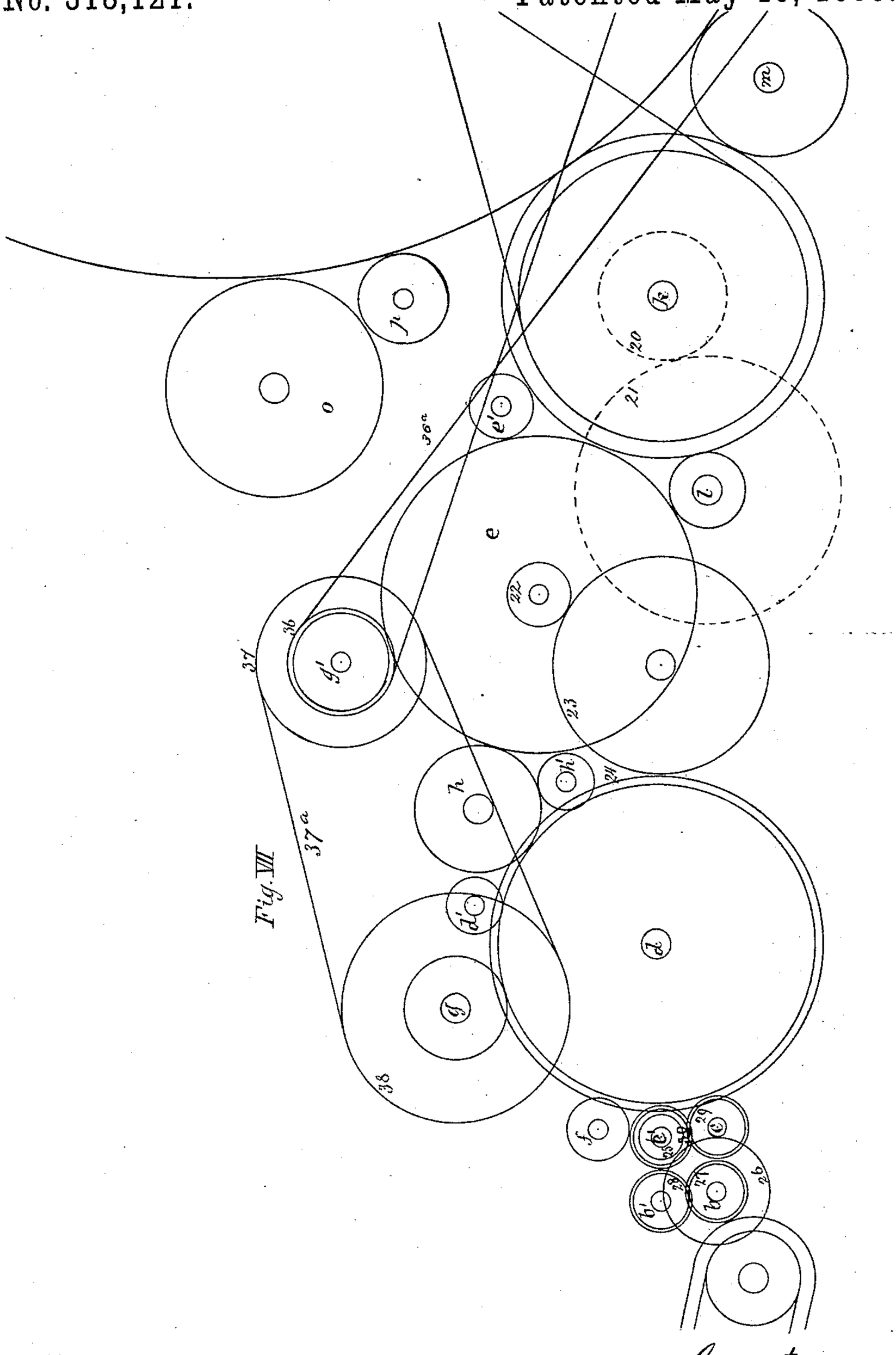

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Peter Ludwig Klein
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UNITED STATES PATENT OFFICE.

PETER LUDWIG KLEIN, OF DÜSSELDORF, PRUSSIA, GERMANY, ASSIGNOR OF ONE-HALF TO PAUL HERMANN MÜLLER, OF SAME PLACE.

DRAWING AND UNBURRING DEVICE FOR CARDING-ENGINES.

SPECIFICATION forming part of Letters Patent No. 318,121, dated May 19, 1885.

Application filed December 23, 1882. (No model.) Patented in Germany October 19, 1880, No. 15,182, November 9, 1880, No. 13,897, and January 25, 1881, No. 15,166; in Belgium December 21, 1880, No. 53,377, and June 29, 1881, No. 55,037; in France December 23, 1880, No. 140,305; in England January 10, 1881, No. 116, and in Austria-Hungary January 31, 1881, No. 4,726 and No. 34,658.

To all whom it may concern:

Be it known that I, PETER LUDWIG KLEIN, of Düsseldorf, in the Kingdom of Prussia and Empire of Germany, have invented a new and useful Drawing and Unburring Device for Carding-Engines, of which the following is a description, reference being had to the accompanying drawings, in which—

Figure I is a sectional elevation of a portion of a carding-engine with my improvements applied thereto. Fig. II is a sectional view on an enlarged scale, showing the position of some of the principal rollers of my apparatus. Figs. III and IV are a front elevation and a sectional view, respectively, of my improved grooved feed-rollers. Fig. V is a diagrammatic plan view on an enlarged scale, showing the gearing, by means of which the variable speed is imparted to the different rollers. Fig. VI is a diagrammatic side view of the same, showing also the carding-rollers, looking in the direction of the arrow *z*, Fig. V; and Fig. VII is a similar view, looking in the direction of the arrow *z'*, Fig. V.

Like letters of reference indicate like parts in the several figures.

The wool is carried in the usual way by a feed-apron, *a*, to the first pair of feed-rollers, *b b'*, which pass the material directly to the second pair of feed-rollers, *c c'*. Of these feed-rollers the second pair revolves at double the speed of the first pair, whereby the first drawing of the fibrous material is effected. The upper feed-rollers, *b' c'*, are provided with teeth placed in spiral rows, inclined or running in opposite directions, and the lower feed-roller of each pair provided with teeth placed in spiral rows complementary to those of the upper rollers, so that the teeth of each pair will intermesh, as shown in Figs. III and IV; but so far I have presented no novel feature. I have found, however, in practice that the corners formed by the straight surfaces of the rollers and the bases of the rows of teeth present an obstruction to the easy passage of the burrs, some of which stick in such corners and form a hold for others, which not only obstructs the easy passage of the fibrous material, but tears it, which tearing it is especially desirable to avoid, as it is very difficult, if not impossible, to remove the small bits into which the burrs are thus torn. My aim is to remove the burrs as much as possible unbroken and entire, and to accomplish this they must have a free and easy passage between the feed-rollers, and be removed later on in the process, as will be hereinafter fully described. To this end I form grooves *r* in the surfaces of these feed-rollers, corresponding to and between the spiral rows of teeth in such a manner that the teeth of the one roller of each pair are opposite to and move in the groove *r* of the opposite roller, as is clearly shown in Figs. III and IV. These grooves being semicircular in cross-section, and the above-mentioned obstructing-corners being thereby obviated, the burrs find no opportunity to stick fast in the same or to be torn, as they glide without hindrance in these smoothly-worked grooves *r*.

d is a burring-roller, which receives the wool as it passes from the feed-rollers *c c'*; and *f* is a clearing-roller, which serves to remove from the feed-roller *c'* any fibers remaining thereon and to pass them onto said burring-roller *d*, whose circumferential speed is about twenty times that of the feed-rollers *c c'*.

It will be understood that when the wool is taken by a fast-moving roller from between a slower moving pair it will be "drawn out," and thereby become distributed upon the faster moving one in a layer as many times thinner than that on the slower moving ones as the circumferential speed of the one is greater than that of the other, approximately speaking.

d' is a roller, termed a "drawing-roller," which is placed above, and is revolved at the same circumferential speed as the roller *d*.

From the preceding it will be readily seen that as the wool is taken by the rollers *d d'* it will be drawn out to about one-twentieth of its bulk as it is passed from the rollers *b b'* to the rollers *c c'*, or one-fortieth its original bulk.

h is a roller, termed a "stripping-roller,"

which is revolved at twice the circumferential speed of the rollers *d d'*, and serves to strip the wool therefrom, and, in conjunction with a second drawing-roller, *h'*, which revolves at the same circumferential speed as itself, draws the material out a third time, in the manner already described.

It is obvious that the oftener the material is passed between rollers of successively-increasing circumferential speed the more it will be drawn out or reduced in bulk and "parallelized," or the single fibers drawn parallel to each other in the direction of their length, and the easy removal of the burrs is proportional to these conditions, as the thinner the material the closer the burrs will be brought to the surface.

e represents a second burring-roller, the circumferential speed of which is twice as great as that of the rollers *h h'*, from which latter it takes the wool and thereby effects a fourth drawing and parallelizing, and this time affecting, principally, the under side thereof. The wool is then passed by this roller *e*, and a third drawing-roller, *e'*, (their circumferential speed being the same,) to a stripping-roller, *k*, whose circumferential speed is twice as great as that of the rollers *e e'*, whereby the material is again drawn out. A small catch-roller, *l*, with a circumferential speed about equal to that of the roller *e*, is so arranged between and below the rollers *e* and *k* as to catch any fibers dropping from the former and pass them onto the latter. After the roller *k* has combed the wool on the working-roller *m*, the circumferential speed of which is the same as that of the roller *e*, the main cylinder *n* takes it from the rollers *k* and *m*, after which the usual operation on the main cylinder, by the series of working and stripping rollers *o p o p*, takes place. I will here remark that the office of the so-called "drawing-roller" is twofold—namely, the drawing out of the material as it is delivered to it from a preceding pair of rolls revolving at a slower circumferential velocity, and also the holding of the material between it and some other roller of the same circumferential speed, so that the next roller of greater velocity will be compelled to "draw the material out," as explained in contradistinction to lifting it off in a matted condition.

I will now proceed to describe the unburring device, which in this illustration consists in two beater-rollers, *g g'*, located over the respective burring-rollers, *d e*. The rollers *g g'* revolve in the same direction as the rollers *d e*, so that the contiguous faces of the rollers *d g* and *e g'* will move in opposite directions and in close proximity to one another.

i j are pans for receiving the burrs as they are thrown off by the respective beaters *g g'*, said pans being supported at their ends by the frame of the machine or by any other convenient or desirable means. These pans may themselves be placed in such close proximity to the burring-rollers as to catch the burrs, but are each preferably formed with a thin metallic extension, which projects therefrom and close to the point where the burrs are thrown from the burring-rollers.

It is obvious that the number of burring and beating rolls may be increased or reduced without departing from my invention.

Fig. V shows in a plan view the means by which the successive increase of speed from the first pair of feed-rollers to the roller *k* is imparted, while Figs. VI and VII show side views of the same from opposite sides, those cog-wheels and belt-pulleys which are situated on the same side of the machine, but inside of the frame and hid thereby, being shown in dotted lines, thus showing in each of the last two figures all of the wheels that are situated on the respective sides of the machine.

In order to simplify the description, I will indicate the shafts by the letters of the rollers to which they respectively belong. A belt, 31ª, from the pulley 31 on the main shaft *n*, drives the pulley 32 on the shaft *k*, which latter carries, also, two cog-wheels, 15 and 20, of which 15, through means of a larger cog-wheel, 14, and a still larger one, 9, both on separate shafts, drives the shaft *e* by means of its cog-wheel 13, and the shaft *h'* by means of cog-wheel 10. The shaft *e* carries a belt-pulley, 34, from which, through belt 34ª and pulley 35, the shaft *m* is driven, two cog-wheels, 17 and 22, being also located on and driven by said shaft *e*. Cog-wheel 17, gearing with cog-wheel 16, drives the shaft *e'*. The shaft *h'* is further provided with a smaller cog-wheel, 11, which, through means of a larger cog-wheel, 12, drives the shaft *h*. The shaft *d'* carries a small cog-wheel, 18, which gears with a large cog-wheel, 19, on the shaft *d*, and is driven thereby. The latter is provided with two or more cog-wheels, a large one, 24, and a small one, 8, of which, by means of two intervening differently-sized cog-wheels, 7 and 6, and a larger cog-wheel, 5, on the shaft *c*, drives the latter. Of the other two smaller cog-wheels, 29 and 4, on the shaft *c*, the wheel 4 drives the shaft *f* through means of cog-wheel 3. The endless cloth or apron *a* is driven by means of cog-wheel 1 gearing into cog-wheel 2 on the shaft *b'*.

In Fig. VII the side of the apparatus is shown which is opposite to that shown in Fig. VI. Cog-wheel 20 on shaft *k* drives the shaft *l* by means of the larger cog-wheel 21, secured thereon while shaft *d* is driven by the successively larger cog-wheels 22, 23, and 24, of which the intervening cog-wheel 23 has its own shaft. The shaft *g'* is driven by a belt, 36ª, passing over the belt-wheel 36 from a similar wheel, 33, mounted on a shaft of its own below the main cylinder-shaft, and in turn drives the shaft *g* by means of a belt, 37ª, passing over wheels 37 and 38. From shaft *c* the shaft *c'* is driven by means of equalized cog-wheels 29 and 30, and shaft *b* drives the shaft *b'* through similar cog-wheels, 27 and 28, of equal size with 29 and 30, the shafts *b b'* being driven at half the velocity of shafts *c c'* through means of

a larger cog-wheel, 26, on shaft *b*, gearing with a small cog-wheel, 25, on shaft *c'*.

Any one skilled in the art to which my invention belongs will readily perceive that by means of the difference in size of the several cog-wheel gearings the series of rollers *b b'*, *c c'*, *d d'*, *h h'*, and *e e'*, and *k*, in the sequence named, have each an increased circumferential velocity.

It will be understood that the second freeing from the wool of the most part of the burrs and other impurities still remaining after the passing the first beater-roller, *g*, by means of the second beater-roller, *g'*, situated above instead of below the burring-roller *e*, is of the utmost importance, as thereby a loss of material, unavoidable when the second unburring occurs below the second burring-roller, cannot occur there. By means of the third drawing out of the wool between the rollers *d d'* and the stripping-roller *h*, and the fourth drawing out between the rollers *h h'* and the roller *e*, the burrs and other impurities are loosened in the fiber and are brought to the surface of the same on the roller *e* by means of its teeth, which gently press them upward through the loose and parallelized material, in order to enable them to be beaten off by the beater-roller *g'* into the pan *j*. Thus not only the upper portion, but the entire material, is subjected to the second burring process. The perfect unburring, however, is only possible through means of the drawing, and it will be observed that at the third as well as at the fourth drawing the stripping-roller *h* is both times the principal part, without which the two drawings would be impossible.

I am well aware that a second unburring above in contradistinction to below the second burring-roller is not new in itself; but in none of the carding-engines now known and in use has the double unburring been done above both of the unburring-rollers. It has been done above the first and below the second burring-roller, or vice versa, as the material in passing onto the second burring-roller is usually divided, the lower portion of the same being retained by the teeth of the first burring-roller, and thus passing on not cleansed a second time to the main cylinder, and not coming in contact with the second beater-roller, which operates only on the upper portion of the material. The stripping-roller *h*, however, passes the entire material without dividing the same from the first burring-roller, *d*, to the second burring-roller, *e*, it serving also, in combination with the rollers *d*, *d'*, and *h'* to draw out and thereby loosen and parallelize the material. Even without these latter rollers, *d' h'*, the said stripping-roller *h* would pass the entire material, and not the upper portion only thereof, onto the second burring-roller, *e*. In this case, however—that is, if the rollers *d'* and *h'* were dispensed with—the further advantage of the double drawing out of the material would be lost. The stripping-roller thus performs a twofold function, first, in its relation to the two burring-rollers *d e*, and then its relation to the two drawing-rollers *d'* and *h'*.

I am well aware that feed-rollers in pairs provided with spirally-arranged rows of teeth, and with increasing speed of the consecutive pairs are not new, and I do not claim them as part of my invention.

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

1. The combination of a pair of feed-rollers having teeth arranged spirally thereon, substantially in the manner described, and formed with grooves between said rows of teeth, as and for the purpose set forth.

2. The combination of a pair of feed-rollers, each having teeth arranged in rows thereon and formed with grooves between said rows of teeth, as and for the purpose set forth.

3. The stripping-roller *h*, in combination with the burring-rollers *d e*, and drawing-rollers *d' e'*, and belts and gearing, substantially as described, whereby rollers *d*, *d'*, *h*, and *e*, *e'* are driven at circumferential speed, increasing successively in the sequence named, as and for the purpose set forth.

4. In combination with the stripping-roller *b* and drawing-roller *h'*, the burring-roller *d* and drawing-roller *d'*, said rollers *d d'* and *h h'* being arranged in pairs, a second burring-roller, *e*, and belts and gearing, substantially as described, for rotating said pairs of rollers and the roller *e* at successively-increasing circumferential velocity, as and for the purposes set forth.

5. The herein-described apparatus for drawing and parallelizing wool, consisting of feed-rollers, a burring-roller, *d*, and a drawing-roller, *d'*, stripping-roller *h*, and drawing-roller *h'*, burring-roller *e*, and drawing-roller *e'*, all arranged in pairs, substantially as described, rollers for passing the material from the last pair above named onto the carding-cylinder, and belts and gearing whereby said pairs of rollers and the subsequent rollers are revolved at successively-increasing circumferential velocity, substantially in the manner and for the purpose set forth.

6. The several pairs of rollers, *b b'*, *c c'*, *d d'*, *h h'*, and *e e'*, and rollers for taking the material from the last-named pair and delivering it onto the carding-cylinder, in combination with belts and gearing, substantially as herein described, whereby the said pairs of rolls and the delivery roller or rollers are driven at successively-increasing circumferential velocity, as and for the purpose set forth.

PETER LUDWIG KLEIN.

Witnesses:
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ALEXR. A. C. KLAUCKE.