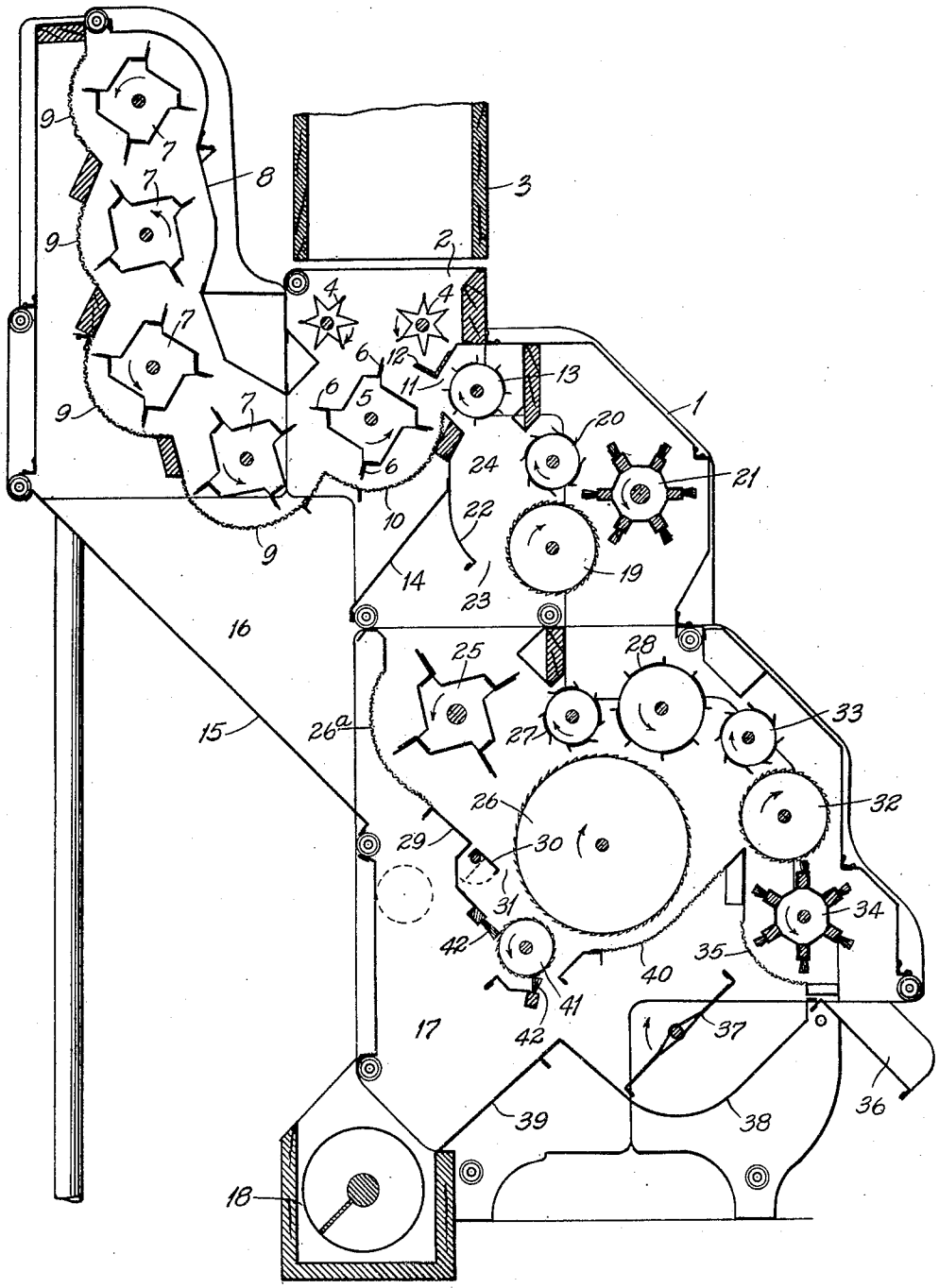
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COTTON EXTRACTING AND CLEANING MACHINE

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## COTTON EXTRACTING AND CLEANING MACHINE

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This invention has for its general object the provision of a cotton extracting and cleaning machine which, while occupying substantially the same space, shall have much greater capacity and higher efficiency than machines of this general character heretofore invented and patented by me.

Otherwise stated, I aim in this machine to materially increase the effectiveness of a machine of this class in separating hulls, sticks and other trash from a flowing stream of seed cotton, without the waste of good cotton, while at the same time keeping the size of the machine within the limits of the space provided for mounting such machines on top of gin stands.

Originally, machines of this kind were provided with a single saw cylinder and kicker roll, the latter operating, as far as practicable, to prevent hulls and trash being carried through with the cotton to the gin, and the hulls and trash being mostly discharged through a space defined on the one side by the saw cylinder itself, and on the other by the bottom of a slide or hull board.

This type of machine has long since become inadequate for extracting a sufficient quantity of cotton to meet the increased capacity of modern gins, and at the same time have the cotton delivered to the gins sufficiently free of hulls and trash to prevent interference with the operation of the gin saws and lowering the grade of the cotton.

Furthermore, owing to the increasing percentage of hulls and trash in the cotton, due to changes in cotton-picking and harvesting methods, it became necessary to gradually enlarge and widen the hull and trash discharge gap past the saw cylinder, and this made it impossible to prevent good cotton going through with the hulls and trash, and eventually rendered such machines too wasteful for practical purposes.

This difficulty was overcome, in a measure, by the double-saw-cylinder type of machine disclosed in Patent No. 1,426,588 granted to me on August 22, 1922. In this machine the upper cylinder extracted the bulk of the cotton from the stream, while the remaining cotton, containing most of the hulls and trash, passed through a comparatively wide discharge space. The lower cylinder removed most of the remaining cotton, and the bottom of the hull board defining one side of the space past this lower saw cylinder could be set close enough to permit most of the hulls and trash to discharge reasonably fast without excessive waste of good cotton.

However, the increasing speed of gins to obtain additional ginning capacity made it necessary to gradually raise the kicker rolls to permit the saw cylinders to carry the cotton through fast enough to supply the gins, and this resulted in an excess amount of hulls and trash getting by and going to the gin, even in this type of machine.

In the present machine, I secure the necessary increased capacity by the use of three cotton separating units, each of which comprises a saw cylinder, a cooperating kicker roll and a doffer; and I so arrange the saw cylinders of these units with respect to each other that the seed cotton delivered to the first separating unit is divided into two streams by its saw cylinder, one of which, containing the cotton and the major portion of the hulls and trash escaping past the saw cylinder, is delivered to the saw cylinder of the second unit; and the other of which, containing the cotton recovered by the saw cylinder of the first unit, together with such hulls and trash as may be mixed therewith, is delivered to the saw cylinder of the third separating unit coincidently with the delivery thereto of the cotton recovered by the saw cylinder of the second separating unit.

A feature of the invention, and one which makes it possible to greatly increase the capacity without enlarging the machine beyond allowable limits, is the fact that the saw cyl-

inder of the second separating unit is of much greater diameter than either the first saw cylinder, which divides the stream, or the third saw cylinder, which recleans the combined streams of cotton after the bulk of the hulls and trash has been removed. The second saw cylinder has the most difficult cotton in character to deal with, due to the fact that a considerable portion of the cotton that must be separated, or extracted, by it is more or less hard, or of the one-seed lock variety, which is the most difficult for the saw teeth to engage. Also, the percentage of hulls and trash in the stream reaching the second saw cylinder is much greater than is the case with the first or third saw cylinders, and the greater area of contact afforded by a large saw cylinder is necessary to effectively handle the cotton at this stage. Finally, the larger diameter of saw cylinder, in the case of the second separating unit, is required to provide sufficient peripheral surface for cooperating with both the third or recleaning saw, and also with a small reclaiming saw.

The invention is illustrated in the accompanying drawing, in which, the figure is a vertical sectional view of a machine constructed according to my invention.

Referring now to the drawing, the numeral 1 indicates, generally, the casing or housing of the machine, in the top of which is provided an opening 2, which is located immediately under the lower end of a hopper 3, through which seed cotton to be cleaned and extracted is delivered to said opening. Immediately below the mouth of opening 2 are located two star-shaped feed rollers 4, which operate to slightly compress the seed cotton as they feed it into the machine. Below the feed rollers is mounted an impact cylinder 5, provided with longitudinal blades 6, which, in the rotation of the cylinder, operate to continuously remove cotton from the compressed stream of cotton fed in by rollers 4 and deliver the same to the lowermost of a vertically arranged series of impact cylinders 7, operating in a housing 8, one side of which is formed by a series of curved screens 9 located, respectively, at one side of the respective cylinders 7. A similar curved screen 10 is located under the impact cylinder 5. The impact cylinders 5 and 7 are rotated in the direction indicated by the arrows, and the cotton removed from the fed-in stream by the cylinder 5 is thrown on to the lowermost impact cylinder 7 and transferred from this to the next impact cylinder, and so on throughout the series, being thus passed up on one side of the housing 8 and then, in a similar manner, is started in a downward course and passed over the screen 9 at the opposite side of the casing, and delivered by the underside of the lowermost impact cylinder 7 to the impact cylinder 5, the underside of which causes it to be passed over the screen 10 to an opening 11, the size of which is defined on one side by an angle bar 12 and on the other by a picker roll 13.

The part of the machine above described, comprising the housing 8, screens 9, and impact cylinders 7, forms a boll breaking and cleaning element, the unopened bolls being broken by impact of the cylinders 7 therewith, and small trash, dirt, sand, and the like, passing through the screens 9 as the cotton is passed over these screens by said impact cylinders. The impact cylinder 5 operates to feed the seed cotton to the boll breaker and cleaner and in cooperation with the picker roll 13 to remove the mixed cotton and hulls delivered by the lowermost impact cylinder of the cleaner to the cotton extracting and cleaning mechanism hereinafter described.

The opening 11 is of such a size that unopened bolls cannot pass through the same and such bolls are accordingly returned by the impact cylinder 5 to the cleaner, and caused to repeat the circuit around the housing and screens thereof in the manner previously described. An inclined partition 14, located under the screen 10, and an inclined bottom 15, located at one side of the machine, provide a refuse compartment 16, the refuse passing through screens 9 and 10 falling into this compartment and sliding down the bottom 15 into another trash compartment 17, whence it falls into a conveyor 18, which removes it from the machine.

The part of the machine just described does not enter into the present invention, but as it is part of the complete machine, it is illustrated and briefly described in order that the complete operation may be clearly understood.

I will now describe the arrangement and operation of the three associated cotton separating units, which constitute the subject matter of this invention.

The first or upper cotton separating unit comprises a saw cylinder 19 of relatively small diameter, a kicker roll 20 cooperating with the same on its upper side, and a doffer 21 which, as usual, operates to remove from saw cylinder 19 the cotton carried under the kicker roll 20 by said saw cylinder. On the side of the saw cylinder 19 opposite that at which the doffer 21 is mounted, I provide a hull board 22, the lower end of which defines the size of a relatively wide discharge gap 23 past the saw cylinder 19. The cotton removed from the cleaner by the picker roll 13 is discharged into the working chamber 24, bounded on one side by the saw cylinder 19 and picker roll 20, and on the other by the hull board 22, and a large proportion of the cotton is engaged by the teeth of the saw cylinder and carried under kicker roll 20, which operates, as usual, to knock back hull and trash particles carried up by the cotton. Such hulls and trash, together with other

hulls and trash sliding down the hull board, and small locks of cotton not engaged by the saw cylinder, pass freely through the discharge gap 23 on to a rotary beater 25, which is usually of the same construction as one of the impact cylinders 7 before referred to. This beater, rotating in the direction indicated by the arrow, operates to pass the hulls, trash and unrecovered cotton over a curved screen 26, and then to deliver the same to the second or intermediate cotton separating unit.

This second or intermediate cotton separating unit comprises a saw cylinder 26, of much greater diameter than the saw cylinder 19 of the first unit, a kicker roll 27, and a doffer 28 which, in this instance, is preferably in the form of a bladed cylinder, instead of the brush type illustrated by doffer 21. A short hull board 29, having a lower adjustable end partition 30, directs the cotton and hulls passing over screen 26 towards the surface of saw cylinder 26, and the hull board section 30 defines the size of an opening 31 past saw cylinder 26 for the escape of hulls and trash and any small locks of cotton which may not be engaged by the teeth of saw cylinder 26. This saw cylinder will engage the greater percentage of the cotton delivered to it and carry the same under the kicker roll 27, which, as usual, knocks back the hulls and trash particles carried up by the cotton, the hulls and trash ultimately escaping through the discharge gap 31. The cotton carried around by saw cylinder 26 is removed therefrom by the doffer 28, and thrown across an intervening space into engagement with the saw cylinder 32 of a third cotton separating unit which, in addition, comprises a kicker roll 33 and a doffer 34.

Returning now to the first separating unit, it has been stated that the cotton carried around by the saw cylinder 19 is removed therefrom by the doffer 21. This cotton is only partly cleaned as, owing to the fact that, in the interest of increased capacity, the kicker roll 20 rotates at a greater distance from the surface of the saw cylinder 19 than would otherwise be desirable, it is inevitable that a certain amount of small hulls and trash particles will be carried under the picker roll with the cotton, and this cotton must therefore be recleaned. To accomplish this within the compass of a single machine, not exceeding in size the allowable limits of a machine capable of being mounted on a gin stand, is one of the main objects of this invention. To this end, the cotton removed from the saw cylinder 19 of the first cotton separating unit by the doffer 21, is delivered by the latter, through an intervening space, directly on the upper surface of the doffer 28 of the second, or intermediate, cotton separating unit, and is carried around by the same through the space between it and the kicker roll 27 and combined with the cotton removed by said doffer from the saw cylinder 26; and the resultant mixture of cotton is thrown by the doffer 28 on to the surface of the saw cylinder 32 of the final cotton separating unit. The cotton removed from saw cylinder 32 is passed over a curved screen 35 by the doffer 34 and the cleaned cotton is then discharged through a spout 36 into the gin.

The numeral 37 indicates a rotating wiper, which operates to continuously remove dirt and trash from a curved bottom 38 of the casing and throw the same over into the trash compartment 17, which has an inclined bottom 39 for directing the trash into the conveyor 18.

On the underside of the saw cylinder 26 is a screen 40 which extends from a point adjacent the saw cylinder 32 to a point well under the saw cylinder 26, and in fairly close proximity to the surface of the latter. Hulls and trash and small cotton wads or locks knocked back by the kicker roll 33, or not engaged by the saw cylinder 32, slide over this screen, the cotton content being engaged by the teeth of the saw cylinder 26 and any sand, dirt, or small refuse passing through screen 40. The remaining trash passes off of the screen and drops on to the inclined bottom 39 and passes to the conveyor 18.

The discharge gap 31 past saw cylinder 26, while ordinarily smaller in width than the discharge gap 29 past the saw cylinder of the first separating unit, is still not sufficiently small to entirely prohibit the passage past the saw of a small amount of cotton, which is usually in the form of small, one-seed lock cotton. To recover this cotton, I mount under and slightly to one side of saw cylinder 26 a small reclaiming saw cylinder 41, rotating in contact with brushes 42. These latter force small locks of cotton into engagement with the teeth of the reclaiming saw, from which they are removed by the saw cylinder 26, while hulls and trash are discharged by the reclaiming saw into the trash compartment 17. The function of the reclaiming saw cylinder is fully described in my prior Patent No. 1,613,242, dated January 4, 1927, and need not be described in detail herein, as in itself it forms no part of the present invention.

The saw cylinder 32 of the final cotton separating unit is substantially of the same diameter as the saw cylinder 19 of the first unit, and therefore of much less diameter than the intermediate saw cylinder 26. Both of these saw cylinders can be of relatively small size for the reason that, as to the first saw cylinder 19, it will readily engage and remove from the seed cotton the greater portion thereof not in the form of hard locks; that is, compact wads of cotton surrounding

a cotton seed; and the saw cylinder 32 can readily engage practically all of the cotton delivered to it because, due to the treatment by the previous units it is all practically in a light, fluffy condition, which is the ideal condition to enable cotton to be engaged by saw teeth. Here the kicker roll 33 may be set to rotate relatively close to the saw cylinder, so that adhering particles of trash and hulls may be readily knocked back by it.

The combination and cooperation of the three saw cylinders insures the quickest extraction of the cotton, and its delivery to the gins practically free of hulls and trash, and at the same time insures a continuous and rapid discharge of the hulls and trash separated from the cotton without the waste of any cotton of value.

I claim:—

1. In a cotton extracting and cleaning machine, in combination, an initial, intermediate and final cotton separating unit, means for delivering the trash and unrecovered cotton escaping from the first unit to the intermediate separating unit, and means common to the three units for combining the streams of recovered and partly cleaned cotton passing from the initial and intermediate units and delivering the mixture to the third separating unit.

2. In a cotton extracting and cleaning machine, in combination, an initial, intermediate and final cotton separating unit, means for delivering the trash and unrecovered cotton escaping from the first to the intermediate separating unit, and a rotary member functioning in association with all three units and operating continuously to receive the recovered and partly cleaned cotton delivered by the first separating unit, to remove from the intermediate separating unit the recovered and partly cleaned cotton delivered thereby, and to deliver the same, together with the recovered cotton received from the first unit, to the final separating unit.

3. In a cotton extracting and cleaning machine, in combination, an initial, intermediate and final cotton separating unit, each of which comprises a saw cylinder, means cooperating with the saw cylinder of the first unit for dividing the seed cotton fed thereto into two streams, one of which, containing the unrecovered cotton and a large proportion of hulls and trash is passed to the saw cylinder of the intermediate unit, and the other of which streams, containing the recovered cotton and a smaller percentage of hulls and trash, is passed to the saw cylinder of the final unit, and means for doffing the cotton from the saw cylinder of the second unit and delivering it to the saw cylinder of the final unit.

4. In a cotton extracting and cleaning machine, in combination, an initial cotton separating unit comprising a saw cylinder, an intermediate cotton separating unit having a saw cylinder of larger diameter than the saw cylinder of the first unit, a final cotton separating unit also comprising a saw cylinder, means for passing the unrecovered cotton together with the hulls and trash escaping from the first separating unit to the saw cylinder of the intermediate unit, means for doffing the cotton from the saw cylinder of the second unit and delivering it to the saw cylinder of the final unit and means for passing the recovered and partly cleaned cotton delivered by the first separating unit to the saw cylinder of the final separating unit.

5. In a cotton extracting and cleaning machine, in combination, an initial, intermediate and final cotton separating unit, each of which comprises a saw cylinder, means cooperating with the saw cylinder of the first unit for dividing the seed cotton fed thereto into two streams, one of which contains the unrecovered cotton and a large proportion of hulls and trash and the other of which contains the recovered cotton and a smaller percentage of hulls and trash, means for delivering the first named stream to the saw cylinder of the intermediate unit, and means for delivering the second named stream to the saw cylinder of the final unit.

6. In a cotton extracting and cleaning machine, in combination, an initial, intermediate and final cotton separating unit, each of which comprises a saw cylinder, means cooperating with the saw cylinder of the first unit for dividing the seed cotton fed thereto into two streams, one of which contains the unrecovered cotton and a large proportion of hulls and trash escaping from said first separating unit, and the other of which contains the cotton recovered by said first unit and a smaller proportion of hulls and trash, means for delivering the first named stream to the saw cylinder of said intermediate unit, and means for delivering said second stream together with the cotton recovered by said intermediate unit to the saw cylinder of the third unit.

7. A cotton extracting and cleaning machine having three associated cotton separating units each of which comprises a saw cylinder and a kicker roll, means for delivering the unrecovered cotton and the hull and trash escaping from the first unit to the saw cylinder of the second unit, a doffer cooperating with the saw cylinder of the first unit and adapted to remove therefrom the recovered cotton together with such hull and trash particles as may be mixed therewith, and deliver same to the second cotton separating unit, a doffer cooperating with the saw cylinder of said second unit to remove the extracted cotton therefrom, said latter doffer being positioned to receive the partly cleaned cotton delivered by the doffer of the first unit and to deliver the same, simultaneously with

the cotton removed by it from the saw cylinder of the second unit, to the saw cylinder of the third unit, and a doffer cooperating with the latter saw cylinder and operating to remove the cleaned cotton therefrom and deliver the same to a gin.

In testimony whereof, I have hereunto set my hand.

JOHN E. MITCHELL.