Dec. 7, 1926. 1,610,209

J. F. SCHIMEK

METHOD OF AND APPARATUS FOR HANDLING CARDED MATERIAL

Filed Nov. 24, 1924 6 Sheets-Sheet 1

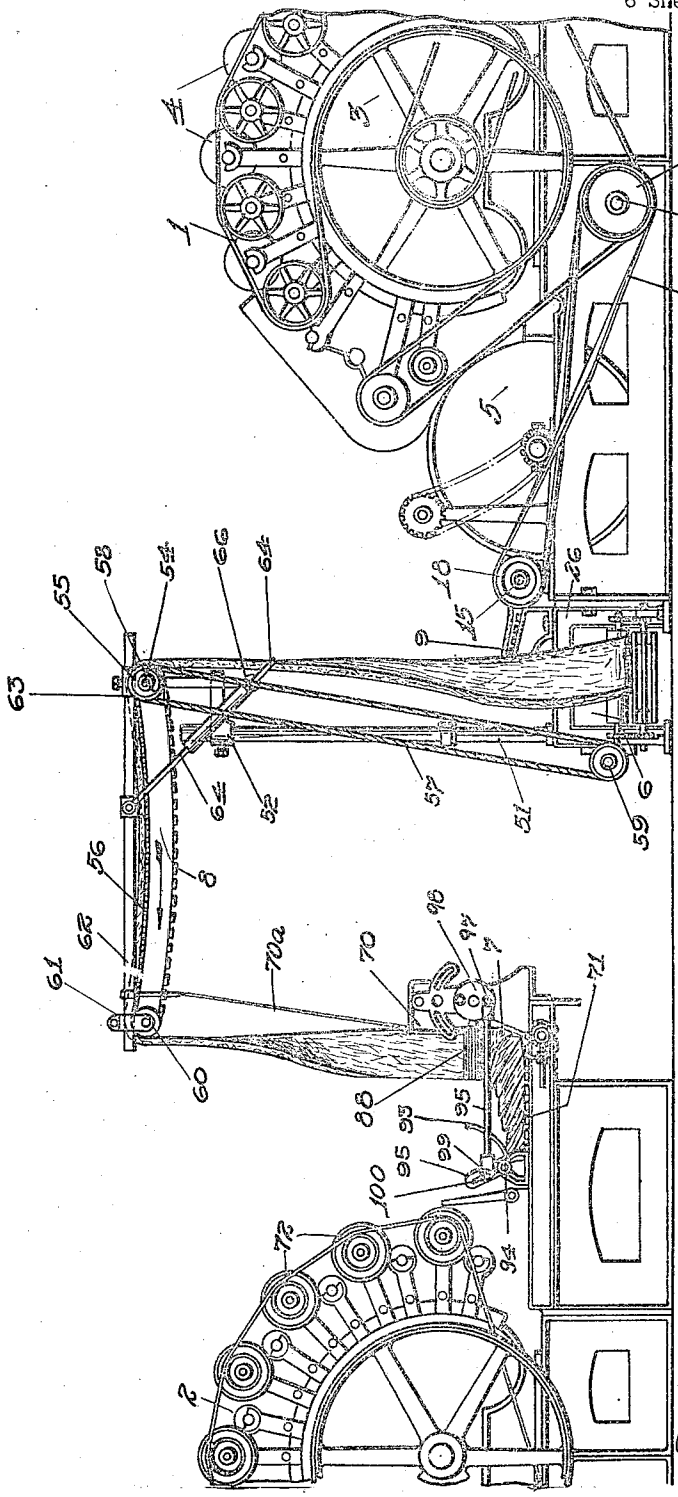


Fig. 1.

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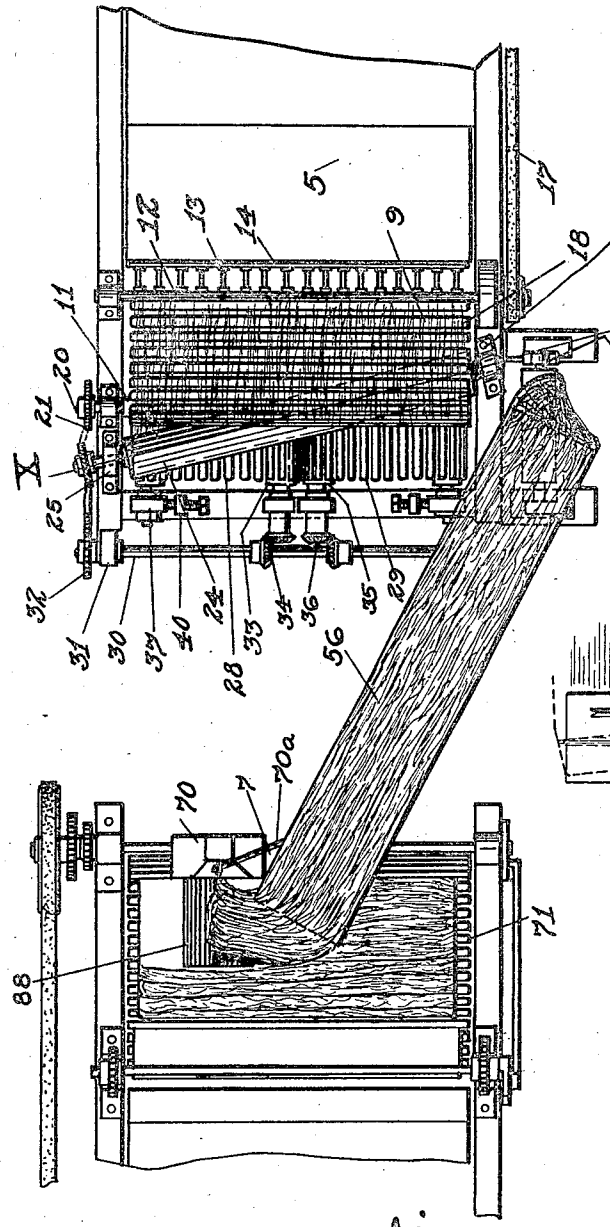


Fig. 2.

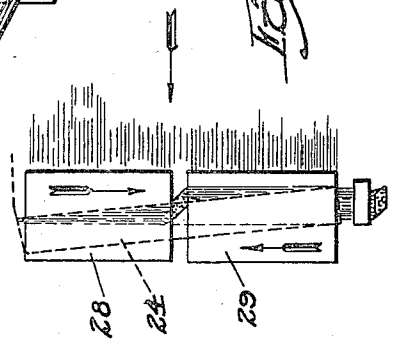


Fig. 6.

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Fig. 3.

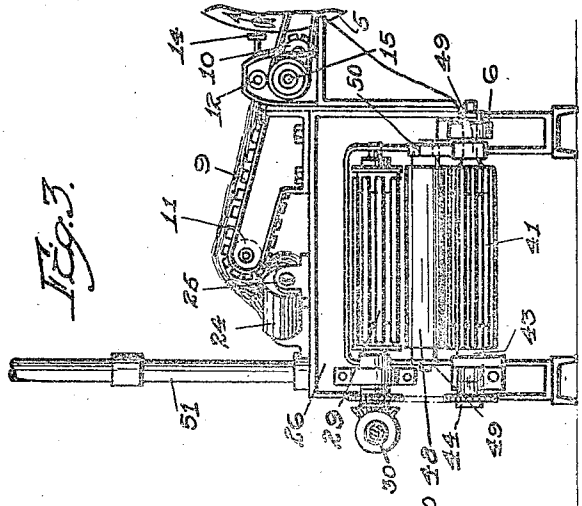


Fig. 5.

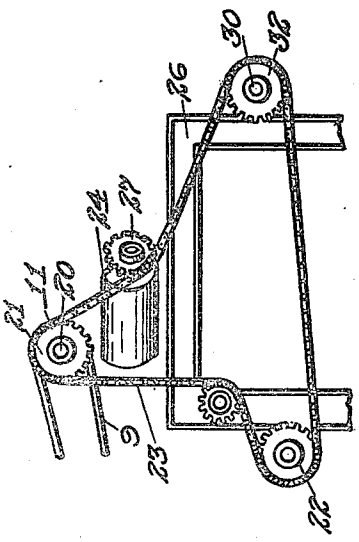
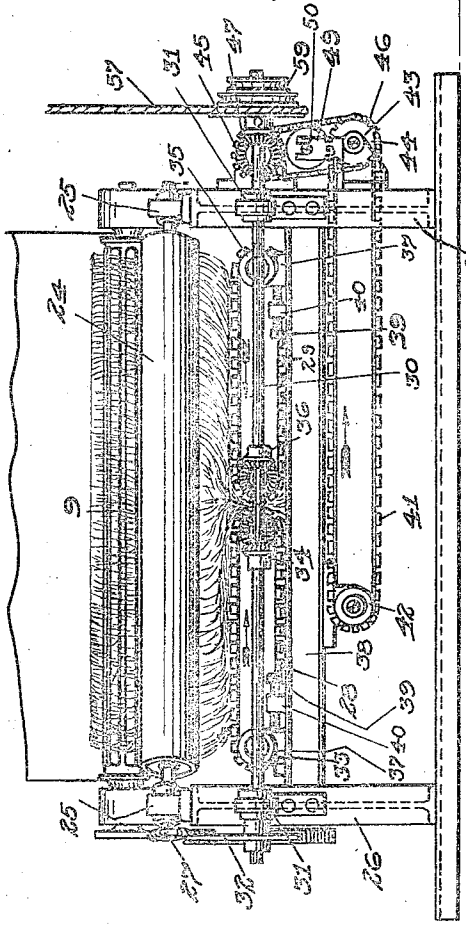


Fig. 4.



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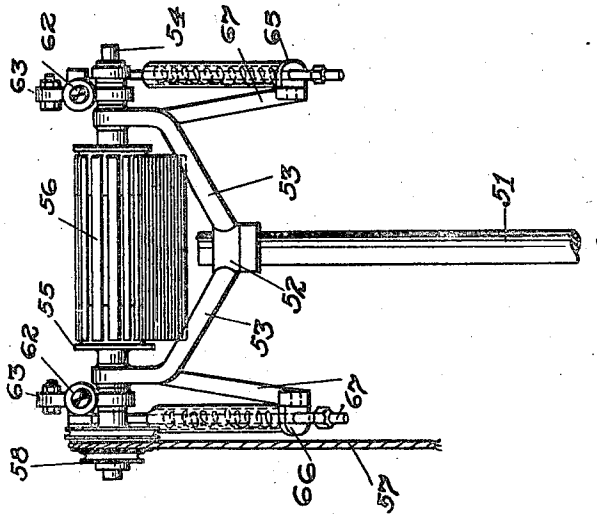


Fig. 8.

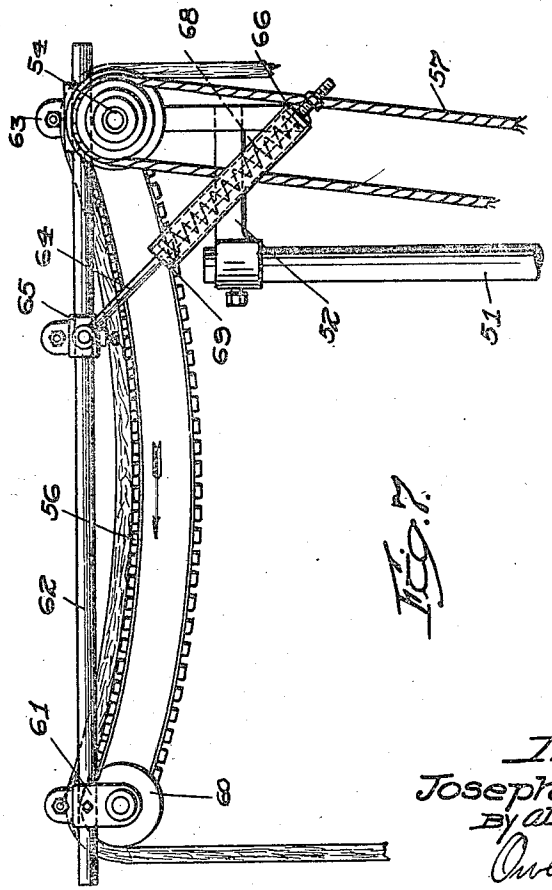


Fig. 9.

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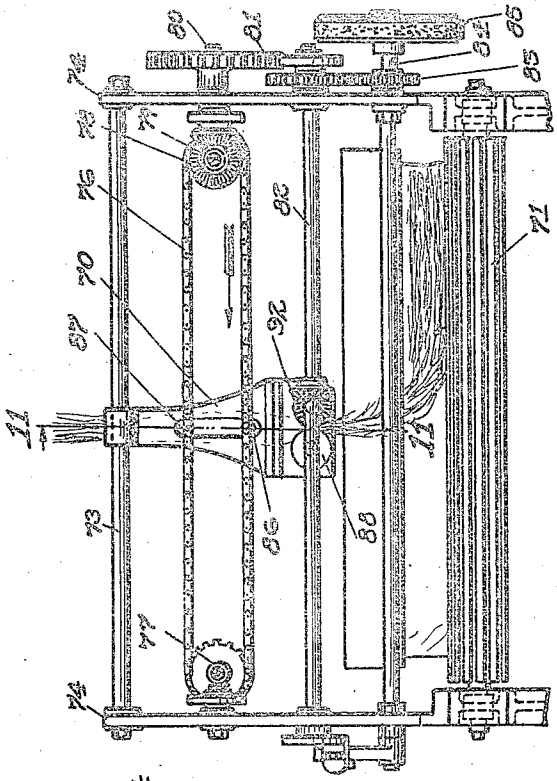


Fig. 10.

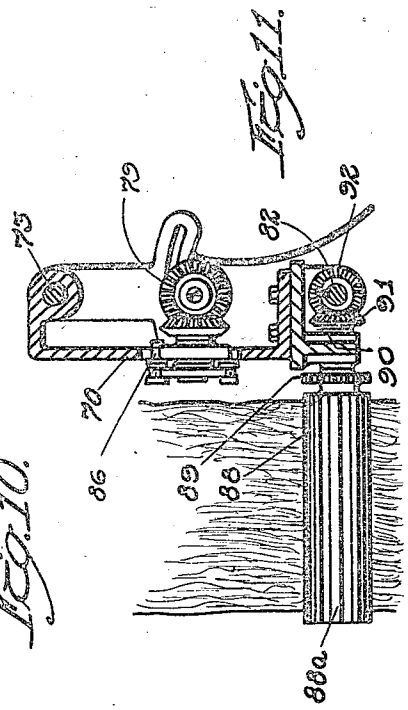


Fig. 11.

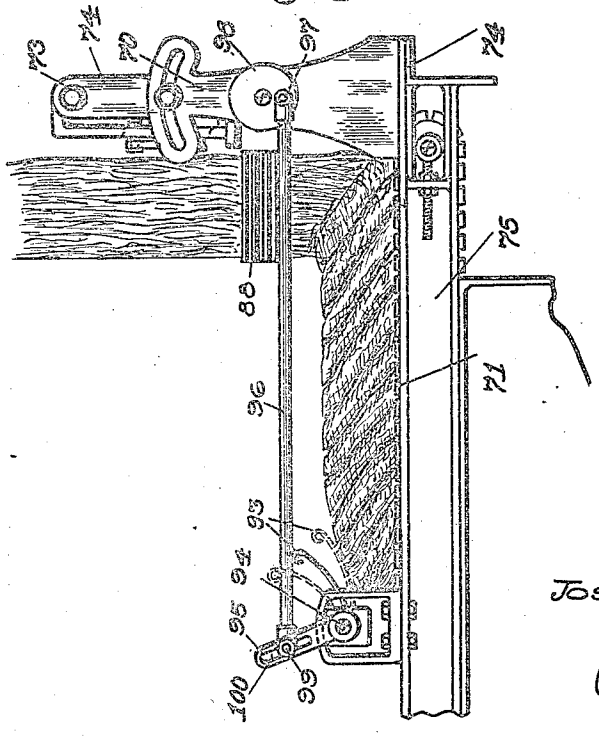


Fig. 9.

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METHOD OF AND APPARATUS FOR HANDLING CARDED MATERIAL

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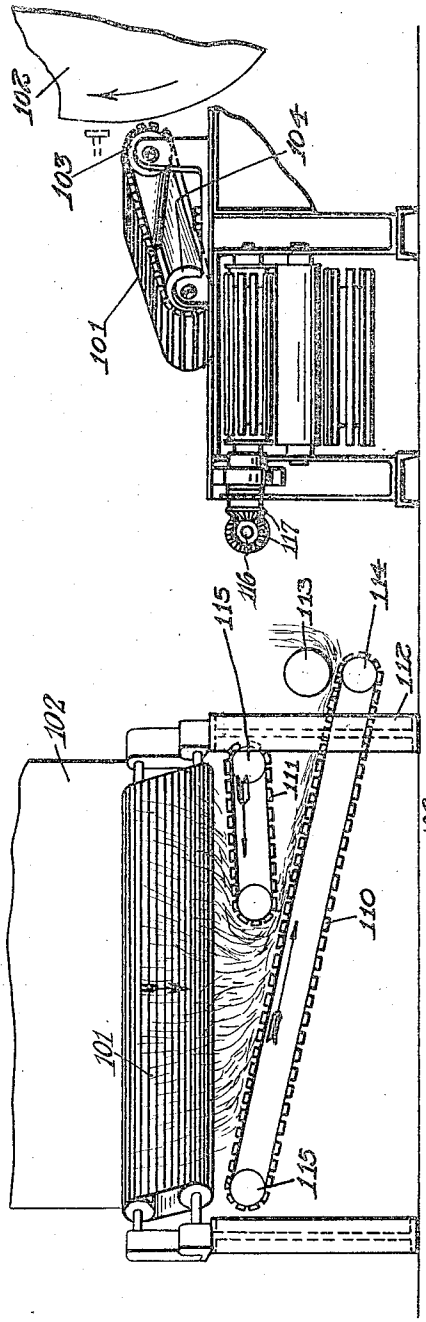


Fig. 12.

Fig. 13.

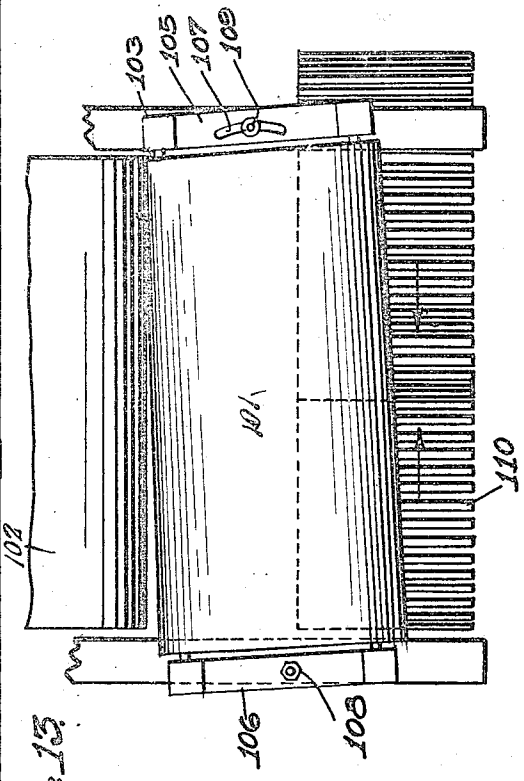


Fig. 14.

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UNITED STATES PATENT OFFICE.

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METHOD OF AND APPARATUS FOR HANDLING CARDED MATERIAL.

Application filed November 24, 1924. Serial No. 751,890.

My invention relates generally to the art of carding and has particular relation to the apparatus commonly employed for drawing out and placing in parallel relation the fibres of wool, cotton, or other staple, such apparatus being generally referred to as carding machinery. The object of my invention is to provide an improved method of and apparatus for handling carded staple, so that the cardings from one machine may be quickly transferred for operation on by another machine with a minimum amount of disturbance of the parallel relation of the fibres of the carded staple.

I am aware that apparatus has been heretofore employed for transferring cardings from one machine to another, such apparatus being usually interposed between successive breaker cards, or between a breaker card and a finishing card, as desired. The purpose of transferring cardings from one machine to another is to present the cardings of the first machine to the teeth of the second machine in such a manner that the fibres of the staple extend substantially parallel to the axis of rotation of the card cylinders of the second machine. It is well known, however, that apparatus heretofore constructed for transferring the carded material from one machine to another has been subject to certain defects owing to the manner in which the cardings are handled, and these defects will now be pointed out in order to give a more complete understanding of what is accomplished by the present invention.

The difficulties arising from the previous manner of handling carded material are largely due to the fact that the parallel relation between the fibres of the staple is seriously disturbed at the time of removing the cardings from the doffer cylinder. As the doffer knife removes the sheet of parallel fibres from the doffer cylinder, the fibres are condensed into a rope-like sliver, as it is then called, at a point tangent to the doffer cylinder, which sliver is passed through a suitable funnel, or nozzle, which tends to further condense it, often with a twisting movement, so that the sliver can be conveniently transferred to the next carding machine in the same manner as a continuous length. It will be apparent, however, that the parallel relation between the fibres of the carded staple is seriously disturbed as the fibres are condensed into the sliver, particularly when any twisting occurs, so that the teeth of the succeeding card cylinders will exert a tearing effect on the fibres as they are again drawn into parallel relation. This tearing action is particularly objectionable when working with staple having long fibres, for obviously many of the fibres will be broken as they are torn apart, thus destroying the advantages gained by the use of long staple material, such as high grade wool.

According to the present invention I provide an improved method and apparatus for handling carded staple as it is transferred from one carding machine to another in such a manner that the parallel relation between the fibres remains practically undisturbed from the time the fibres leave the doffer cylinder until they are acted upon by the teeth of the next card. The cardings which are handled by my improved apparatus are presented to the teeth of the second card in such a manner that the fibres are drawn out in their new relation with an almost complete absence of the tearing apart of the fibres, due to their having been compacted and twisted together in the formation and handling of the sliver as heretofore practiced. The above and other advantageous features of my invention will hereinafter more fully appear, reference being had to the accompanying drawings in which—

Fig. 1 is a view in side elevation showing portions of two separate carding machines with my improved apparatus for conveying carded staple therebetween.

Fig. 2 is a plan view illustrating the apparatus shown in Fig. 1, on an enlarged scale.

Fig. 3 is an end view of that portion of my improved apparatus which cooperates directly with the first carding machine.

Fig. 4 is a view in front elevation of the parts shown in Fig. 3.

Fig. 5 is an end view similar to Fig. 3, looking from the opposite side of the machine.

Fig. 6 is a diagrammatic view illustrating the principle of operation of the gathering device.

Fig. 7 is a view in side elevation, show-

ing on an enlarged scale, that portion of my apparatus for conveying the sliver from one carding machine to the other.

Fig. 8 is a view in end elevation of the parts shown in Fig. 7.

Fig. 9 is a view in end elevation, showing on an enlarged scale, that portion of my apparatus which delivers the cardings to the second carding machine.

Fig. 10 is a view in front elevation of the parts shown in Fig. 9.

Fig. 11 is a vertical sectional view along the line 11—11 of Fig. 10, looking in the direction of the arrows.

Fig. 12 is an end view similar to Fig. 3, showing a modification of a portion of my apparatus.

Fig. 13 is a view, in front elevation, of the parts shown in Fig. 12.

Fig. 14 is a plan view of the parts shown in Fig. 13, certain structural details being omitted.

Like reference characters refer to like parts in the different figures.

Referring first to Figs. 1 and 2, portions of two separate carding machines are generally designated by the reference characters 1 and 2, and for convenience of description, these machines 1 and 2 will be hereinafter referred to as the first and second carding machines respectively. The machines 1 and 2 may be of any well known type, although both machines would probably be what are commonly referred to as "breaker cards" in the usual practice. It is entirely within the contemplation of my invention, however, to employ my improved method and apparatus in connection with a breaker card and a finishing card.

In the ordinary operation of the first machine 1, the fibres of the staple are drawn into parallel relation by cooperation between the card cylinder 3 and the smaller card rolls 4 surrounding the same. The doffer cylinder 5 is adapted to strip the fibres from the main cylinder 3, the fibres then being in a thin sheet extending around the periphery of the doffer cylinder. The parts described thus far form no part of the present invention, which has to do entirely with the manner of removing the cardings from the doffer cylinder 5 and the subsequent handling thereof.

The improved apparatus for carrying out my invention consists of three units, namely, a gathering device 6 cooperating with the first carding machine 1, a distributing device 7 cooperating with the second carding machine 2, and a conveyor 8 cooperating with a gathering and distributing devices 6 and 7. As illustrated, the gathering device 6 and the distributing device 7 are so constructed as to constitute complete units which may be readily applied to any carding machine, although of course, either one or both of these devices may be incorporated in the actual structure of a carding machine.

As best shown in Figs. 2, 3 and 4, the gathering device 6 consists of an apron 9 extending the length of the doffer cylinder 5, one end of the apron 9 being supported by a roll 10 rotatably mounted near the periphery of the doffer cylinder 5, with its axis of rotation parallel to the axis of the cylinder 5. The other end of the apron 9 passes over a roll 11 which is rotatably mounted with its axis of rotation parallel to, but vertically displaced with respect to the axis of the roll 10, so that the apron 9 has an upward inclination away from the doffer cylinder 5. A shaft 12 extends above the doffer end of the apron 9, and as best shown in Fig. 2, carries a number of fingers 13, to which are attached a doffing knife 14. The doffing knife 14 extends parallel to the surface of the cylinder 5 at a small distance therefrom, and is adapted to have an oscillatory movement imparted thereto, whereby it will remove the cardings from the cylinders 5 as the latter rotates in the direction of the arrow.

As is usual in the operation of carding machines, the cardings are carried on the surface of the cylinder 5 in the form of a thin sheet of fibres, more or less interlaced with each other, and all extending in substantially the same direction. The oscillation of the knife 14 therefore serves to strip the sheet of cardings from the cylinder 5 without disturbing the arrangement of the fibres, so that the sheet of cardings passes on to the apron 9 substantially intact. In other words, the cooperation between the cylinder 5, the apron 9 and the knife 14 is such as to merely change the direction of movement of the sheet of cardings from a circumferential path around the periphery of the cylinder 5 into a rectilinear path determined by the moving surface of the apron 9.

Oscillatory movement is imparted to the shaft 12, which carries the knife 14 by means of its connection to a shaft 15 which is adapted to be driven from a suitable source of power, such as the drive shaft 16 of the carding machine 1, by means of a belt 17 passing over pulleys 18 and 19, see Fig. 1. As best shown in Fig. 5, the upper apron roll 11 is provided with the shaft extension 20 carrying a sprocket wheel 21, which is driven from a suitable source of power, such as a driving sprocket 22, by means of a chain 23 which also serves to drive other parts of the gathering device 6, to be hereinafter described.

As best shown in Figs. 2 and 3, a deflecting roll 24 extends partially beneath the upraised end of the apron 9 with its axis of rotation angularly displaced with respect to the axis of rotation of the apron roll 11. The roll 24 is rotatably mounted in end bearings 25

which are adjustable on the end frames 26, so that the position of the axis of rotation X—X of the roll 24 may be varied for a purpose to be hereinafter described. It will be readily apparent from an inspection of Figs. 2 and 3, that the sheet of cardings conveyed by the apron 9 will fall upon the periphery of the roll 24 as the sheet reaches the end of the apron 9 and that the cardings will be deflected beneath the overhanging end of the apron 9 by reason of the angle between the axes of rotation of the roll 24 and the upper apron roll 11, such deflection being accomplished without disturbing the parallelism of the fibres. The deflecting roll 24 is driven at substantially the same speed of rotation as the apron roll 11 by means of a sprocket wheel 27, under which the chain 23 passes, see Fig. 5.

As best shown in Fig. 4, a pair of gathering aprons 28 and 29 are provided beneath the deflecting roll 24 for receiving the sheet of cardings. The aprons 28 and 29 are of sufficient width to receive the deflected cardings for any given setting of the roll 24, for it is evident from an inspection of Fig. 3, that the angularity of the roll 24 will determine the width of the zone within which the cardings are laid on the gathering aprons 28 and 29. The aprons 28 and 29 are adapted to be driven in opposite directions, as indicated by the arrows in Fig. 4, and a preferred arrangement for driving the aprons 28 and 29 will now be described.

A shaft 30 is rotatably mounted in bearings 31 carried by the end frames 26, and is driven at substantially the same speed of rotation as the upper apron roll 11 and the deflecting roll 24 by means of a sprocket wheel 32, around which the chain 23 also passes. As best shown in Fig. 2, the shaft 30 extends in front of the gathering aprons 28 and 29 and is connected to one roll 33 of the apron 28 by means of bevel gearing 34. One roll 35 of apron 29 is connected to the shaft 30 by means of bevel gearing 36, and it is obvious from a consideration of Fig. 4, that when the shaft 30 is driven in the direction of rotation indicated by the arrow, the upper surfaces of the aprons 28 and 29 will move toward each other. The bearings 37 which support the outside apron rolls 33 and 35 are adjustable on a cross member 38 of the frame by means of screws 39 cooperating with lugs 40 fixed on the frame member 38, so that the degree of tightness of the surfaces of the aprons 28 and 29 may be varied or the distance between the ends of the aprons changed after loosening the bearings of the inner rolls 33 and 35, for a purpose to be hereinafter described.

It will be evident from a consideration of the apparatus described thus far, that the sheet of cardings which passes from the apron 9 will be deflected by the roll 24 in such a manner that it will be distributed laterally on the aprons 28 and 29. As the deflected cardings reach the oppositely moving aprons 28 and 29, the sheet will be gathered in folds, as shown in Fig. 4, and the fibres constituting the sheet will undergo a transition from an arrangement in the form of a wide sheet of negligible thickness into an arrangement in the form of a ribbon having a width determined by the angularity of the roll 24, and a thickness determined by the space between the ends of the gathering aprons 28 and 29.

The action of transforming the cardings from a sheet into a ribbon is illustrated diagrammatically in Fig. 6, the direction of movement of the fibres as they fall upon the moving aprons 28 and 29 being indicated in full lines. The outline of the deflecting roll 24 is indicated in dotted lines, from which it is apparent that the angularity of the axis of rotation of this roll 24 will positively determine the width of the ribbon formed on the aprons 28 and 29. It will also be obvious from an inspection of Fig. 6, that the cross section of the ribbon as it passes down between the ends of the aprons 28 and 29 will be generally that of a non-rectangular parallelogram, indicated by dots in Fig. 6, one dimension of which will be determined by the inclination of the roll 24, and the other dimension of which will be determined by the distance between the aprons 28 and 29. A peculiar characteristic of this ribbon, which has an important bearing on its furture handling, as hereinafter described, is that the fibres lying along the edges of the ribbon are considerably less dense than the fibres at the middle of the section. It should also be borne in mind at this point that in forming the ribbon, the original parallel arrangement of the fibres as they are stripped in the form of a sheet from the doffer roll 5, has not been appreciably disturbed, as the fibres travel successively over the apron 9, under the roll 24 and upon the aprons 28 and 29. the surfaces of the aprons and the roll all moving at substantially the same linear speed.

As the completely formed ribbon passes from between the aprons 28 and 29, it drops upon an apron 41 moving in the same direction as the apron 28, which apron 41 conveys the ribbon to a point beyond the right hand end frame 26. The apron 41 is supported on rolls 42 and 43, the latter roll 43 being driven from the shaft 30 by means of sprocket wheels 44 and 45, a chain 46 and bevel gearing 47. A pressure roll 48 is loosely mounted between brackets 49 carried by the end frame 26, each bracket being provided with a slot 50 for receiving the trunnions of the roll 48. The ribbon passes between the apron 41 and the roll 48, which latter presses upon the ribbon and prevents

it from leaving the apron 41 as the ribbon passes upwardly to the conveyor 8, which will now be described.

Referring now to Figs. 1, 7 and 8, a standard 51 extends upwardly from the frame 26 at the delivery end of the apron 41 and is provided at its upper end with a pivotally mounted bracket 52. The bracket 52 provides upwardly extending divergent arms 53, between which is rotatably mounted a shaft 54, carrying a roll 55, around which passes an endless apron 56. The shaft 54 is adapted to be driven by means of a belt 57 passing around any one of a number of stepped pulleys 58 carried by the shaft 54, the belt passing downwardly around any one of a number of correspondingly stepped pulleys 59 carried by the shaft 30, as best shown in Fig. 4. With this arrangement it is obvious that the apron 56 may be driven at different speeds. The other end of the apron 56 passes around a roll 60, rotatably supported at its ends by bearing brackets 61. The brackets 61 are adjustably mounted on arms 62 which extend in the direction of the shaft 54, and the end portions of the arms 62 are received in clamping members 63 which are loosely mounted on the shaft 54 so that the arms 62, together with the outer apron roll 60, are capable of pivotal movement about the axis of the shaft 54. The arms 62, however, are yieldingly maintained in such a position as to hold the apron 56 extended, by means of thrust rods 64, which are carried by the collars 65 clamped on the arms 62 at a distance from the shaft 54. The thrust rods 64 extend downwardly at an angle to the apron arms 62 and pass loosely through lugs 66 provided at the ends of extensions 67 projecting downwardly from the bracket arms 53. Each rod 64 is surrounded by a coil spring 68, the lower end of which rests against the lug 66 while the upper end engages a collar 69 fixed on the rod 64. The springs 68 being under compression, exert an upward thrust on the rods 64 which tends to yieldingly maintain the apron arms 62 in a substantially horizontal position, in which the apron 56 is loosely extended between the rolls 55 and 60.

In the operation of my apparatus, the ribbon passes upwardly from between the pressure roll 48 and the apron 41 to the apron 56, which is driven in the direction of the arrow by the belt 57. As best shown in Fig. 2, the apron 56 extends above the space between the first and second carding machines 1 and 2, so that its outer end terminates at a point approximately above the center line of the second machine 2, and it is evident from Fig. 1, that the ribbon passes upward freely to the apron 56 without materially disturbing the parallel arrangement of the fibres therein, and after being conveyed by the apron 56, will drop freely to the distributing device 7, which will now be described.

Referring now to Figs. 1 and 2, the distributing device 7 consists of a laying head 70 which is adapted, by a reciprocatory movement, to lay the ribbon on an apron 71, the upper surface of which moves in the direction of the card cylinders 72 of the second carding machine 2. As best shown in Figs. 9 to 11 inclusive, the laying head 70 is slidably supported on a rod 73 extending between upright frame members 74 secured to horizontal frame members 75 carried by the carding machine. The head 70 is adapted to be moved back and forth between the frame members 74 by means of an endless chain 76 supported at its ends by sprocket wheels 77 and 78. The sprocket wheel 78 is connected by bevel gearing 79 to a shaft 80, which is in turn connected by gearing 81 to a shaft 82 extending between the frame members 74 parallel to the rod 73. The shaft 82 is connected by gearing 83 to a shaft 84 carrying a pulley 85, by means of which the shaft 84 is driven from a suitable source of power, not shown. Rotation of the shaft 80 will cause the chain 76 to be driven continuously and carry with it the head 70 by means of a driving connection between the head 70 and the chain 76 which consists of a pin 86 received in one of the links of the chain, and also movable in a slot 87 provided in the head 70.

It is obvious that when the chain 76 is driven in the direction of the arrow, the pin 86 will carry the head 70 to the left until the link of the chain which receives the pin 86 passes around the sprocket wheel 70 and starts to move in the opposite direction. The movement of the pin 86 around the periphery of the wheel 77 is permitted by the slot 87, so that when the pin 86 starts on its upper course, the head 70 is moved to the right. Continued movement of the chain 76 by the sprockets 77 and 78 will, therefore, impart a reciprocatory movement to the head 70 above the apron 71.

As best shown in Figs. 10 and 11, the laying head 70 also carries a pair of laying rolls 88, each provided around its periphery with corrugations 88^a. The rolls 88 are rotatably mounted on the head 70 and are connected by spur gears 89, one roll being provided with a shaft extension 90 carrying a bevel gear 91. The gear 91 is in mesh with a bevel gear 92 slidably keyed to the shaft 82, which as previously described, is adapted to be driven from the power shaft 84. By means of this gearing the rolls 88 are driven in unison in opposite directions as the head 70 is moved back and forth between the frame members 74.

As clearly shown in Figs. 1 and 2, the ribbon is adapted to pass downwardly from the apron 56 between the rolls 88 which are

adapted to hold the silver therebetween as the head 70 is moved back and forth. The rolls 88 are adapted, by their rotation, to feed the ribbon downwardly to the apron 71, while the reciprocatory movement of the head 70 causes the ribbon to be laid back and forth on the moving apron 71. The moving head 70 is connected to the arms 62 which support the apron 56 by a flexible connector 70ª, so that as the head 70 moves first to one side and then to the other of the apron 56, the arms 62 yield downwardly against the action of the springs 68 and thus permit the laying of the ribbon without subjecting the same to any tensile strain which might tend to pull its fibres apart.

Referring again to Fig. 9, it will be apparent that as one course of the ribbon is laid upon the apron 71 by the head 70 it will be moved away from the head by the apron 71, so that the next course will be laid upon a different portion of the apron 71. As previously pointed out, the cross section of the ribbon at any point in its length is generally that of a non-rectangular parallelgram, so that as successive courses of the same are laid upon the apron 71, the courses will nest upon each other in such a manner that the succession of courses will make a flat layer on the apron 71, this action being clearly shown in Fig. 9.

As successively laid courses of the ribbon are moved toward the second carding machine, they are acted upon by a patter 93 which tends to flatten out and reduce the thickness of the layers of ribbon carried on the apron 71. The patter 93 is carried by a shaft 94 and is adapted to have an oscillatory movement imparted thereto, so that the patter 93 moves up and down between the extreme positions, as indicated in dotted lines in Fig. 9. The shaft 94 carries an arm 95 which is connected by means of a rod 96 to a pin 97 eccentrically mounted on a crank disk 98 carried by the shaft 82. The rod 96 is connected to the arm 95 by means of a pin 99 adjustable within a slot 100, whereby the throw of the arm 95 and the amplitude of movement of the patter 93 may be varied.

It will be apparent that as successively laid courses of ribbon are carried underneath the patter 93 by the apron 71, they will be compressed to a certain degree so that the cardings may be more readily acted upon by the teeth of the carding cylinders 72. It will also be apparent that the laying of the courses of the ribbon on the apron 71 results in little or know disturbance of the parallelism of the fibres, so that the drawing out of the fibres by the second carding machine 2 is accomplished without tearing the fibres.

Referring now to Figs. 12, 13 and 14, there is illustrated a modification of the apparatus for receiving the cardings from the first doffer cylinder and gathering the same into the ribbon which is distributed for further operation thereon by the second carding machine. In the modified form of my invention, the principle of operation is the same as with the apparatus previously described, the modification consisting primarily of the elimination of certain mechanical elements found in the previously described mechanism and in the substitution therefor of other mechanical elements, each capable of performing the functions of two or more of the elements eliminated.

Referring to Fig. 12, the modified apparatus consists of an apron 101 extending the length of the doffer cylinder 102, the ends of the aprons being supported by rolls 103 and 104 at different heights, whereby the apron 101 has an inclination downward from the doffer cylinder 102. As best shown in Fig. 14, the axes of the rolls 103 and 104, while parallel to each other, extend at a slight angle to the axis of the doffer cylinder 102, which angle is shown as being exaggerated. The angle of the apron 101 may be varied by shifting the pedestals 105 and 106, carrying the bearings of the rolls 103 and 104 respectively, and to this end the pedestal 105 is provided with a curved slot 107, whereby the entire apron structure may be swung about a pivot bolt 108 cooperating with the other pedestal 106, a bolt 109 serving to clamp the pedestal 105 in position.

As best shown in Fig. 13, a pair of aprons 110 and 111 are arranged below the apron 101 with their conveying surfaces inclined downwardly and inwardly toward each other. The apron 110 extends beneath the apron 111 and terminates at a point slightly beyond the end frame 112, and a guide roll 113 is loosely mounted just above the end of the apron 110 for confining the ribbon as it passes upwardy to the conveyor 8, which operates in exactly the same manner as it does in connection with the distributing device 7, previously described. The aprons 110 and 111 are adapted to be driven in opposite directions, as indicated by the arrows, the lower end of apron 111 terminating a short distance above the surface of the apron 110. The degree of tightness of the apron 110 is adapted to be varied by shifting the axis of its lower apron roll 114 with respect to the axes of its upper apron roll 115 preferably as described with reference to the apron rolls 33 and 35, whereby the distance between the aprons 110 and 111 may be closely regulated to vary the thickness of the ribbon. As indicated in Fig. 12, the aprons 110 and 111 are adapted to be driven in unison from a shaft 116 through gearing 117, these driving members having been removed in Figs. 13 and 14 in order to show more clearly the functioning of the aprons 110 and 111.

When the machine is in operation, it is evident that a sheet of cardings will pass from the doffer cylinder 102 onto the downwardly moving surface of the apron 101, upon which surface the cardings will remain in sheet form. The cardings will then be moved downwardly by the apron 101 until they reach the end of the same, whereupon the cardings will fall upon the oppositely moving surfaces of the aprons 110 and 111. It will be evident from an inspection of Fig. 14, that the cardings will be distributed laterally on the aprons 110 and 111, by reason of the fact that the lower edge of the apron 101 extends at an angle to the edges of the aprons 110 and 111. As the sheet of carding reaches the oppositely moving aprons 110 and 111, the sheet will be gathered in folds, as shown in Fig. 13, in substantially the same manner as shown in Fig. 4, it being obvious that the angular displacement between the apron 101 and the aprons 110 and 111 will have the same effect on the distribution of the cardings as the deflecting roll 24. The gathered cardings will then be drawn beneath the lower end of the apron 111 by the movement of the apron 110, and it is evident that the fibres originally constituting the sheet of cardings will undergo a transition from an arrangement in the form of a wide sheet of negligible thickness into an arrangement in the form of a ribbon having a width determined by the angularity of the apron 101, and a thickness determined by the space between the lower end of the apron 111 and the surface of the apron 110. This transformation of the cardings takes place in substantially the same manner as indicated diagrammatically in Fig. 6 and the ribbon is then carried on the apron 110 to a point beyond the end frame 112, from which it passes upwardly under the roll 113 to the conveyor 8, not shown. The ribbon is then acted upon by the distributing device 7 in substantially the same manner as previously described.

From the foregoing it is apparent that while the modified devices shown in Figs. 12, 13 and 14 are adapted to carry out my invention in substantially the same manner as the devices shown in Figs. 2, 3 and 4, the modified devices are somewhat more compact in arrangement as compared to the devices previously described, for example, the apron 101 is adapted to perform substantially the same functions as the apron 9 operating in conjunction with the deflecting roll 24, while the aprons 110 and 111 are adapted to perform substantially the same functions as the aprons 28 and 29 operating in conjunction with the apron 41.

From the foregoing it is apparent that by my invention I have provided an improved method of and apparatus for handling carded material, whereby the material may be transferred from one carding machine to another in such a manner that the parallel relation between the fibres of the material remains practically undisturbed from the time the fibres leave the doffer cylinder, until they are acted upon by the teeth of the next card. By the practice of my invention the tearing apart of the fibres by the action of the teeth of the second card is substantially eliminated due to the fact that no compacting or twisting of the fibres occurs in transferring the material from one carding machine to another.

I claim:

1. The improvement in the handling of carded material which consists in removing carded material in sheet form from the doffer cylinder of one carding machine, then gathering the sheet of material into a ribbon having the section of a non-rectangular parallelogram for lengthwise conveyance to a second carding machine, and then laying the ribbon back and forth with successive courses in nesting relation on the receiving apron of said second machine transversely to the line of movement of said apron.

2. The improvement in the handling of carded material which consists in removing carded material in sheet form from the doffer cylinder of one carding machine, then gathering the sheet of material into a ribbon having the section of a non-rectangular parallelogram for lengthwise conveyance to a second carding machine, and then laying the ribbon with layers in nesting relation upon the apron of said second machine with the fibres extending substantially parallel to the axis of rotation of its breaker cylinder.

3. The improvement in the handling of carded material, which consists in transferring carded material in sheet form from the doffer cylinder of a carding machine to surfaces moving in different planes and in different directions, whereby the fibres constituting the sheet of cardings undergo a transition from an arrangement in sheet form to an arrangement in the form of a ribbon having the section of a non-rectangular parallelogram.

4. The improvement in the handling of carded material, which consists first in transferring carded material in sheet form from the doffer cylinder of a carding machine to a plane surface moving away from the said cylinder, and then transferring the carded material to other surfaces moving towards each other, whereby the fibres constituting the sheet of cardings will undergo a transition from an arrangement in the form of a sheet into an arrangement in the form of a ribbon having the section of a non-rectangular parallelogram.

5. In apparatus of the class described, the combination with the doffer cylinder of a carding machine, of a pair of aprons adapted

for movement towards each other, and means for conveying cardings away from said cylinder in sheet form and distributing the cardings laterally upon said aprons, whereby the cardings undergo a transition from an arrangement in sheet form to an arrangement in the form of a ribbon having the cross section of a non-rectangular parallelogram.

6. In apparatus of the class described, the combination with the doffer cylinder of a carding machine, of a pair of aprons adapted for movement towards each other, and means for conveying cardings away from said cylinder in sheet form and distributing the cardings laterally upon said aprons, whereby the cardings are gathered into a ribbon having the cross section of a non-rectangular parallelogram without disturbing their parallel relation.

7. In apparatus of the class described, the combination with means for removing cardings in sheet form from the doffer cylinder of a carding machine, and means for gathering the cardings into a ribbon having the section of a non-rectangular parallelogram without disturbing the parallelism of the fibres, of means of conveying the gathered cardings to a point above the apron of a second carding machine for distribution in nesting relation on said apron transversely to the line of movement of said apron.

8. In apparatus of the class described, the combination with means for removing cardings in sheet form from the doffer cylinder of a carding machine, means for gathering the cardings into a ribbon having the section of a non-rectangular parallelogram without disturbing the parallelism of the fibres, of means for conveying the gathered cardings to a point above the apron of a second carding machine, and means for laying successive courses of the gathered cardings in nesting relation on said apron.

9. In apparatus of the class described, the combination with means for removing cardings in sheet form from the doffer cylinder of a carding machine, means for gathering the cardings into a ribbon having the section of a non-rectangular parallelogram without disturbing the parallelism of the fibres, of means for conveying the gathered cardings to a point above the apron of a second carding machine, means for laying successive courses of the gathered cards in nesting relation on said apron, and means for compressing the courses thus laid prior to being acted on by the cards of the second machine.

10. The improvement in the handling of carded material, which consists first in transferring carded material in sheet form from the doffer cylinder of a carding member to a surface moving obliquely away from said cylinder, and then transferring the carded material from said obliquely moving surface to oppositely moving surfaces below said first named surface, whereby cardings will undergo a transition from an arrangement in sheet form into an arrangement in the form of a ribbon having the section of a non-rectangular parallelogram.

11. In apparatus of the class described, the combination with the cylinder of a carding, machine, a doffer for removing cardings in sheet form from said cylinder and a pair of aprons adapted for movement towards each other, of means for distributing the sheet of cardings obliquely across said aprons, whereby the cardings are gathered into a ribbon, the edges of which are thinner than the middle thereof.

12. In apparatus of the class described, the combination with the cylinder of a carding machine, a doffer for removing cardings in sheet form from said cylinder and a pair of aprons adapted for movement towards each other, of means for distributing the sheet of cardings obliquely across said aprons, whereby the cardings are gathered into a ribbon, the width of which is determined by the obliquity of the sheet of cardings across the aprons, and the thickness of which is determined by the space between the aprons for the passage of the ribbon.

13. In apparatus of the class described, the combination with the cylinder of a carding machine, a doffer for removing cardings in sheet form from said cylinder and a pair of aprons adapted for movement towards each other, of means for distributing the sheet of cardings obliquely across said aprons, whereby the cardings are gathered into a ribbon, and means for varying the degree of obliquity of the sheet of cardings across the aprons to determine the width of the ribbon.

14. In apparatus of the class described, the combination with the cylinder of a carding machine, a doffer for removing cardings in sheet form from said cylinder and a pair of aprons adapted for movement towards each other, of means for distributing the sheet of cardings obliquely across said aprons, whereby the cardings are gathered into a ribbon, and means for varying both the degree of obliquity of the sheet of cardings across the aprons and the space between the aprons to determine the width and thickness of the ribbon.

Dated this 21st day of November, 1924.

JOSEPH F. SCHIMEK.