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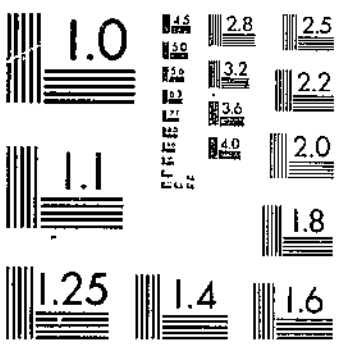

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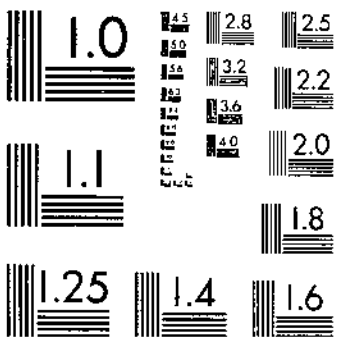

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Saw-Cylinder Lint Cleaning at Cotton Gins: Effects of Saw Speed and Combing Ratio on Lint Quality

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By GINO J. MANGIALARDI, JR., *research agricultural engineer*, Agricultural Engineering Research Division, Agricultural Research Service

REVIEW OF LITERATURE

During the early days of the ginning industry, the bulk of the cleaning in gins was done on seed cotton, a practice that slowed the development of lint cleaning machinery. However, development did proceed: Some of the early lint cleaning pioneers were Jones in 1842, Carver in 1844, and Withers in 1858 (*1*).[1] Early developments introduced fiber cleaning in the gin stand immediately behind the ribs, with a series of brush sticks used to remove pin and pepper trash before doffing from the saws. Another development brought about the transfer of the ginned lint from gin saws, over screens to doffer, and then to high-speed saws before final doffer.

A U.S. patent was issued in 1894 to Henry Rembert on a lint cotton cleaner, suitable for use at either the cotton gin or cotton mill. Rembert's invention employed rotary screen drums, with interior stationary shield, and permitted the conveying air to remove fine trash. Other patents were issued in 1926 to John Garner on a flotation lint cleaner and in 1929 to George Spencer on a special lint flue with herringbone grids. Features of Spencer's patent were a lint flue trunk, grids along the lower half of the flue trunk for trapping dirt dislodged during air conveyance, and a trash pocket below grids.

Long interested in lint-cleaner research, the U.S. Cotton Ginning Research Laboratory at Stoneville, Miss., initiated work on this phase of ginning in 1939. Staff members found from numerous experiments that neither the flotation principle nor the scrubbing of lint over grid bars, when used separately, achieved desirable results (*7*). However, the experimental work indicated that a combination of air-wash cleaning and mechanical scrubbing or combing might prove promising.

This experimental background led to the design and development of the single saw-cylinder cleaner, which attempted to retain simplicity while employing as many principles of cleaning as feasible. The new process involved blowing

[1] Italic numbers in parentheses refer to Literature Cited, p. 32.

the lint past a revolving screen cylinder and delivering it to the saw-cylinder, where it was cleaned by a combination of centrifugal force, scrubbing action between saw-cylinder and triangularly notched grid bars, and gravity assisted by an air current.

Referred to as a "Flow-Through Lint Cleaner," this machine was installed and tested in a commercial-type gin plant at the laboratory during the 1948-49 ginning season. From a standpoint of engineering and technological performance, the cleaner proved sound. Consistent and significant grade improvements on the cotton were obtained, including increases in the value of the cotton; however, experiments with this machine emphasized that lint cleaning is designed primarily for increasing the value of trashy or machine-harvested cotton.

U.S. Public Patent No. 2,569,501 was granted in 1951 to Victor Stedronsky and C. Scott Shaw, employees of the Stoneville Laboratory, for the development of this cleaner, which utilized the single saw-cylinder principle. The flow-through lint cleaner was, thereafter, manufactured by several companies.

About the same time, a controlled-batt unit lint cleaner was developed by E. H. Brooks (*2*). This advance was followed by the development of the battery type of cleaner by Ennis Moss (*5*). The cleaning action of both the unit and the battery controlled-batt lint cleaner is similar to that of the flow-through saw cleaner, except that lint from the gin stand or another lint cleaner is formed into a batt on the condenser screen drum. The batt is then fed through one or more sets of compression rollers, passed between a very closely fitted feed roller and feed plate or bar, and fed onto the saw-cylinder. The feed roller and feed plate grip the batt so that a combing action takes place as the saw teeth seize the fibers. Effective operation of the lint cleaner depends upon the condition of the batt, its uniformity and thickness, and the manner in which it is delivered to the saw (*6*).

Although lint cleaners that rely upon air conveyance, commonly known as air-jet cleaners, are used in some gins, the controlled-batt saw cleaner is now the standard model used by the ginning industry. The use of lint cleaners in cotton gins has become accepted practice, with more than 90 percent of the gins employing one or more saw-type lint cleaners.

Of the 4,625 gins employing lint cleaning by 1967, 60 percent had two stages of lint cleaning and 16 percent had three stages (*9*).

Lint-cleaner experiments conducted during the 1964 ginning season showed that the decrease in foreign-matter content and grade improvement obtained by saw-cylinder lint cleaning was highly significant (*4*). However, these improvements were accompanied by highly significant decreases in classer's staple length, 2.5-percent span length, and 50-percent span length and uniformity ratio, and by a

highly significant increase in nep count.

Research during 1965 indicated that, when card crusher rolls are used at the mill, substantial quantities of foreign matter may be left in the ginned lint and removed during mill processing with no adverse effect on processing performance (*3*). This finding suggests that a decrease in the amount of lint cleaning might be acceptable if this decrease results in longer fiber length, fewer neps, and improved spinning performance.

PURPOSE AND SCOPE OF STUDY

Commercial lint cleaners developed by the various manufacturers vary considerably in saw-cylinder speeds, combing ratios,[2] and spline feed-roller speeds employed. Saw-cylinder diameters range from 12 inches to 17 inches (*6*), with manufacturer-recommended saw-speeds covering a still wider range: 700 r.p.m. to 1,500 r.p.m. As a result of this wide range, these speeds have been calculated to give a minimum saw-tip speed of 2,199 feet per minute and a maximum tip speed of 5,341 feet per minute.

Combing ratios used at the gin are also a variable as they are based upon the drive-speed ratio between saw-cylinder and feed roller. Most manufacturers make the drive speed selective, providing the ginner with a choice of approximately three combing ratios.

This bulletin provides basic data required in the design and operation of these controlled-batt saw-cylinder lint cleaners, the type used almost exclusively by the ginning industry. The data relate to the optimum lint cleaner saw-cylinder speed, feed-roller speed, and combing ratio needed to provide the lint qualities desired by the grower, ginner, and spinner.

The results presented in this paper were obtained during a 2-year study, 1966 and 1967 crops, conducted at the U.S. Cotton Ginning Research Laboratory, Stoneville, Miss.

METHODOLOGY

Experimental Design

Data from the 2-year study were analyzed statistically by analysis of variance. Tukey's *w*-procedure was used to indicate significant differences between individual lint-cleaner treatments (*8*).

Experiments in 1966

Experimental work during the 1966 crop year was performed to investigate the following hypotheses and problems:

[2] Combing ratio is defined as a ratio of the tip speed (feet per minute) of the combing saw to the rim speed (feet per minute) of the spline feed roller.

Hypothesis 1.—The efficiency of foreign matter removal by controled-batt saw-cylinder lint cleaners is directly related to saw-cylinder speed.

Hypothesis 2.—Fiber length distribution shifts toward the longer fibers with decrease in saw speed.

Hypothesis 3.—Increasing the combing ratio by increasing the saw-cylinder speed or decreasing the feed-roller speed of the lint cleaner increases the cleaning efficiency but causes additional fiber breakage.

Hypothesis 4.—Cleaning efficiency and fiber length are directly related to combing ratio, independent of saw- or feed-roller speed.

Problem 1.—To determine whether the relationship described in hypotheses 1 to 4 are progressive or whether there is interaction between saw-cylinder and feed-roller speeds.

Problem 2.—To determine the optimum lint-cleaner saw and feed-roller setting for maximum foreign matter removal commensurate with minimum change in fiber-length distribution.

Seed cotton employed was 100 30-pound test lots grown and machine-harvested by the Delta Branch Experiment Station at Stoneville. Variety was Stoneville 213, and harvest date was October 11, 1966.

Processing was performed in five replications on October 19, October 20, November 2, November 3, and November 16 (fig.1). In each replication, a unit of 20 test cotton lots received separate cleaning treatments in which the lint cleaner's

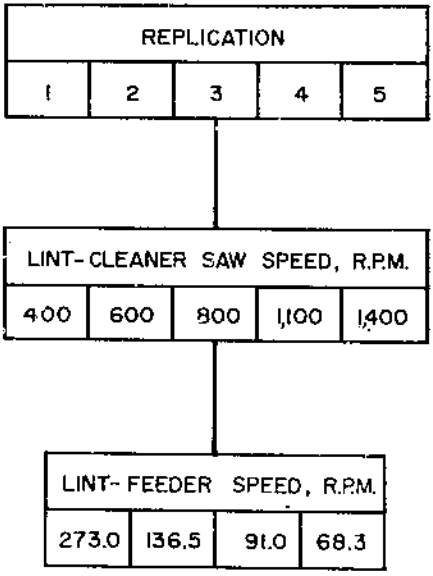

FIGURE 1.—Experimental test layout, crop of 1966.

feed roller and saw cylinder were operated at different speeds. Four feed-roller speeds were separately tested with each of five saw-cylinder speeds. Experimental saw-cylinder speeds were 400 r.p.m., 600 r.p.m., 800 r.p.m., 1,100 r.p.m., and 1,400 r.p.m.; these speeds produced saw tip speeds of 1,257, 1,885, 2,513, 3,456, and 4,398 feet per minute, respectively. Feed-roller speeds were 68.3 r.p.m., 91 r.p.m., 136.5 r.p.m., and 273 r.p.m.; these speeds produced feed-roller rim speeds of 50.3, 67, 100.5, and 201 feet per minute. A combing ratio range of 6.2 to 87.4 was obtained as a result of the combination of saw- and feed-roller speeds (table 1).

Lint feed rate to the saw-cylinder was maintained at 10.5 pounds of lint per inch of saw-cylinder length

TABLE 1.—*Combing ratios*[1] *obtained from combined feed-roller and saw-cylinder speeds in experimental saw-cylinder lint cleanings, crop of 1966*[2]

Batt No.	Batt density	Feed-roller speed	Combing ratio obtained with saw-cylinder speed of—				
			400 r.p.m.	600 r.p.m.	800 r.p.m.	1,100 r.p.m.	1,400 r.p.m.
	Lb.[3]	*R.p.m.*					
Batt 1.....	0.011	273.0	6.2	9.4	12.5	17.2	21.9
Batt 2.....	.021	136.5	12.5	18.8	25.0	34.4	43.8
Batt 3.....	.031	91.0	18.8	28.1	37.5	51.6	65.6
Batt 4.....	.042	68.3	25.0	37.5	50.0	68.7	87.4

[1] Combing ratio is a ratio of the speed (feet per minute) of the tip of the combing saw to the speed (feet per minute) of the rim of the feed roller.
[2] Data for each batt represent an average of 5 replications of each interacting speed-setting treatment.
[3] Per square foot of batt area.

per hour, comparable to standard-size equipment, for all interacting speed-setting treatments. The four feed-roller speeds gave batt densities of 0.011, 0.021, 0.031, and 0.042 pounds of lint per square foot of batt area, the faster speed giving the thinnest batt. Batt 1, the thinnest, was fed as tufts. Batts 2 and 3 and batt 4, the thickest, were fed in continuous form.

Experiments in 1967

Experiments conducted during the 1967 crop year were performed to obtain additional information not covered by the 1966 data. Hypotheses studied during 1967 were:

Hypothesis 1.—The fiber-length distribution shifts toward the longer fibers with increase in saw-cylinder speed although combing ratio remains unchanged.

Hypothesis 2.—Greater numbers of long fibers are broken by the faster saw speeds, but this effect is masked because the additional centrifugal action removes more short fibers.

Seed cotton employed was twenty-five 30-pound test lots, grown and machine-harvested by the Delta Branch Experiment Station at Stoneville. The variety was Stoneville 213; harvest date was October 19, 1967.

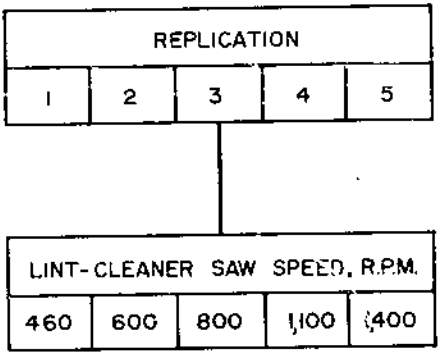

FIGURE 2.—Experimental test layout, crop of 1967.

Five replications of tests were performed and in each replication, a unit of five test cotton lots received separate cleaning treatments in which the cylinder was operated at different speeds (fig. 2). Experimental saw-cylinder speeds were 460 r.p.m., 600 r.p.m., 800 r.p.m., 1,100 r.p.m., and 1,400 r.p.m., and produced saw tip speeds of 1,445, 1,885, 2,513, 3,456, and 4,398 feet per minute. Feed roller speeds were such that a combing ratio of 25 was maintained.

The rate of lint fed to the saw-cylinder was maintained at 11.7 pounds of lint per inch of saw-cylinder length per hour, comparable to standard-size equipment, for all treatments.

Experimental Equipment

Seed-cotton drying, cleaning, and ginning were conducted in the Laboratory's pilot-size gin plant. Gin machinery sequence consisted of tower drier No. 1, six-cylinder cleaner, stick machine, tower drier No.

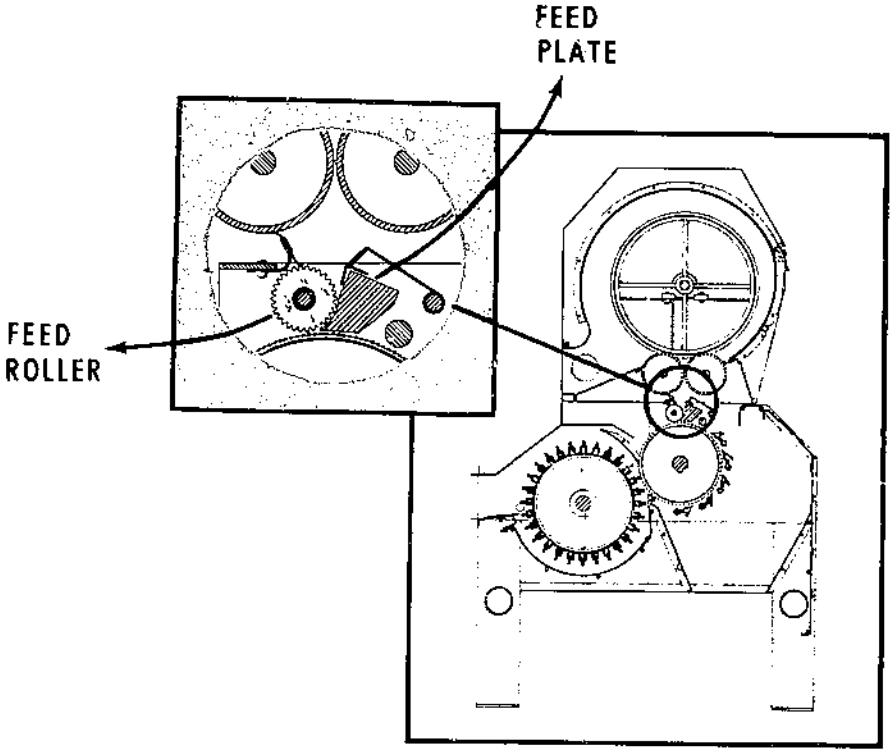

FIGURE 3.—Experimental lint cleaner's feeding mechanism consists of one feed roller and a feed plate. These hold the cotton fibers as they are delivered to the saw so that a definite combing action is produced.

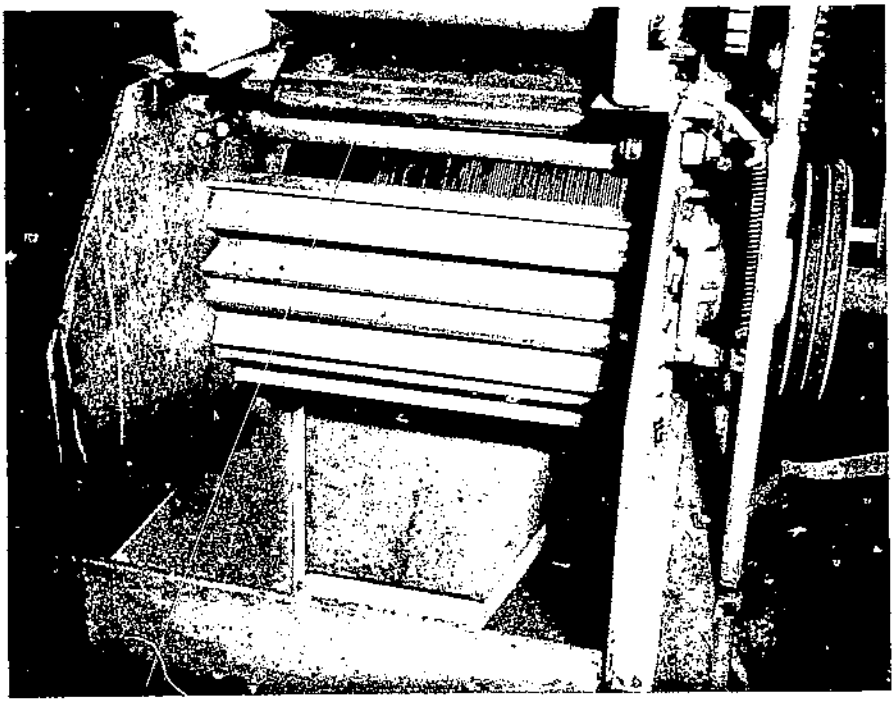

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FIGURE 4.—Saw-cylinder and grid-bar configuration used in saw-speed and combing-ratio study conducted during 1966 and 1967.

2, six-cylinder cleaner, extractor-feeder, 20-saw gin stand, and one stage of experimental lint cleaning. An electronic moisture meter served as an aid in adjusting driers for a minimum 6-percent fiber moisture content at ginning.

The experimental lint cleaner's feeder mechanism and the saw-cylinder to grid-bar relationship is illustrated in figure 3 to better orient the reader as to the cleaning principles involved. A total of 115 individual saws, spaced one-eighth inch apart and containing 235 teeth each, provided 49.4 teeth per square inch of saw-cylinder surface (fig. 4).

The saw cylinder (12-inch diameter) and feed roller ($2^{13}/_{16}$-inch diameter) were operated by individual electric motors with variable speed drives (fig. 5). Spacing between saw cylinder and the five grid bars was one-sixteenth inch. Saw-cylinder length was 14¼ inches.

Test Procedure

Experimental test lots of seed cotton apportioned for each replication were randomly assigned to individual lint-cleaner treatments at the different speed settings. This procedure was used for both years (1966 and 1967) of the study.

During the processing of each

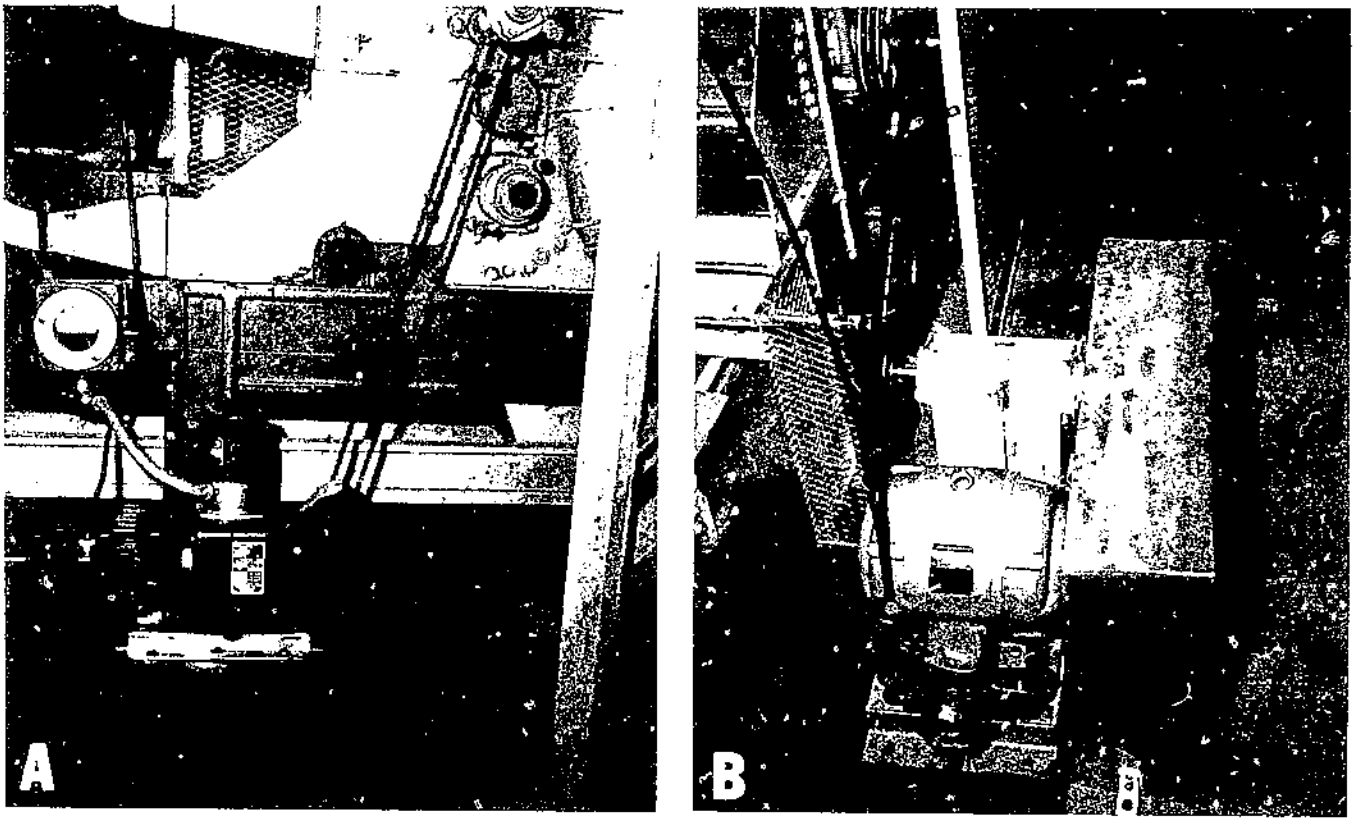

FIGURE 5.—Electric motors with variable-speed drives used in experimental lint cleaning: *A*, 5-hp. motor used to operate feed roller, and *B*, 7½-hp. motor used to operate saw cylinder.

experimental lot, the ambient temperature and relative humidity were recorded. In obtaining a ginning history of the cotton, samples were taken for determination of wagon seed-cotton moisture and foreign-matter content, cottonseed moisture content during ginning, cottonseed germination level after ginning, and the fiber moisture level maintained during ginning and lint cleaning.

During processing for the lint cleaner treatments, samples for analysis of lint foreign-matter content, classer's grade and staple length, and fiber testing were obtained before lint cleaning and on arrival at the press. The U.S. Department of Agriculture's Consumer and Marketing Service classed the samples at Greenwood, Miss., and made fiber tests at Clemson, S.C. Fiber tests included maturity fineness, Suter-Webb[3] arrays, Pressley strength (⅛-inch gauge), and nep count.

Suter-Webb arrays were also performed on lint-cleaner waste material during the 1967 experiments.

EXPERIMENTAL RESULTS, 1966

Seed-Cotton Data

Oven-moisture determinations of wagon samples of the seed cotton showed that moisture levels averaged 10.3 percent, 9.8 percent, 9.6 percent, 9 percent, and 10.5 percent for samples processed for replications 1, 2, 3, 4, and 5 (table 2 and appendix table 19). Fractionation tests showed wagon seed-cotton foreign-matter contents of 6.8 percent, 6 percent, 4.8 percent, 4.8 percent, and 4.4 percent for samples processed for the five replications of the speed-setting treatments (table 2 and appendix table 20).

Cottonseed Data

Cottonseed-moisture contents during ginning averaged 9.5 percent, 9.6 percent, 8.7 percent, 8.5 percent, and 9.6 percent for samples processed for replications 1, 2, 3, 4, and 5 (table 3 and appendix table 21). Seed-germinating levels for these replications were 89.9 percent, 92.3 percent, 89.2 percent, 91.4 percent, and 87.3 percent (table 3 and appendix table 22).

[3] Trade names are used in this publication solely for the purpose of providing specific information. Mention of a trade name does not constitute a guarantee or warranty of the product by the U.S. Department of Agriculture or an endorsement by the Department over other products not mentioned.

TABLE 2.—*Moisture and foreign-matter contents of wagon seed cotton processed for experimental saw-cylinder lint cleanings, crop of 1966*[1]

Feed-roller speed (r.p.m.)	Moisture content of samples processed for cleaning with saw-cylinder speed of [2]—					
	400 r.p.m.	600 r.p.m.	800 r.p.m.	1,100 r.p.m.	1,400 r.p.m.	Average
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
273.0	9.6	9.4	10.9	10.2	9.5	9.9
136.5	9.3	10.2	9.6	9.6	9.9	9.7
91.0	9.2	9.9	9.9	9.9	10.1	9.8
68.3	9.3	10.4	10.2	9.6	9.8	9.9
Average	9.4	10.0	10.2	9.8	9.8	
	Foreign-matter content of samples processed for cleaning with saw-cylinder speed of [2]—					
	400 r.p.m.	600 r.p.m.	800 r.p.m.	1,100 r.p.m.	1,400 r.p.m.	Average
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
273.0	5.4	5.4	5.1	5.4	4.6	5.2
136.5	4.9	5.3	5.2	5.5	5.1	5.2
91.0	5.1	5.6	5.3	5.8	5.4	5.4
68.3	5.1	5.4	6.0	5.7	5.5	5.5
Average	5.1	5.4	5.4	5.6	5.2	

[1] Table is a summary of appendix tables 19 and 20.
[2] Lint-cleaning treatments at each interacting speed setting were replicated 5 times. Data represent average findings for samples tested before each replication.

Lint-Moisture Content

Samples for determining lint moisture taken between the gin stand and lint cleaner showed the moisture level to average 5.2 percent, 5 percent, 5.9 percent, 5.2 percent, and 6.5 percent for lint processed for replications 1, 2, 3, 4, and 5, respectively. When test lots apportioned for each replication were assigned to cleaning treatments in a random manner, results showed no significant individual differences in moisture content of cotton assigned to the different saw-cylinder or feed-roller speeds (table 4 and appendix table 23).

Lint Foreign-Matter Content

Increasing the combing ratio by increasing the saw-cylinder speed gave a progressive and accumulated decrease of 0.73 percent in the lint foreign-matter content—a highly significant result (table 5 and appendix tables 24 and 25). Foreign-matter differences between the 800 r.p.m. and 1,100 r.p.m. speeds and between the 1,100 r.p.m. and 1,400 r.p.m. speeds were not significant.

Highly significant decreases in lint foreign-matter content were obtained when the combing ratio was

TABLE 3.—*Moisture content during ginning and seed-germination level after ginning in cottonseed samples processed for experimental saw-cylinder lint cleanings, crop of 1966* [1]

Feed-roller speed (r.p.m.)	Moisture content of samples processed for cleaning with saw-cylinder speed of [2]—					
	400 r.p.m.	600 r.p.m.	800 r.p.m.	1,100 r.p.m.	1,400 r.p.m.	Average
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
273.0	9.4	9.4	9.4	8.8	9.0	9.2
136.5	9.4	9.1	9.2	9.0	9.0	9.1
91.0	9.3	9.2	9.5	8.9	9.0	9.2
68.3	9.2	9.3	9.4	9.0	9.0	9.2
Average	9.3	9.3	9.4	8.9	9.0	

	Seed-germination level of samples processed for cleaning with saw-cylinder speed of [2]—					
	400 r.p.m.	600 r.p.m.	800 r.p.m.	1,100 r.p.m.	1,400 r.p.m.	Average
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
273.0	88.3	90.0	88.1	88.1	91.3	89.2
136.5	89.9	90.7	90.0	90.8	89.7	90.2
91.0	91.2	90.4	88.4	91.8	88.5	90.1
68.3	90.4	89.3	88.0	90.3	90.4	89.7
Average	90.0	90.1	88.6	90.3	90.0	

[1] Table is a summary of appendix tables 21 and 22.
[2] Lint-cleaning treatments at each interacting speed setting were replicated 5 times. Data represent average findings for samples tested before each replication.

TABLE 4.—*Precleaning moisture content of ginned lint samples processed for experimental saw-cylinder lint cleanings, crop of 1966* [1]

Feed-roller speed (r.p.m.)	Moisture content of samples processed for cleaning with saw-cylinder speed of [2]—					
	400 r.p.m.	600 r.p.m.	800 r.p.m.	1,100 r.p.m.	1,400 r.p.m.	Average
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
273.0	5.7	5.3	5.5	5.5	5.6	5.5
136.5	5.7	5.5	5.5	5.4	5.6	5.5
91.0	5.6	5.6	5.4	5.7	5.6	5.6
68.3	5.9	5.2	5.3	5.7	5.6	5.5
Average	5.7	5.4	5.4	5.6	5.6	

[1] Table is a summary of appendix table 23.
[2] Lint-cleaning treatments at each interacting speed setting were replicated 5 times. Data represent average findings for samples tested before each replication. Differences in moisture content among saw-cylinder speeds and among feed-roller speeds are not significant.

TABLE 5.—*Foreign-matter content in ginned lint samples before and after 1 stage of experimental saw-cylinder lint cleanings, crop of 1966* [1]

Feed-roller speed (r.p.m.)	Foreign matter in samples processed for cleaning with saw-cylinder speed of—					
	400 r.p.m.	600 r.p.m.	800 r.p.m.	1,100 r.p.m.	1,400 r.p.m.	Average
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
273.0	3. 22	3. 06	3. 24	3. 01	3. 01	3. 11
136.5	3. 51	3. 25	3. 14	3. 21	3. 11	3. 24
91.0	3. 28	2. 99	3. 16	3. 34	3. 28	3. 21
68.3	3. 25	3. 27	3. 28	3. 15	3. 49	3. 29
Average	3. 32	3. 14	3. 21	3. 18	3. 22	.....
	Foreign matter in samples after cleaning with saw-cylinder speed of [2] —					
	400 r.p.m.	600 r.p.m.	800 r.p.m.	1,100 r.p.m.	1,400 r.p.m.	Average
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
273.0	2. 91	2. 56	2. 25	2. 12	1. 89	2. 35
136.5	2. 72	2. 29	2. 11	2. 02	1. 75	2. 18
91.0	2. 40	2. 28	2. 01	2. 04	1. 93	2. 13
68.3	2. 42	2. 38	2. 11	1. 87	1. 95	2. 15
Average	2. 61	2. 38	2. 12	2. 01	1. 88	.....

[1] Table is a summary of appendix tables 24 and 25.
[2] Lint-cleaning treatments at each interacting speed setting were replicated 5 times. Data represent average findings for samples tested before and after each replication. For cleaned lint samples, foreign-matter differences among saw-cylinder speeds and among feed-roller speeds are significant at the 1-percent level.

TABLE 6.—*Lint-cleaner efficiency in experimental saw-cylinder lint cleanings, crop of 1966* [1] [2]

Feed-roller speed (r.p.m.)	Lint-cleaning efficiency with saw-cylinder speed of—					
	400 r.p.m.	600 r.p.m.	800 r.p.m.	1,100 r.p.m.	1,400 r.p.m.	Average
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
273.0	9. 6	16. 3	30. 6	29. 6	37. 2	24. 4
136.5	22. 5	29. 5	32. 8	37. 1	43. 7	32. 7
91.0	26. 8	23. 7	36. 4	38. 9	41. 2	33. 6
68.3	25. 5	27. 2	35. 7	40. 6	44. 1	34. 7
Average	21. 4	23. 5	34. 0	36. 8	41. 6	.....

[1] The cleaning efficiency of a lint cleaner is the ratio of foreign matter removed from the cotton to the foreign-matter content of the cotton as it entered the lint cleaner.
[2] Data are calculated from table 5 and represent an average of 5 replicate lint-cleaning treatments at each interacting speed setting.

increased by decreasing feed-roller speed, with no significant difference between the 68.3 r.p.m. and 91 r.p.m. speeds.

Increasing the saw-cylinder and feed-roller speeds at such a rate that the combing ratio remained constant resulted in additional decreases in the foreign-matter content of the cleaned lint (appendix table 32). This result indicates that the centrifugal action of the saw-cylinder has a cleaning effect in addition to the combing action.

Lint-Cleaner Efficiency

Foreign-matter contents, presented as evidence of lint-cleaner efficiency, showed efficiency increasing with increase in the combing ratio (table 6 and fig. 6). Increases were obtained by increasing saw-cylinder speed, by decreasing feed-roller speed, or by changing these speeds in combination. The lowest combing ratio (6.2) gave a cleaning efficiency of 9.6 percent and the highest combing ratio (87.4) gave an efficiency of 44.1 percent.

When a constant combing ratio was maintained but the saw-cylinder speed was changed, results showed that the higher speed gave the greater cleaning efficiency.

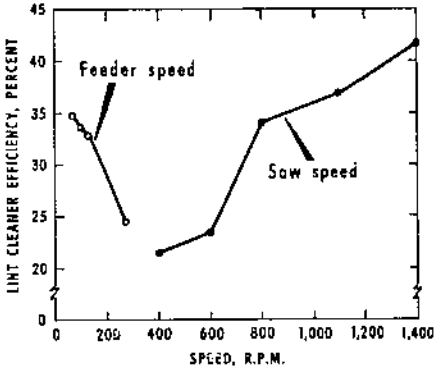

FIGURE 6.—Effect of feeder speed and saw speed on lint-cleaner efficiency, crop of 1966.

Classer's Grade

Increasing the saw-cylinder speed gave a highly significant increase in the grade indexes of the cleaned lint (fig. 7, table 7, and appendix tables 26 and 27). No significant differences in grade indexes were observed between the 600 r.p.m., 800 r.p.m., and 1,100 r.p.m. saw speeds.

A significant decrease in the grade index was obtained with the 273 r.p.m. feed-roller speed. No significant differences were observed

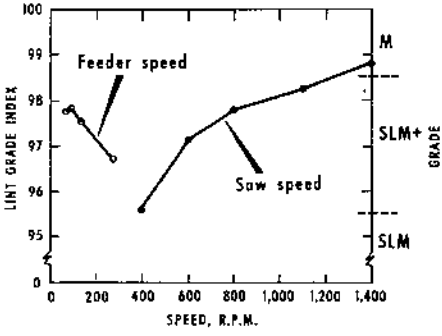

FIGURE 7.—Effect of feeder speed and saw speed on grade index and grade of cleaned lint, crop of 1966.

TABLE 7.—*Classer's grade index for ginned lint samples before and after 1 stage of experimental saw-cylinder lint cleanings, crop of 1966* [1]

Feed-roller speed (r.p.m.)	Grade index of samples processed for cleaning with saw-cylinder speed of [2]—					
	400 r.p.m.	600 r.p.m.	800 r.p.m.	1,100 r.p.m.	1,400 r.p.m.	Average
273.0	94.0	94.0	94.0	94.0	93.0	93.8
136.5	93.2	93.2	94.0	94.6	94.6	93.9
91.0	94.6	94.0	94.0	93.0	93.8	93.9
68.3	93.6	95.2	94.4	93.2	94.0	94.1
Average	93.9	94.1	94.1	93.7	93.9	
	Grade index of samples after cleaning with saw-cylinder speed of [2]—					
	400 r.p.m.	600 r.p.m.	800 r.p.m.	1,100 r.p.m.	1,400 r.p.m.	Average
273.0	94.6	96.4	96.2	97.6	99.0	96.8
136.5	96.0	96.6	98.2	98.0	98.8	97.5
91.0	95.8	98.0	98.6	98.6	98.6	97.9
68.3	96.0	97.2	97.8	98.6	98.8	97.7
Average	95.6	97.1	97.7	98.2	98.8	

[1] Table is a summary of appendix tables 26 and 27.
[2] Lint-cleaning treatments at each interacting speed setting were replicated 5 times. Data represent average findings for samples tested before and after each replication. For cleaned lint, differences among saw-cylinder speeds are significant at the 1-percent level and among feed-roller speeds at the 5-percent level.

between the 68.3 r.p.m., 91 r.p.m., and 136.5 r.p.m. feed-roller speeds.

Higher saw-cylinder speeds were associated with higher grade indexes, although the combing ratio remained unchanged.

The one stage of experimental lint cleaning afforded the test cotton lots improved their grades approximately one grade as a result of the interacting speed-setting treatments (table 8 and appendix tables 28 and 29). Grades of the cleaned lint were in the Strict Low Middling to Middling range.

Classer's Staple Length

Highly significant and progressive decreases in staple length were attributed to increases in the saw-cylinder speed (fig. 8, table 9, and appendix tables 30 and 31). Differences between the 400 r.p.m. and 1,400 r.p.m. saw-cylinder speeds were highly significant, but the differences between 600 r.p.m., 800 r.p.m., and 1,100 r.p.m. were slight and not significant.

Increasing the combing ratio by decreasing the feed-roller speed resulted in decreases in staple length. However, these decreases

TABLE 8.—*Classer's grade designation of ginned lint samples before and after 1 stage of experimental saw-cylinder lint cleanings, crop of 1966* [1]

Feed-roller speed (r.p.m.)	Grade designation of samples processed for cleaning with saw-cylinder speed of [2]—					
	400 r.p.m.	600 r.p.m.	800 r.p.m.	1,100 r.p.m.	1,400 r.p.m.	Average
273.0	SLM	SLM	SLM	SLM	SLM	SLM
136.5	SLM	SLM	SLM	SLM	SLM	SLM
91.0	SLM	SLM	SLM	SLM	SLM	SLM
68.3	SLM	SLM	SLM	SLM	SLM	SLM
Average	SLM	SLM	SLM	SLM	SLM	.....
	Grade designation of samples after cleaning with saw-cylinder speed of [2]—					
	400 r.p.m.	600 r.p.m.	800 r.p.m.	1,100 r.p.m.	1,400 r.p.m.	Average
273.0	SLM	SLM+	SLM+	SLM+	M	SLM+
136.5	SLM+	SLM+	SLM+	SLM+	M	SLM+
91.0	SLM+	SLM+	M	SLM+	M	SLM+
68.3	SLM+	SLM+	SLM+	M	M	SLM+
Average	SLM+	SLM+	SLM+	SLM+	M	.....

[1] Table is a summary of appendix tables 28 and 29.
[2] Lint-cleaning treatments at each interacting speed setting were replicated 5 times. Data represent average findings for samples tested before and after each replication.

were slight and not statistically significant.

The higher saw speeds resulted in lower staple lengths, although the combing ratio remained unchanged.

Ginned lint was reduced in average staple length from 34.51 to 34.39 thirty-seconds of an inch as a result of receiving the one stage of lint cleaning. Staple length varied from 34 to 35 thirty-seconds of an inch as a result of the experimental treatments.

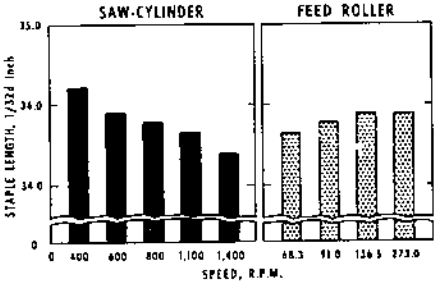

FIGURE 8.—Effect of lint cleaner saw-cylinder speed and feed-roller speed on staple length of cotton, crop of 1966.

Fiber Maturity and Fineness

Fiber testing of samples taken from ginned lint indicated cotton of normal maturity (appendix table 33). The Causticaire measurement for fineness averaged 4.7 micrograms per inch. This average was in close agreement with the micronaire reading of 4.8.

TABLE 9.—*Staple length for ginned lint samples before and after 1 stage of experimental saw-cylinder lint cleanings, crop of 1966* [1]

Feed-roller speed (r.p.m.)	Staple length of samples processed for cleaning with saw-cylinder speed of [2]—					
	400 r.p.m.	600 r.p.m.	800 r.p.m.	1,100 r.p.m.	1,400 r.p.m.	Average
	1/32-inch	*1/32-inch*	*1/32-inch*	*1/32-inch*	*1/32-inch*	*1/32-inch*
273.0	34. 60	34. 40	34. 40	34. 50	34. 80	34. 54
136.5	35. 00	34. 40	34. 20	34. 20	34. 60	34. 48
91.0	34. 60	34. 80	34. 40	34. 40	34. 40	34. 52
68.3	34. 40	34. 40	34. 80	34. 60	34. 20	34. 48
Average	34. 65	34. 50	34. 45	34. 43	34. 50	
	Staple length of samples after cleaning with saw-cylinder speed of [2]—					
	400 r.p.m.	600 r.p.m.	800 r.p.m.	1,100 r.p.m.	1,400 r.p.m.	Average
	1/32-inch	*1/32-inch*	*1/32-inch*	*1/32-inch*	*1/32-inch*	*1/32-inch*
273.0	34. 53	34. 47	34. 47	34. 40	34. 33	34. 44
136.5	34. 67	34. 47	34. 53	34. 33	34. 26	34. 45
91.0	34. 60	34. 47	34. 27	34. 47	34. 07	34. 38
68.3	34. 60	34. 40	34. 27	34. 13	34. 13	34. 31
Average	34. 60	34. 45	34. 39	34. 33	34. 20	

[1] Table is a summary of appendix tables 30 and 31.

[2] Lint-cleaning treatments at each interacting speed setting were replicated 5 times. Data represent average findings for samples tested before and after each replication. For cleaned lint, differences among saw-cylinder speeds are significant at the 1-percent level; differences among feed-roller speeds are not significant.

TABLE 10.—*Precleaning data on fiber length, strength, and nep count for cotton samples used in experimental saw-cylinder lint cleanings, crop of 1966* [1]

Item	Replicate lint cleaning [2]—					
	1	2	3	4	5	Average
Upper quartile length.....inches..	1. 27	1. 28	1. 29	1. 28	1. 29	1. 28
Mean length.....inches..	1. 07	1. 06	1. 07	1. 06	1. 08	1. 07
Coefficient of variation.....percent..	27. 0	28. 3	29. 3	29. 7	29. 0	28. 7
Fibers longer than 1 inch.....percent..	70. 6	69. 2	69. 0	68. 9	70. 5	69. 6
Fibers ½ to 1 inch.....percent..	22. 5	23. 3	22. 8	22. 9	21. 9	22. 7
Fibers shorter than ½ inch.....percent..	6. 9	7. 5	8. 2	8. 2	7. 6	7. 7
Fiber strength (⅛-inch gauge) grams per tex.....	21. 9	22. 2	22. 2	22. 3	21. 9	22. 1
Neps per 100 square inch of web.....	9. 0	9. 0	12. 3	14. 3	13. 0	11. 5

[1] Table is a summary of appendix tables 34 and 35.

[2] In each replication, saw-cylinder settings of 400 r.p.m., 600 r.p.m., 800 r.p.m., 1,100 r.p.m., and 1,400 r.p.m. were each tested with 4 separate feed-roller speeds: 273 r.p.m., 136.5 r.p.m., 91 r.p.m., and 68.3 r.p.m. Data for each replication represent average findings from 3 trials.

Fiber-Length Distribution

Upper quartile length, mean length, and coefficient of variation for cotton before lint cleaning averaged 1.28 inches, 1.07 inches, and 28.7 percent (table 10 and appendix table 34). Percentage of fibers longer than 1 inch, percentage of fibers from ½ to 1 inch, and percentage of fibers shorter than ½ inch averaged 69.6 percent, 22.7 percent, and 7.7 percent.

Upper quartile length

Increasing the combing ratio by increasing the saw speed resulted in significant decreases in the upper quartile length (table 11 and appendix table 36). The highest saw speed, 1,400 r.p.m., produced the shortest fiber length.

Decreasing the feed-roller speed (increasing combing ratio) produced a progressive and highly significant decrease in the upper quartile length. Fiber length for the 68.3 r.p.m. feed-roller speed was significantly shorter than that for the 136.5 r.p.m. and 273 r.p.m. speeds.

Attempts to evaluate the effects of changing the saw speed at a constant combing ratio were largely unsuccessful (appendix table 42). Results indicated that additional fibers are broken by the faster saw speeds, but that this effect is masked because part of the short fibers disappear into the lint-cleaner waste. However, not enough data were available to make the results meaningful.

Mean length

The 1,400 r.p.m. speed gave the shortest mean length, which was significantly different (10-percent level) from the mean length at the other saw speeds (appendix table 37). Decreasing the feed-roller speed gave progressive and highly significant decreases in the mean length. The 68.3 r.p.m. feed-roller speed gave a mean length of 1.012 inches and the 273 r.p.m., 136.5 r.p.m., and 91 r.p.m. speeds gave mean lengths of 1.038 inches, 1.034 inches, and 1.028 inches. Statistically, differences between the three faster speeds were not significantly different.

Coefficient of length variation

Increasing the saw-cylinder speed and decreasing the feed-roller speed gave increases in the coefficient of length variation (fig. 9 and appendix table 38). Differences between saw speeds were significant at the 10-percent level. Coefficient-of-variation differences were highly significant between the 68.3 r.p.m. and 273 r.p.m. feed-roller speeds whereas differences between the three faster speeds were not significant.

Percentage of fibers longer than 1 inch

The one stage of lint cleaning afforded the test lots reduced the percentage of fibers longer than 1

TABLE 11.—*Upper quartile length, mean length, and coefficient of length variation for lint samples after 1 stage of experimental saw-cylinder lint cleanings, crop of 1966* [1] [2]

Feed-roller speed (r.p.m.)	Upper quartile length with saw-cylinder speed of [3]—					
	400 r.p.m.	600 r.p.m.	800 r.p.m.	1,100 r.p.m.	1,400 r.p.m.	Average
	Inches	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*
273.0	1.270	1.282	1.280	1.280	1.262	1.275
136.5	1.272	1.266	1.276	1.276	1.270	1.272
91.0	1.264	1.266	1.270	1.272	1.254	1.265
68.3	1.258	1.258	1.258	1.258	1.250	1.256
Average	1.266	1.268	1.271	1.272	1.259	
	Mean length with saw-cylinder speed of [3]—					
	400 r.p.m.	600 r.p.m.	800 r.p.m.	1,100 r.p.m.	1,400 r.p.m.	Average
	Inches	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*
273.0	1.036	1.042	1.046	1.036	1.028	1.038
136.5	1.034	1.032	1.038	1.046	1.020	1.034
91.0	1.032	1.038	1.030	1.030	1.012	1.028
68.3	1.018	1.018	1.008	1.010	1.008	1.012
Average	1.030	1.033	1.031	1.031	1.017	
	Coefficient of variation with saw-cylinder speed of [3]—					
	400 r.p.m.	600 r.p.m.	800 r.p.m.	1,100 r.p.m.	1,400 r.p.m.	Average
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
273.0	31.0	31.8	31.0	31.8	31.0	31.3
136.5	31.2	31.6	31.2	30.8	32.8	31.5
91.0	30.6	31.0	32.0	31.8	32.4	31.6
68.3	32.0	31.8	32.8	32.8	33.0	32.5
Average	31.2	31.6	31.8	31.8	32.3	

[1] Table is a summary of appendix tables 36, 37, and 38.

[2] Lint-cleaning treatments at each interacting speed setting were replicated 5 times. Data represent average findings for samples tested after each replication.

[3] Differences among saw-cylinder speeds are significant at the 5-percent level for upper quartile length and are significant at the 10-percent level for mean length and coefficient of variation. Differences among feed-roller speeds are significant at the 1-percent level for upper quartile length, mean length, and coefficient of variation.

inch from 69.6 percent to 63.5 percent. Increasing the saw-cylinder speed and decreasing the feed-roller speed, both separately and in combination, gave progressive decreases in the percentage of long fibers (fig. 10, table 12, and appendix table 39). Decreases as a result of increased saw-cylinder speed were significant at the 10-percent level.

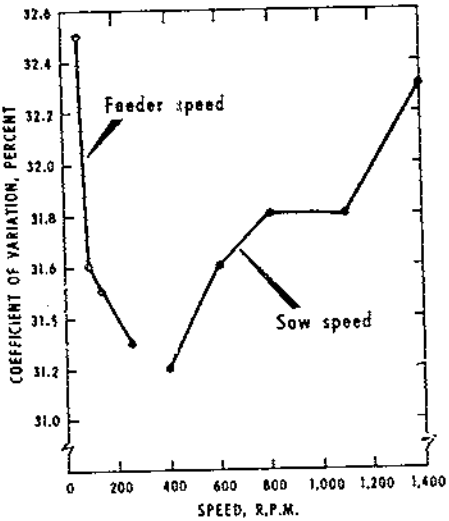

FIGURE 9.—Effect of saw-cylinder speed and feed-roller speed on coefficient of length variation, crop of 1966.

The 68.3 r.p.m. feed-roller speed produced a smaller proportion of long fibers than the 91 r.p.m., 136.5 r.p.m., and 273 r.p.m. speeds—a highly significant result (fig. 11).

Percentage of fibers ½ to 1 inch

Percentage of fibers from ½ to 1 inch increased somewhat with lint cleaning. The 1,400 r.p.m. saw-cylinder speed gave a higher percentage, which was significant at the 10-percent level (appendix table 40). Decreasing the feed-roller speed to 68.3 r.p.m. gave highly significant increases in the percentage of fibers from ½ to 1 inch.

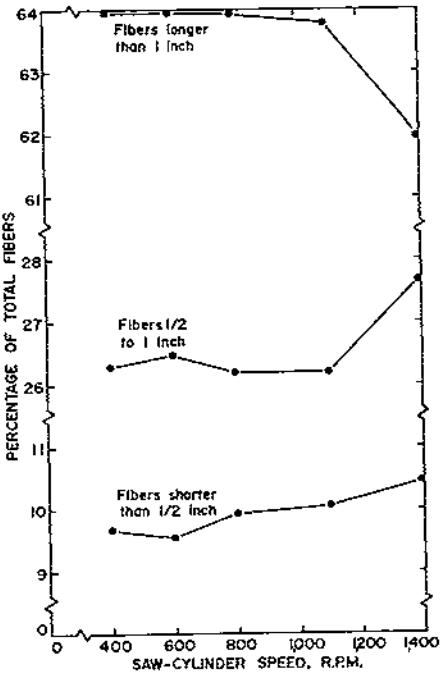

FIGURE 10.—Effect of lint cleaner saw-cylinder speed on fiber-length distribution, crop of 1966.

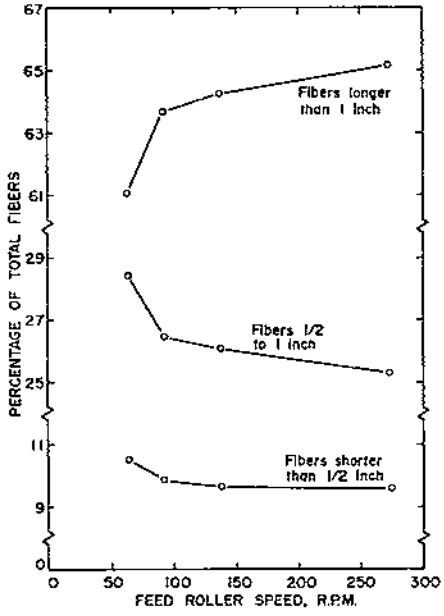

FIGURE 11.—Effect of lint cleaner feed-roller speed on fiber-length distribution, crop of 1966.

TABLE 12.—*Percentage of fibers longer than 1 inch, ½ to 1 inch, and shorter than ½ inch for lint samples after 1 stage of experimental saw-cylinder lint cleanings, crop of 1966* [1] [2]

Feed-roller speed (r.p.m.)	Fibers longer than 1 inch with saw-cylinder speed of [3]—					
	400 r.p.m.	600 r.p.m.	800 r.p.m.	1,100 r.p.m.	1,400 r.p.m.	Average
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
273.0	65.7	65.7	66.3	64.4	63.8	65.2
136.5	64.4	64.0	65.0	65.5	62.2	64.2
91.0	64.7	64.7	63.9	63.9	61.2	63.7
68.3	61.4	61.7	60.4	61.2	60.5	61.0
Average	64.0	64.0	63.9	63.8	61.9	
	Fibers ½ to 1 inch with saw-cylinder speed of [3]—					
	400 r.p.m.	600 r.p.m.	800 r.p.m.	1,100 r.p.m.	1,400 r.p.m.	Average
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
273.0	24.8	24.7	24.4	25.4	26.8	25.2
136.5	25.9	26.4	25.7	25.6	27.0	26.1
91.0	26.0	26.3	25.9	26.0	28.1	26.5
68.3	28.5	28.5	28.7	27.7	28.6	28.4
Average	26.3	26.5	26.2	26.2	27.6	
	Fibers shorter than ½ inch with saw-cylinder speed of [3]—					
	400 r.p.m.	600 r.p.m.	800 r.p.m.	1,100 r.p.m.	1,400 r.p.m.	Average
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
273.0	9.5	9.6	9.3	10.2	9.4	9.6
136.5	9.7	9.7	9.3	9.0	10.7	9.7
91.0	9.4	9.0	10.2	10.1	10.7	9.9
68.3	10.1	9.8	10.9	11.0	10.9	10.6
Average	9.7	9.5	9.9	10.1	10.4	

[1] Table is a summary of appendix tables 39, 40, and 41.
[2] Lint-cleaning treatments at each interacting speed setting were replicated 5 times. Data represent average findings for samples tested after each replication.
[3] Differences among saw-cylinder speeds are significant at the 10-percent level for fibers longer than 1 inch and fibers from ½ to 1 inch but are not significant at the 10-percent level for fibers shorter than ½ inch. Differences among feed-roller speeds are significant at the 1-percent level for fibers longer than 1 inch and fibers ½ to 1 inch, and are significant at the 5-percent level for fibers shorter than ½ inch.

Percentage of fibers shorter than ½ inch

The one stage of lint cleaning increased the short-fiber content of samples tested from 7.7 percent to an average of 9.9 percent.

Increasing the saw-cylinder speed produced increases in the percentage of short fibers (appendix table 41).

The highest percentage was obtained with the 1,400 r.p.m. speed setting. A continous and progressive increase in the proportion of short fibers was obtained with decrease in the lint-cleaner feed-roller speed. Short-fiber content for the 68.3 r.p.m. speed was significantly higher than that for the 136.5 r.p.m. and 273 r.p.m. speeds.

Strength Index

The effects of lint-cleaner treatments on fiber strength were not generally consistent (table 13 and appendix tables 35 and 43). The lowest fiber strength was obtained with the 1,400 r.p.m. saw-cylinder setting, which was significantly lower than that obtained for the 1,100 r.p.m. speed setting.

The effect on fiber strength of feed-roller speed was neither consistent nor significant.

TABLE 13.—*Fiber strength and nep count of lint samples after 1 stage of experimental saw-cylinder lint cleanings, crop of 1966* [1] [2]

Feed-roller speed (r.p.m.)	Fiber strength with saw-cylinder speed of [3]—					
	400 r.p.m.	600 r.p.m.	800 r.p.m.	1,100 r.p.m.	1.400 r.p.m.	Average
	Grams per tex	*Grams per tex*	*Grams per tex*	*Grams per tex*	*Grams per tex*	*Grams per tex*
273.0	22. 1	22. 5	22. 2	23. 1	22. 5	22. 5
136.5	22. 4	22. 5	22. 5	22. 8	22. 0	22. 4
91.0	22. 3	22. 2	22. 5	22. 6	22. 2	22. 4
68.3	22. 6	22. 5	22. 3	22. 9	22. 6	22. 6
Average	22. 4	22. 4	22. 4	22. 8	22. 3	
	Nep count with saw-cylinder speed of [3] [4]—					
	400 r.p.m.	600 r.p.m.	800 r.p.m.	1,100 r.p.m.	1,400 r.p.m.	Average
273.0	14. 6	15. 6	15. 8	18. 0	19. 0	16. 6
136.5	16. 2	15. 6	16. 6	17. 6	23. 6	17. 9
91.0	15. 4	15. 2	15. 6	19. 4	21. 6	17. 4
68.3	16. 0	16. 8	17. 8	19. 4	23. 8	18. 8
Average	15. 6	15. 8	16. 5	18. 6	22. 0	

[1] Table is a summary of appendix tables 43 and 44.

[2] Lint-cleaning treatments at each interacting speed setting were replicated 5 times. Data represent average findings for samples tested after each replication.

[3] Differences among saw-cylinder speeds are significant at the 5-percent level for fiber strength and are significant at the 1-percent level for nep count. Differences among feed-roller speeds are not significant for either fiber strength or nep count.

[4] Per 100 square inches of web.

Nep Count

Lint cleaning increased the neps per 100 square inches of web from 11.5 before cleaning to 17.7 after one stage of saw-cylinder cleaning.

Increasing the saw-cylinder speed produced a progressive and highly significant increase in the nep count of the cleaned lint (fig. 12 and appendix table 44). The 1,400 r.p.m. saw-cylinder speed produced considerably more neps than other saw speeds, and this result was highly significant. Nep-count differences between 400 r.p.m., 600 r.p.m., and 800 r.p.m. and between 800 r.p.m. and 1,100 r.p.m. were not significant.

Although the 273 r.p.m. feed-roller speed produced the least number of neps and the 68.3 r.p.m. speed the greatest number, these differences were found to be not statistically significant.

The faster saw-cylinder speeds of 1,100 r.p.m. and 1,400 r.p.m. tended to produce higher nep counts than slower saw speeds at the same combing ratio (appendix table 45).

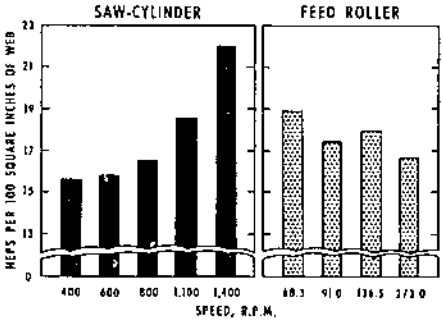

FIGURE 12.—Nep count as a function of saw-cylinder speed and feed-roller speed of lint cleaner, crop of 1966.

Analysis of Variance

The study was analyzed statistically as a factorial experiment involving five replications of five saw-cylinder speeds and four feed-roller speeds.

The analysis of variance was calculated with the following distribution of degrees of freedom:

Source	*Degrees of freedom*
Replication	4
Saw-cylinder speed	4
Feed-roller speed	3
Feed-roller times saw-cylinder speed	12
Error	76

These data, with the resulting significant level, are shown in appendix table 46. No significant interaction between saw-cylinder speed and feed-roller speed was found for any of the fiber properties studied. Significant differences at the 1-percent and 5-percent levels for individual saw-cylinder and feed-roller speeds are shown in appendix table 47 and 48.

Curvilinear Regression

Although the relation between the fiber properties studied and saw-cylinder and feed-roller speeds were approximately linear when studied over a limited range of speeds, a nonlinear curve would best describe the relation over the entire range.

The data were best described by the logarithmic expressions Log $Y = a_1 + b_1 X$ and Log $Y = a_1 + b$ Log X or the exponentials $Y = ab^X$ and $Y = aX^b$, where:

Y = Magnitude of fiber property,
X = Saw-cylinder or feed-roller speed, and a, a_1, b, b_1, = Constants based upon experimental data.

EXPERIMENTAL RESULTS, 1967

Seed-Cotton Data

Oven-moisture determinations showed that the moisture level of the wagon samples of seed cotton averaged 8.3 percent for the study (table 14 and appendix table 49). Fractionation tests gave an average foreign-matter content of 4.9 percent.

Cottonseed Data

Cottonseed-moisture contents at ginning averaged 9.2 percent for the experiments, and seed-germination percentages averaged 86.4 percent (table 14 and appendix table 50).

TABLE 14.—*Precleaning data for wagon seed-cotton and cottonseed samples processed before experimental lint cleanings, crop of 1967* [1]

Item	Precleaning data for samples processed for cleaning with saw-cylinder speed of [2]—				
	460 r.p.m.	600 r.p.m.	800 r.p.m.	1,100 r.p.m.	1,400 r.p.m.
Wagon seed cotton:	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Moisture content	8.6	8.6	8.3	7.6	8.3
Foreign-matter content	4.7	4.8	5.2	5.5	4.5
Cottonseed:					
Moisture content	9.2	9.0	9.2	9.3	9.1
Germination level	88.7	85.2	86.5	85.6	85.9

[1] Table is a summary of appendix tables 49 and 50.
[2] Lint-cleaning treatments at each saw-cylinder speed setting were replicated 5 times. Data represent average findings for samples tested before each replication.

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Lint-Moisture Content

Lint-moisture samples taken between the gin stand and lint cleaner had an average moisture level of 8 percent for the five replications. When lots apportioned for each replication were assigned in a random manner to the cleaning treatments, the lint-moisture content for the five saw speeds fell within a 7.9 to 8.1 percent range (table 15 and appendix table 51).

Lint Foreign-Matter Content

Increasing the saw-cylinder and feed-roller speed at such a rate that the combing ratio remained constant resulted in decreases in the foreign-matter content of the cleaned lint (table 15 and appendix table 51). An accumulated decrease of 0.63 percent in the lint foreign-matter content was obtained when the saw-cylinder speed was increased from 460 r.p.m. to 1,400 r.p.m.; this decrease is statistically significant. Foreign-matter differences between the 600 r.p.m., 800 r.p.m., and 1,100 r.p.m. speeds were not significant.

These results indicate that the centrifugal action of the saw-cylinder has a cleaning effect in addition to the combing effect of the saws.

Lint-Cleaner Efficiency

Foreign-matter contents, presented as lint cleaner efficiency, indicated that efficiency increased with increases in saw speed at constant combing ratio (table 15). The 460 r.p.m. saw speed produced the lowest cleaning efficiency, 2.1 percent, and efficiency increased substantially at the 1,100 r.p.m. speed setting.

Classer's Grade

No differences in grade indexes of grade resulting from saw-cylinder speed were detected by the cotton classer. All grades for the lint were Strict Low Middling (tables 16 and 17, and appendix table 52).

Classer's Staple Length

The highest saw speed, 1,400 r.p.m., produced the lowest staple length, 35.53 thirty-seconds of an inch, although the combing ratio remained unchanged. However, these decreases were slight and were not significant statistically (table 17 and appendix table 52).

TABLE 15.—*Moisture content and foreign-matter level in lint samples, and lint-cleaner efficiency,*[1] *for experimental lint cleanings, crop of 1967*[2]

Moisture content, foreign-matter content, and cleaner efficiency	Moisture content and foreign matter in lint samples, and lint-cleaner efficiency, with saw-cylinder speed of [3]—				
	460 r.p.m.	600 r.p.m.	800 r.p.m.	1,100 r.p.m.	1,400 r.p.m.
Lint-moisture content, percent [4]	8. 1	7. 9	8. 1	8. 0	8. 1
Lint foreign-matter content, percent:					
Before lint cleaning	3. 26	3. 11	3. 27	3. 15	2. 93
After lint cleaning [5]	3. 19	2. 95	3. 12	2. 61	2. 56
Lint cleaner efficiency, percent	2. 1	5. 1	4. 6	17. 1	12. 6

[1] The efficiency of a lint cleaner is the ratio of foreign matter removed from cotton during cleaning to the foreign-matter content of the cotton as it entered the lint cleaner.
[2] Table is a summary of appendix table 51.
[3] Lint-cleaning treatments at each saw-cylinder speed setting were replicated 5 times.
[4] Precleaning moisture content.
[5] Differences among saw-cylinder speeds are significant at the 5-percent level.

TABLE 16.—*Fiber properties for ginned lint samples processed before experimental lint cleanings, crop of 1967* [1]

Fiber properties		Experimental data [2]
Staple length	32nds-inch	35. 56
Upper quartile length	inches	1. 29
Mean length	inches	1. 09
Coefficient of variation	percent	26. 2
Fibers longer than 1 inch	percent	73. 8
Fibers ½ to 1 inch	percent	19. 3
Fibers shorter than ½ inch	percent	6. 4
Fiber strength (⅛-inch gauge)	grams per tex	22. 1
Neps per 100 square inch of web		10. 6

[1] Table is a summary of data from appendix tables 52 and 54.
[2] Lint-cleaning treatments at saw-cylinder speed settings of 460 r.p.m., 600 r.p.m., 800 r.p.m., 1,100 r.p.m., and 1,400 r.p.m. were each replicated 5 times. Data represent average findings for samples tested before each replication. All samples were classified with a grade index of 94, and designated SLM.

Fiber Maturity and Fineness

Fiber testing of samples taken from ginned lint indicated cotton of normal maturity (appendix table 53). The Causticaire measurement for fineness averaged 4.8 micrograms per inch. This average was in close agreement with the micronaire reading of 4.6.

TABLE 17.—*Fiber properties for ginned lint samples after 1 stage of experimental saw-cylinder lint cleanings, crop of 1967* [1]

Fiber properties	Fiber property of samples afforded cleaning with saw-cylinder speed of [2]—				
	460 r.p.m.	600 r.p.m.	800 r.p.m.	1,100 r.p.m.	1,400 r.p.m.
Staple length.....1/32-inch..	35. 73	35. 67	35. 73	35. 87	35. 53
Upper quartile length [3].....inches..	1. 276	1. 272	1. 288	1. 280	1. 272
Mean length.....inches..	1. 050	1. 052	1. 058	1. 060	1. 058
Coefficient of variation.....percent..	29. 2	29. 0	29. 6	29. 0	28. 6
Fibers longer than 1 inch.....percent..	66. 8	67. 5	68. 2	68. 9	68. 1
Fibers ½ to 1 inch.....percent..	24. 6	23. 9	22. 8	22. 5	23. 3
Fibers shorter than ½ inch...percent..	8. 0	8. 0	8. 5	7. 9	8. 0
Fiber strength (⅛-inch gauge) grams per tex..	22. 0	21. 6	21. 9	22. 0	21. 6
Neps per 100 square inch of web.....	13. 8	13. 8	14. 6	15. 8	15. 4

[1] Table is a summary of data from appendix tables 52, 55, 56, and 59.

[2] Lint-cleaning treatments at saw-cylinder speed settings of 460 r.p.m., 600 r.p.m., 800 r.p.m., 1,100 r.p.m., and 1,400 r.p.m. were each replicated 5 times. Data represent average findings for samples tested after experimental lint cleaning. All samples were classified with a grade index of 94, and designated SLM.

[3] Differences among saw-cylinder speeds are significant at the 5-percent level for upper quartile length. Differences among saw-cylinder speeds for the other fiber properties shown are not significant.

Fiber-Length Distribution

Upper quartile length, mean length, and coefficient of variation for cotton before lint cleaning averaged 1.29 inches, 1.09 inches, and 26.2 percent, respectively (table 16 and appendix table 54). Percentage of fibers longer than 1 inch, percentage of fibers from ½ to 1 inch, and percentage of fibers shorter than ½ inch averaged 73.8 percent, 19.3 percent, and 6.4 percent.

Upper quartile length

Upper quartile length for the study averaged 1.28 inches for cleaned lint and 1.22 inches for lint-cleaner waste material (tables 17 and 18 and appendix tables 55 and 57). The highest saw-cylinder speed, 1,400 r.p.m., produced the shortest upper quartile length and this result was significant statistically.

Upper quartile length differences between saw speeds for lint-cleaner waste material were not significant statistically. The slightly longer fiber length obtained at 1,400 r.p.m. might be attributed to the increased centrifugal action of the saws causing additional lint to be removed with the waste material.

Mean length

No significant differences in mean length for cleaned lint or lint-cleaner

waste material were attributed to saw-cylinder speed. Mean length for cleaned lint and lint-cleaner waste averaged 1.06 inches and 0.92 inch.

Coefficient of length variation

Coefficient of length variation differences were not significant results of saw-cylinder speed. Coefficients for cleaned lint and lint-cleaner waste material averaged 29.1 percent and 41.4 percent.

Percentage of fibers longer than 1 inch

The one stage of lint cleaning reduced the percentage of fibers longer than 1 inch from 73.8 percent to 67.9 percent. Increasing the saw speed at constant combing ratio produced no significant changes in the percentage of long fibers. Fibers longer than 1 inch averaged 67.9 percent for cleaned lint and 53 percent for the lint-cleaner waste material.

Percentage of fibers ½ to 1 inch

Percentage of fibers from ½ to 1 inch increased somewhat with lint cleaning. However, fiber length differences between saw speeds were not significant.

Percentage of fibers shorter than ½ inch

The one stage of lint cleaning increased the short fiber content from 6.4 percent to an average of 8.1 percent. Short-fiber content for lint-cleaner waste averaged 20 percent.

Short-fiber content differences, as a result of saw-cylinder speed, were small and not significant.

TABLE 18.—*Fiber-length data for lint-cleaner waste material from 1 stage of experimental saw-cylinder lint cleaning, crop of 1967* [1]

Item	Fiber-length data for waste samples with saw-cylinder speed of [2]—				
	460 r.p.m.	600 r.p.m.	800 r.p.m.	1,100 r.p.m.	1,400 r.p.m.
Upper quartile length.....inches..	1. 20	1. 22	1. 20	1. 21	1. 24
Mean length.....inches..	. 88	. 93	. 89	. 93	. 96
Coefficient of variation.....percent..	45. 0	41. 0	44. 0	39. 0	38. 0
Fibers longer than 1 inch.....percent..	48. 9	54. 6	49. 5	54. 1	57. 8
Fibers ½ to 1 inch.....percent..	26. 7	25. 5	27. 5	27. 4	25. 1
Fibers shorter than ½ inch...percent..	23. 8	19. 4	22. 4	17. 9	16. 4

[1] Table is a summary of appendex tables 57 and 58.

[2] Lint-cleaning treatments at each saw-cylinder speed setting were replicated 5 times. Data represent average findings for samples tested. Differences among saw-cylinder speeds are not significant for any of the fiber length categories.

Again, the slight decrease in short-fiber content of waste material at the faster saw speeds might be attributed to the additional lint removed by the increased centrifugal action of the saw.

Strength Index

The strength index averaged 22.1 grams per tex before lint cleaning and 21.8 grams per tex after one stage of saw-cylinder lint cleaning (tables 16 and 17 and appendix table 54 and 59).

The effect of lint-cleaner saw speed on fiber strength was not significant. However, the 460 r.p.m. speed produced a slightly higher strength index than the faster saw-cylinder speeds.

Nep Count

Lint cleaning increased the neps per 100 square inches of web from 10.6 before cleaning to 14.7 after one stage of saw-cylinder cleaning.

The faster saw speeds tended to give higher nep counts than slower saw speeds at the same combing ratio (fig. 13, table 17 and appendix table 59). Nep count differences, however, were small and were found to be not statistically significant.

Analysis of Variance

The study was analyzed statistically as a randomized complete-block experiment involving five replications each of five saw speeds. The analysis of variance was calculated with the following distribution of degrees of freedom:

Source	*Degrees of freedom*
Replication	4
Treatment	4
Error	16

These data, with the resulting significant levels, are shown in appendix tables 60 and 61.

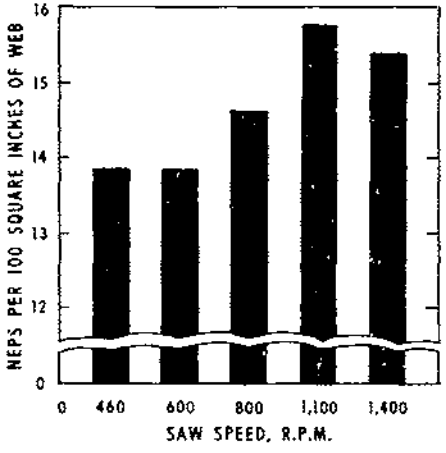

FIGURE 13.—Nep count as a function of lint-cleaner saw speed, crop of 1967.

CONCLUSIONS

The study indicated that increasing the combing ratio by increasing the saw-cylinder speed to 1,400 r.p.m. (4,398 feet per minute tip speed) produces considerably more fiber breakage than is produced by speeds of 800 r.p.m. and 1,100 r.p.m. The higher speed also produces a highly significant increase in neps, but produces no significant increase in foreign-matter removal or increase in grade.

Saw-cylinder speeds of 400 r.p.m. and 600 r.p.m. (1,257 and 1,885 f.p.m. tip speeds) resulted in lower fiber breakage and fewer neps. These results were generally not significantly lower than those produced by the 800 and 1,100 r.p.m. speeds, but the lower speeds produced significantly higher foreign-matter contents and lower grades.

At constant combing ratio, increasing the saw-cylinder speeds to 1,400 r.p.m. (4,398 f.p.m. tip speed) caused more fiber breakage than occurred at lower speeds. The 1,400 r.p.m. speed gave a significant decrease in the upper quartile length, a slight decrease in staple length, and a high nep count. Although there appeared to be a slight but significant decrease in the foreign-matter content at this speed, this effect was not reflected in the classer's grade. Saw-cylinder speeds of 460 r.p.m. and 600 r.p.m. (1,445 and 1,885 f.p.m. tip speeds) gave marked decreases in cleaning efficiency, but nep counts were not significantly lower than for the 800 and 1,100 r.p.m. speeds. Staple length, upper quartile length, mean length, and percentage of fibers longer than 1 inch obtained at saw-cylinder speeds of 800 r.p.m. to 1,100 r.p.m. (2,513 to 3,456 f.p.m. tip speed) were as great or greater than those obtained at slower speeds.

Therefore, for maximum foreign-matter removal commensurate with minimum changes in fiber length, saw-cylinder speeds of 800 r.p.m. to 1,100 r.p.m. (2,513 to 3,456 f.p.m. tip speed) are recommended. Feed-roller speed should be such that the proper combing ratio is maintained in respect to these recommended saw speeds. Combing ratios of 12.5 to 37.5 are desired. Higher ratios produced high fiber breakage and nep counts and lower ratios produced considerably decreased cleaning efficiency.

The 800 r.p.m. speed is preferred from a fiber-breakage standpoint. However, if additional cleaning is preferred, the 1,100 r.p.m. speed may be used with combing ratios at the lower end of the recommended range.

In applying these recommendations for quality preservation, emphasis is placed on tip speed. Feed-roller and saw-cylinder speeds in terms of revolutions per minute can be misleading because the tip speed also depends upon the feed-roller and saw diameters.

Lint-cleaner research has shown that as the moisture content of the lint increases, the fibers become

stronger and fewer fibers are broken by the lint-cleaning actions. However, these higher moisture levels are also accompanied by decreased cleaning action (*4*).

It is not impractical to assume that an automatic control system could be employed to record the moisture content of the lint. This measurement could then be used to control variable speed drives to maintain the proper relationship between spline feed-roller speed, saw-cylinder speed, and combing ratio. With such a control, cotton with a higher moisture content could be processed at increased saw speed or combing ratio, or both, for more thorough cleaning. The drier cotton, the fiber of which is more susceptible to damage, could receive gentler action at reduced saw speed and combing ratio. These controls could also be designed to adjust the cleaner's action to accord with the amount of cotton being processed (lint feed rate) and the foreign-matter content of the cotton.

Developments of this nature are in the planning stage.

SUMMARY

Experimental studies were conducted at the Stoneville Cotton Ginning Research Laboratory, Stoneville, Miss., during the 1966 and 1967 crop years to obtain basic data required in the design and operation of controlled-batt saw-cylinder lint cleaners, the type used almost exclusively by the ginning industry. The primary objective of the studies was to determine the effect of lint-cleaner saw-cylinder speed, feed-roller speed, and combing ratio on foreign-matter removal and on fiber-length distribution of cleaned lint. A number of hypotheses relating to this objective were formulated and investigated.

During the 1966 crop year, 100 test lots were processed through one stage of experimental lint cleaning in five replications. In each replicate cleaning, four feed-roller speeds were each tested with five saw-cylinder speeds. Saw-cylinder (12-inch diameter) speeds employed were 400 r.p.m., 600 r.p.m., 800 r.p.m., 1,100 r.p.m., and 1,400 r.p.m. Feed-roller ($12\frac{13}{16}$-inch-diameter) speeds of 68.3 r.p.m., 91 r.p.m., 136.5 r.p.m., and 273 r.p.m. were used. These speeds provided a combing ratio range varying from 6.2 to 87.4.

Experiments conducted from the 1967 crop were directed toward ascertaining the effect of lint-cleaner saw-cylinder speed, independent of combing ratio, on foreign-matter removal and on fiber-length distribution. Twenty-five test lots were processed through the experimental lint cleaner in five replications of each of five saw speeds. Saw-cylinder speeds employed were 460 r.p.m., 600 r.p.m., 800 r.p.m., 1,100 r.p.m., and 1,400 r.p.m. A combing ratio

of 25 was maintained for all saw speeds.

Results indicated that foreign-matter removal by the controlled-batt saw-cylinder lint cleaner involves two cleaning principles. These are (1) combing of the fibers at the feed plate and (2) centrifugal action between the saw-cylinder and grid bars. Both actions contribute to overall cleaning.

The validity of the following hypotheses was established by the experiments: The efficiency of foreign-matter removal by controlled-batt saw-cylinder lint cleaners is directly related to saw-cylinder speed; increasing the combing ratio by increasing the saw-cylinder speed or decreasing the lint-cleaner feed-roller speed increases cleaning efficiency but causes additional fiber breakage; and fiber-length distribution shifts toward the longer fibers with decrease in saw speed.

Increasing the lint-cleaner combing ratio by increasing the saw-cylinder speed or decreasing the feed-roller speed gave highly significant decreases in the foreign-matter content of the cleaned lint. These decreases were also reflected in the classer's grade.

Saw-speed increases and feed-roller speed decreases (both of which increased combing ratio) shifted the fiber-length distribution toward the shorter fibers and gave shorter staple lengths.

Highly significant increases in neps per 100 square inches of web were associated with increased saw speed, and somewhat lower increases were associated with decreased feed-roller speed (both adjustments that increased combing ratio).

The hypothesis "cleaning efficiency and fiber length are directly related to combing ratios, independent of saw- or feed-roller speed" was found to be false because, at a constant ratio, high saw speeds gave more cleaning action but also caused additional fiber breakage. The hypothesis "the fiber-length distribution shifts toward the longer fibers with increase in saw-cylinder speed, although the combing ratio remains unchanged" was also found to be false.

For the same combing ratio, faster saw speeds gave increases in lint-cleaning efficiency accompanied by shorter staple lengths and higher nep counts.

The hypothesis "greater numbers of long fibers are broken by the faster saw speeds, but this effect is masked because the additional centrifugal action removes more short fibers" appeared to be true in that the fastest saw speed (1,400 r.p.m.) gave a slightly, but not significantly, longer upper quartile length for lint-cleaner waste material.

Changes in fiber properties with change in saw-cylinder or feed-roller speed were progressive, with no significant interaction between saw and feeder speeds.

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APPENDIX

TABLE 19.—*Moisture content of wagon samples of seed cotton processed before experimental lint cleanings replicated 5 times, crop of 1966* [1]

Saw-cylinder speed and feed-roller speed (r.p.m.)	Moisture content of samples processed before replicate cleaning—					
	1	2	3	4	5	Average
400 r.p.m.	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
273.0	10.6	8.7	9.5	9.6	9.7	9.6
136.5	11.0	9.2	8.3	8.8	9.3	9.3
91.0	10.5	7.6	8.4	9.2	10.3	9.2
68.3	9.6	10.0	9.2	8.2	9.6	9.3
600 r.p.m.						
273.0	8.7	9.9	9.2	8.7	10.4	9.4
136.5	11.0	11.1	9.9	8.0	10.9	10.2
91.0	9.3	11.7	9.7	8.4	10.2	9.9
68.3	11.2	11.1	9.3	9.4	10.9	10.4
800 r.p.m.						
273.0	10.4	11.8	10.8	10.6	11.0	10.9
136.5	9.9	9.2	10.8	7.3	10.8	9.6
91.0	10.7	10.1	11.0	7.3	10.2	9.9
68.3	11.5	10.7	10.2	8.7	9.8	10.2
1,100 r.p.m.						
273.0	10.7	10.4	10.3	9.6	10.8	10.2
136.5	10.2	9.1	9.2	9.9	9.5	9.6
91.0	10.1	10.2	8.3	9.4	11.5	9.9
68.3	9.2	9.2	9.3	8.8	11.7	9.6
1,400 r.p.m.						
273.0	10.3	8.2	9.2	10.0	9.8	9.5
136.5	10.4	8.9	10.1	10.1	10.1	9.9
91.0	10.1	9.8	10.0	9.4	11.1	10.1
68.3	11.0	8.7	9.5	8.1	11.6	9.8
Average	10.3	9.8	9.6	9.0	10.5	.....

[1] Data for each replicate cleaning treatment at each interacting speed setting represent average findings for 3 samples subjected to oven moisture-determination tests.

TABLE 20.—*Foreign-matter content of wagon seed-cotton samples processed before experimental lint cleanings replicated 5 times, crop of 1966* [1]

Saw-cylinder speed and feed-roller speed (r.p.m.)	Foreign matter in samples processed before replicate cleaning—					
	1	2	3	4	5	Average
400 r.p.m.	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
273.0	5.7	5.7	4.8	5.7	4.9	5.4
136.5	5.7	5.3	4.7	4.8	4.0	4.9
91.0	6.8	5.3	4.6	4.7	4.3	5.1
68.3	6.8	5.1	5.1	4.4	4.2	5.1
600 r.p.m.						
273.0	6.4	7.0	4.4	4.8	4.2	5.4
136.5	5.8	6.2	4.7	5.1	4.6	5.3
91.0	7.1	6.2	4.9	5.5	4.1	5.6
68.3	6.3	6.8	4.6	4.6	4.6	5.4
800 r.p.m.						
273.0	6.8	5.4	4.4	4.7	4.4	5.1
136.5	6.7	6.1	3.9	4.7	4.4	5.2
91.0	6.9	5.4	5.3	4.4	4.6	5.3
68.3	7.1	7.4	5.7	4.7	5.1	6.0
1,100 r.p.m.						
273.0	7.2	5.4	4.7	4.7	4.8	5.4
136.5	8.4	5.8	4.4	4.9	4.2	5.5
91.0	7.9	6.6	4.7	4.6	5.2	5.8
68.3	8.5	6.4	4.5	4.4	4.7	5.7
1,400 r.p.m.						
273.0	5.5	5.5	4.0	4.4	3.8	4.6
136.5	6.5	5.0	4.9	5.0	4.1	5.1
91.0	7.2	5.3	5.3	5.4	3.9	5.4
68.3	7.2	6.2	5.3	4.9	3.9	5.5
Average	6.8	6.0	4.8	4.8	4.4	.....

[1] Data for each replicate cleaning treatment at each interacting speed setting represent average findings for 3 samples subjected to fractionation tests.

TABLE 21.—*Moisture content during ginning of cottonseed samples tested before experimental lint cleanings replicated 5 times, crop of 1966* [1]

Saw-cylinder speed and feed-roller speed (r.p.m.)	Moisture content of samples tested before replicate cleaning—					
	1	2	3	4	5	Average
400 r.p.m	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
273.0	9.9	9.8	8.8	8.7	9.6	9.4
136.5	10.0	9.8	8.8	8.8	9.4	9.4
91.0	9.5	9.6	9.1	8.5	9.6	9.3
68.3	9.2	9.4	9.5	8.4	9.6	9.2
600 r.p.m.						
273.0	9.4	10.3	9.2	8.3	9.6	9.4
136.5	9.7	9.8	8.5	8.5	9.2	9.1
91.0	9.1	9.8	9.2	8.5	9.3	9.2
68.3	9.6	10.0	8.7	8.8	9.2	9.3
800 r.p.m.						
273.0	9.2	9.9	9.1	8.8	10.1	9.4
136.5	9.5	9.6	8.4	9.0	9.7	9.2
91.0	9.5	10.0	8.7	9.1	10.1	9.5
68.3	9.7	10.2	8.3	8.9	10.0	9.4
1,100 r.p.m.						
273.0	9.0	8.9	8.4	8.0	9.6	8.8
136.5	9.2	8.8	8.1	8.2	10.5	9.0
91.0	8.9	9.4	8.6	7.7	10.1	8.9
68.3	9.1	9.2	8.5	7.9	10.3	9.0
1,400 r.p.m.						
273.0	9.4	9.0	9.0	8.3	9.1	9.0
136.5	9.6	9.1	8.7	8.3	9.4	9.0
91.0	9.6	9.2	8.7	8.2	9.3	9.0
68.3	9.5	9.1	8.9	8.3	9.1	9.9
Average	9.5	9.6	8.7	8.5	9.6	.....

[1] Data for each replicate cleaning treatment at each interacting speed setting represent findings for 1 sample subjected to oven moisture-determination tests.

TABLE 22.—*Germination level after ginning in cottonseed tested before experimental lint cleanings replicated 5 times, crop of 1966* [1]

Saw-cylinder speed and feed-roller speed (r.p.m.)	Germination level in samples processed before replicate cleaning—					
	1	2	3	4	5	Average
400 r.p.m.	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
273.0	87.0	91.5	89.0	92.0	82.0	88.3
136.5	89.5	92.0	89.5	88.5	90.0	89.9
91.0	91.0	91.0	92.0	91.0	91.0	91.2
68.3	88.5	92.0	93.5	89.5	88.5	90.4
600 r.p.m.						
273.0	92.5	92.5	89.0	90.0	86.0	90.0
136.5	91.5	91.0	91.0	88.0	92.0	90.7
91.0	93.0	93.0	87.5	92.0	86.5	90.4
68.3	86.5	91.0	89.5	90.5	89.0	89.3
800 r.p.m.						
273.0	90.5	87.5	87.0	92.0	83.5	88.1
136.5	92.5	91.5	89.5	90.5	86.0	90.0
91.0	90.5	91.5	85.5	90.5	84.0	88.4
68.3	90.5	90.0	83.5	91.0	85.0	88.0
1,100 r.p.m.						
273.0	86.0	89.5	90.5	90.0	84.5	88.1
136.5	87.5	92.0	93.0	94.0	87.5	90.8
91.0	92.5	92.5	94.0	94.0	86.0	91.8
68.3	91.5	91.0	86.5	95.0	87.5	90.3
1,400 r.p.m.						
273.0	90.0	91.0	93.0	90.5	92.0	91.3
136.5	86.0	92.5	88.5	91.5	90.0	89.7
91.0	90.5	90.0	85.5	92.5	84.0	88.5
68.3	89.5	92.5	86.0	94.0	90.0	90.4
Average	89.9	92.3	89.2	91.4	87.3	.....

[1] Data for each replicate cleaning treatment at each interacting speed setting represent average findings for 4 runs of 50 seeds each. The percentage of abnormal seedlings averaged 2.7, 2.6, 3.3, 2.3, and 2.9 percent for samples processed for replications 1, 2, 3, 4, and 5.

TABLE 23.—*Moisture content after ginning and before lint cleaning for sample lint processed before experimental lint cleanings replicated 5 times, crop of 1966* [1]

Saw-cylinder speed and feed-roller speed (r.p.m.)	Moisture content of samples processed before replicate cleaning [2]—					
	1	2	3	4	5	Average
400 r.p.m.	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
273.0	5.3	4.9	5.8	5.4	7.1	5.7
136.5	5.7	4.8	6.1	4.6	7.4	5.7
91.0	5.1	4.8	5.8	5.5	6.8	5.6
68.3	5.5	5.4	6.1	5.3	7.3	5.9
600 r.p.m.						
273.0	4.9	5.6	5.8	4.4	5.9	5.3
136.5	4.8	5.9	5.4	4.7	6.7	5.5
91.0	5.2	6.4	5.9	4.6	5.8	5.6
68.3	4.5	5.6	5.7	4.6	5.5	5.2
800 r.p.m.						
273.0	5.5	5.0	5.9	4.7	6.5	5.5
136.5	5.1	5.0	6.0	5.1	6.2	5.5
91.0	5.4	4.8	5.9	5.1	6.0	5.4
68.3	4.8	4.5	6.1	5.2	5.8	5.3
1,100 r.p.m.						
273.0	5.0	4.8	5.7	5.8	6.2	5.7
136.5	5.3	4.4	5.7	5.5	6.1	5.4
91.0	5.0	5.0	6.1	5.8	6.4	5.7
68.3	5.2	5.0	6.2	5.9	6.4	5.7
1,400 r.p.m.						
273.0	4.9	4.7	5.8	5.3	7.1	5.6
136.5	5.1	4.8	5.6	5.1	7.6	5.6
91.0	5.4	4.6	5.3	5.8	7.0	5.6
68.3	5.2	4.8	6.3	5.1	6.7	5.6
Average	5.2	5.0	5.9	5.2	6.5	.....

[1] Data for each replicate cleaning treatment at each interacting speed setting represent average findings for 3 samples (taken between gin stand and lint cleaner) subjected to oven moisture-determination tests.

[2] Ambient conditions during replications 1, 2, 3, 4, and 5 were 58.5° F. at 72.4 percent relative humidity; 59.9° F. at 64.6 percent relative humidity; 47.8° F. at 38.8 percent relative humidity; 54.1° F. at 28.4 percent relative humidity; and 64.7° F. at 57 percent relative humidity, respectively.

TABLE 24.—*Foreign-matter content of lint samples before experimental lint cleaning replicated 5 times, crop of 1966* [1]

Saw-cylinder speed and feed-roller speed (r.p.m.)	Foreign-matter content of samples processed before replicate cleaning—					
	1	2	3	4	5	Average
400 r.p.m.	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
273.0	2.83	3.19	3.52	3.17	3.39	3.22
136.5	3.39	3.12	3.06	3.72	4.24	3.51
91.0	2.83	3.37	3.17	3.48	3.57	3.28
68.3	2.34	3.14	3.75	3.50	3.50	3.25
600 r.p.m.						
273.0	2.52	2.79	3.77	3.03	3.21	3.06
136.5	2.77	2.97	3.50	3.28	3.75	3.25
91.0	2.54	2.61	3.46	2.94	3.41	2.99
8.3	2.99	2.90	3.55	3.21	3.70	3.27
800 r.p.m.						
273.0	2.32	2.85	3.41	3.75	3.88	3.24
136.5	2.27	2.88	3.61	2.94	4.01	3.14
91.0	2.10	3.30	3.12	3.79	3.50	3.16
68.3	3.12	2.85	3.59	3.32	3.52	3.28
1,100 r.p.m.						
273.0	2.45	3.08	3.41	2.83	3.26	3.01
136.5	2.65	3.21	3.59	2.72	3.86	3.21
91.0	2.63	3.17	3.30	3.21	4.39	3.34
68.3	2.45	3.77	2.81	2.94	3.79	3.15
1,400 r.p.m.						
273.0	2.45	3.21	3.10	2.99	3.32	3.01
136.5	2.54	3.08	3.35	2.90	3.70	3.11
91.0	2.52	3.01	3.26	3.75	3.86	3.28
68.3	2.68	3.59	3.41	3.19	4.59	3.49
Average	2.62	3.11	3.39	3.24	3.73	.....

[1] Data for each replicate cleaning treatment at each interacting speed setting represent findings for 1 sample subjected to analyses with the Shirley Analyzer method.

TABLE 25.—*Foreign-matter content in lint samples after 1 stage of experimental lint cleanings replicated 5 times, crop of 1966* [1]

Saw-cylinder speed and feed-roller speed (r.p.m.)	Foreign matter content of samples after replicate cleaning—					
	1	2	3	4	5	Average
400 r.p.m.	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
273.0	2.79	2.66	2.78	2.99	3.32	2.91
136.5	2.99	2.52	2.39	2.73	2.96	2.72
91.0	1.57	2.24	2.71	2.59	2.89	2.40
68.3	1.83	2.11	2.54	2.60	3.01	2.42
600 r.p.m.						
273.0	2.08	2.48	2.76	2.47	3.00	2.56
136.5	1.64	2.16	2.50	2.29	2.85	2.29
91.0	1.50	1.89	2.59	2.44	2.98	2.28
68.3	1.68	2.16	2.53	2.70	2.82	2.38
800 r.p.m.						
273.0	1.90	2.27	2.41	2.36	2.30	2.25
136.5	1.86	1.82	2.04	2.16	2.65	2.11
91.0	1.55	1.96	2.21	2.16	2.16	2.01
68.3	1.52	2.22	2.25	2.38	2.16	2.11
1,100 r.p.m.						
273.0	2.26	1.72	1.80	2.24	2.58	2.12
136.5	1.80	1.69	1.95	2.19	2.45	2.02
91.0	2.08	1.87	1.64	2.22	2.39	2.04
68.3	1.96	1.35	1.72	1.99	2.31	1.87
1,400 r.p.m.						
273.0	1.68	1.83	2.17	1.49	2.80	1.89
136.5	1.37	1.60	1.93	1.64	2.21	1.75
91.0	1.35	2.04	1.89	1.89	2.48	1.93
68.3	1.55	2.03	1.78	1.86	2.54	1.95
Average	1.85	2.03	2.23	2.27	2.62	.....

[1] Data for each replicate cleaning treatment at each interacting speed setting represent average findings for 3 samples subjected to analyses with the Shirley Analyzer method.

TABLE 26.—*Classer's grade index for ginned lint samples processed before experimental lint cleanings replicated 5 times, crop of 1966*[1,2]

Saw-cylinder speed and feed-roller speed (r.p.m.)	Grade index of samples processed before replicate cleaning—					
	1	2	3	4	5	Average
400 r.p.m.						
273.0	94.0	94.0	94.0	94.0	94.0	94.0
136.5	94.0	94.0	94.0	94.0	90.0	93.2
91.0	94.0	94.0	97.0	94.0	94.0	94.6
68.3	94.0	94.0	97.0	94.0	89.0	93.6
600 r.p.m.						
273.0	94.0	94.0	94.0	94.0	94.0	94.0
136.5	94.0	94.0	94.0	94.0	90.0	93.2
91.0	94.0	94.0	94.0	94.0	94.0	94.0
68.3	94.0	94.0	97.0	97.0	94.0	95.2
800 r.p.m.						
273.0	94.0	94.0	94.0	94.0	94.0	94.0
136.5	94.0	94.0	94.0	94.0	94.0	94.0
91.0	94.0	94.0	94.0	94.0	94.0	94.0
68.3	94.0	94.0	100.0	94.0	90.0	94.4
1,100 r.p.m.						
273.0	94.0	94.0	94.0	94.0	94.0	94.0
136.5	94.0	94.0	97.0	94.0	94.0	94.6
91.0	94.0	94.0	94.0	94.0	89.0	93.0
68.3	94.0	94.0	94.0	94.0	90.0	93.2
1,400 r.p.m.						
273.0	89.0	94.0	94.0	94.0	94.0	93.0
136.5	94.0	94.0	97.0	94.0	94.0	94.6
91.0	94.0	94.0	97.0	94.0	90.0	93.8
68.3	94.0	94.0	94.0	94.0	94.0	94.0
Average	93.8	94.0	95.2	94.2	92.5	.....

[1] Data for each replicate cleaning treatment at each interacting speed setting represent average findings for 1 sample subjected to cotton-classing tests.

[2] Grade designation and corresponding grade index:

M	=100	M^{1s}	=97
SLM+	= 97		
SLM	= 94	SLM^{1s}	=89
LM+	= 90		
LM	= 85	LM^{1s}	=80

TABLE 27.—*Classer's grade index for ginned lint samples after 1 stage of experimental saw-cylinder lint cleanings replicated 5 times, crop of 1966*[1,2]

Saw-cylinder speed and feed-roller speed (r.p.m.)	Grade index of samples after replicate cleaning—					
	1	2	3	4	5	Average
400 r.p.m.						
273.0	94.0	94.0	97.0	94.0	94.0	94.6
136.5	94.0	98.0	99.0	95.0	94.0	96.0
91.0	94.0	94.0	100.0	97.0	94.0	95.8
68.3	94.0	94.0	98.0	100.0	94.0	96.0
600 r.p.m.						
273.0	96.0	94.0	98.0	100.0	94.0	96.4
136.5	96.0	94.0	99.0	100.0	94.0	96.6
91.0	98.0	98.0	100.0	100.0	94.0	98.0
68.3	96.0	96.0	100.0	100.0	94.0	97.2
800 r.p.m.						
273.0	94.0	94.0	99.0	100.0	94.0	96.2
136.5	98.0	98.0	100.0	99.0	96.0	98.2
91.0	98.0	100.0	100.0	100.0	95.0	98.6
68.3	96.0	100.0	99.0	100.0	94.0	97.8
1,100 r.p.m.						
273.0	96.0	98.0	100.0	100.0	94.0	97.6
136.5	96.0	100.0	100.0	99.0	95.0	98.0
91.0	100.0	100.0	100.0	99.0	94.0	98.6
68.3	98.0	100.0	100.0	100.0	95.0	98.6
1,400 r.p.m.						
273.0	100.0	100.0	99.0	100.0	96.0	99.0
136.5	100.0	100.0	100.0	100.0	94.0	98.8
91.0	98.0	100.0	100.0	100.0	95.0	98.6
68.3	100.0	100.0	100.0	100.0	94.0	98.8
Average	96.8	97.6	99.4	99.2	94.4	.....

[1] Data for each replicate cleaning treatment at each interacting speed setting represent average findings for 3 samples subjected to cotton-classing tests.

[2] Grade designation and corresponding grade index:

M	100
SLM	97
SLM	94
LM	90
LM	85

TABLE 28.—*Classer's grade designation for ginned lint samples processed before experimental lint cleanings replicated 5 times, crop of 1966* [1]

Saw-cylinder speed and feed-roller speed (r.p.m.)	Grade designation for samples processed before replicate cleaning—					
	1	2	3	4	5	Average
400 r.p.m.						
273.0	SLM	SLM	SLM	SLM	SLM	SLM
136.5	SLM	SLM	SLM	SLM	LM+	SLM
91.0	SLM	SLM	M[1a]	SLM	SLM	SLM
68.3	SLM	SLM	SLM+	SLM	SLM[1a]	SLM
600 r.p.m.						
273.0	SLM	SLM	SLM	SLM	SLM	SLM
136.5	SLM	SLM	SLM	SLM	LM+	SLM
91.0	SLM	SLM	SLM	SLM	SLM	SLM
68.3	SLM	SLM	SLM+	SLM+	SLM	SLM
800 r.p.m.						
273.0	SLM	SLM	SLM	SLM	SLM	SLM
136.5	SLM	SLM	SLM	SLM	SLM	SLM
91.0	SLM	SLM	SLM	SLM	SLM	SLM
68.3	SLM	SLM	M	SLM	LM+	SLM
1,100 r.p.m.						
273.0	SLM	SLM	SLM	SLM	SLM	SLM
136.5	SLM	SLM	SLM+	SLM	SLM	SLM
91.0	SLM	SLM	SLM	SLM	SLM[1a]	SLM
68.3	SLM	SLM	SLM	SLM	LM+	SLM
1,400 r.p.m.						
273.0	SLM[1a]	SLM	SLM	SLM	SLM	SLM
136.5	SLM	SLM	SLM+	SLM	SLM	SLM
91.0	SLM	SLM	M[1a]	SLM	LM+	SLM
68.3	SLM	SLM	SLM	SLM	SLM	SLM
Average	SLM	SLM	SLM	SLM	SLM	.....

[1] Data for each replicate cleaning treatment at each interacting speed setting represent average findings for 1 sample subjected to cotton-classing tests and are calculated from grade indexes in appendix table 26.

TABLE 29.—*Grade designation for ginned lint samples after 1 stage of experimental lint cleanings replicated 5 times, crop of 1966* [1]

Saw-cylinder speed and feed-roller speed (r.p.m.)	Grade designation for samples after replicate cleaning—					
	1	2	3	4	5	Average
400 r.p.m.						
273.0	SLM	SLM	SLM+	SLM	SLM	SLM
136.5	SLM	SLM+	M	SLM	SLM	SLM+
91.0	SLM	SLM	M	SLM+	SLM	SLM+
68.3	SLM	SLM	SLM+	M	SLM	SLM+
600 r.p.m.						
273.0	SLM+	SLM	SLM+	M	SLM	SLM+
136.5	SLM+	SLM	M	M	SLM	SLM+
91.0	SLM+	SLM+	M	M	SLM	SLM+
68.3	SLM+	SLM+	M	M	SLM	SLM+
800 r.p.m.						
273.0	SLM	SLM	M	M	SLM	SLM+
136.5	SLM+	SLM+	M	M	SLM+	SLM+
91.0	SLM+	M	M	M	SLM	M
68.3	SLM+	M	M	M	SLM	SLM+
1,100 r.p.m.						
273.0	SLM+	SLM+	M	M	SLM	SLM+
136.5	SLM+	M	M	M	SLM	SLM+
91.0	M	M	M	M	SLM	SLM+
68.3	SLM+	M	M	M	SLM	M
1,400 r.p.m.						
273.0	M	M	M	M	SLM+	M
136.5	M	M	M	M	SLM	M
91.0	SLM+	M	M	M	SLM	M
68.3	M	M	M	M	SLM	M
Average	SLM+	SLM+	M	M	SLM	.....

[1] Data for each replicate cleaning treatment at each interacting speed setting represent average findings for 3 samples subjected to cotton-classing tests and are calculated from grade indexes in appendix table 27.

TABLE 30.—*Staple length of lint samples processed before experimental lint cleanings replicated 5 times, crop of 1966* [1]

Saw-cylinder speed and feed-roller speed (r.p.m.)	Staple length of samples processed before replicate cleaning—					
	1	2	3	4	5	Average
400 r.p.m.	32nds-inch	32nds-inch	32nds-inch	32nds-inch	32nds-inch	32nds-inch
273.0	34.0	35.0	35.0	34.0	35.0	34.6
136.5	35.0	35.0	35.0	35.0	35.0	35.0
91.0	35.0	35.0	35.0	34.0	34.0	34.6
68.3	34.0	35.0	34.0	35.0	34.0	34.4
600 r.p.m.						
273.0	35.0	34.0	34.0	34.0	35.0	34.4
136.5	34.0	35.0	34.0	34.0	35.0	34.4
91.0	35.0	35.0	35.0	35.0	34.0	34.8
68.3	35.0	35.0	34.0	34.0	34.0	34.4
800 r.p.m.						
273.0	34.0	35.0	34.0	35.0	34.0	34.4
136.5	34.0	35.0	34.0	34.0	34.0	34.2
91.0	34.0	35.0	35.0	34.0	34.0	34.4
68.3	35.0	35.0	34.0	35.0	35.0	34.8
1,100 r.p.m.						
273.0	34.0	35.0	35.0	34.0	34.5	34.5
136.5	35.0	34.0	34.0	34.0	34.0	34.2
91.0	35.0	35.0	34.0	34.0	34.0	34.4
68.3	35.0	35.0	35.0	34.0	34.0	34.6
1,400 r.p.m.						
273.0	35.0	35.0	35.0	34.0	35.0	34.8
136.5	34.0	35.0	35.0	34.0	35.0	34.6
91.0	34.0	35.0	35.0	34.0	34.0	34.4
68.3	34.0	35.0	34.0	34.0	34.0	34.2
Average	34.5	34.9	34.5	34.3	34.4	.....

[1] Data for each replicate cleaning treatment at each interacting speed setting represent average findings for 1 sample subjected to cotton-classing tests.

TABLE 31.—*Staple length of lint samples after 1 stage of experimental lint cleanings replicated 5 times, crop of 1966* [1]

Saw-cylinder speed and feed-roller speed (r.p.m.)	Staple length of samples after replicate cleaning—					
	1	2	3	4	5	Average
400 r.p.m.	32nds-inch	32nds-inch	32nds-inch	32nds-inch	32nds-inch	32nds-inch
273.0	35.00	35.00	34.33	34.33	34.00	34.53
136.5	34.67	34.67	34.33	35.00	34.67	34.67
91.0	34.67	34.33	34.67	35.00	34.33	34.60
68.3	34.67	34.67	34.67	34.33	34.67	34.60
600 r.p.m.						
273.0	34.00	35.00	35.00	34.33	34.00	34.47
136.5	34.33	34.67	34.67	34.33	34.33	34.47
91.0	34.67	35.00	34.00	34.33	34.33	34.47
68.3	34.67	34.67	34.33	34.00	34.33	34.40
800 r.p.m.						
273.0	34.33	34.67	34.33	34.33	34.67	34.47
136.5	34.33	35.00	34.33	34.33	34.67	34.53
91.0	34.33	35.00	34.00	34.00	34.00	34.27
68.3	34.33	34.67	34.00	34.00	34.33	34.27
1,100 r.p.m.						
273.0	34.33	35.00	34.00	34.33	34.33	34.40
136.5	34.33	34.33	34.33	34.67	34.00	34.33
91.0	34.67	34.33	34.00	35.00	34.33	34.47
68.3	34.00	34.67	34.00	34.00	34.00	34.13
1,400 r.p.m.						
273.0	34.00	34.33	34.33	35.00	34.00	34.33
136.5	34.33	34.33	34.33	34.00	34.33	34.26
91.0	34.33	34.33	33.67	34.00	34.00	34.07
68.3	34.00	34.33	34.00	34.33	34.00	34.13
Average	34.40	34.65	34.27	34.38	34.27	

[1] Data for each replicate cleaning treatment at each interacting speed setting represent average findings for 3 samples subjected to cotton-classing tests.

TABLE 32.—*Relation of lint-cleaner combing ratio*[1] *to lint foreign-matter content, cleaning efficiency, grade, and staple length; crop of 1966*[2]

Combing ratio	Feed-roller speed	Saw-cylinder speed	Lint foreign-matter content	Lint-cleaner cleaning efficiency	Grade		Staple length
					Index	Designation	
	R.p.m.	*R.p.m.*	*Pct.*	*Pct.*			*1/32-in.*
6.2	273.0	400	2.91	9.6	94.6	SLM	34.53
9.4	273.0	600	2.56	16.3	96.4	SLM+	34.47
12.5	136.5	400	2.72	22.5	96.0	SLM+	34.67
12.5	273.0	800	2.25	30.6	96.2	SLM+	34.47
17.2	273.0	1,100	2.12	29.6	96.7	SLM+	34.40
18.8	91.0	400	2.40	26.8	95.8	SLM+	34.60
18.8	136.5	600	2.29	29.5	96.6	SLM+	34.47
21.9	273.0	1,400	1.89	37.2	99.0	M	34.33
25.0	68.3	400	2.42	25.5	96.0	SLM+	34.60
25.0	136.5	800	2.11	32.8	98.2	SLM+	34.53
28.1	91.0	600	2.28	23.7	98.0	SLM+	34.47
34.4	136.5	1,100	2.02	37.1	98.0	SLM+	34.33
37.5	68.3	600	2.38	27.2	97.2	SLM+	34.40
37.5	91.0	800	2.01	36.4	98.6	M	34.27
43.8	136.5	1,400	1.75	43.7	98.8	M	34.26
50.0	68.3	800	2.11	35.7	97.8	SLM+	34.27
51.6	91.0	1,100	2.04	38.9	98.6	SLM+	34.47
65.6	91.0	1,400	1.93	41.2	98.6	M	34.07
68.7	68.3	1,100	1.87	40.6	98.6	M	34.13
87.4	68.3	1,400	1.95	44.1	98.8	M	34.13

[1] Combing ratio is a ratio of the speed (feet per minute) of the tip of the combing saw and the speed (feet per minute) of the rim of the feed roller.

[2] Data for each combining ratio represents an average of 5 replicate experimental lint cleanings at each interacting speed setting.

TABLE 33.—*Fiber-maturity data for lint processed before experimental lint cleanings, crop of 1966*

Replication and trial No. [1]	Causticaire		Micronaire reading
	Maturity index	Fineness	
	Percent	*Micrograms/ Inch*	
Replication 1			
Trial 1	82	4.8	4.9
Trial 2	82	4.9	5.0
Trial 3	82	4.8	4.8
Replication 2			
Trial 1	82	4.8	5.0
Trial 2	84	4.6	5.0
Trial 3	83	4.9	5.0
Replication 3			
Trial 1	81	4.8	4.8
Trial 2	82	4.6	4.8
Trial 3	82	4.6	4.8
Replication 4			
Trial 1	82	4.5	4.7
Trial 2	80	4.7	4.6
Trial 3	82	4.7	4.8
Replication 5			
Trial 1	81	4.6	4.7
Trial 2	81	4.8	4.8
Trial 3	81	4.5	4.6

[1] The data for the lint used in each trial for each of the replications represent the average findings for 1 sample subjected to 2 fiber-maturity determinations.

TABLE 34.—*Fiber-length data for cotton processed before experimental lint cleanings replicated 5 times, crop of 1966*

Replication and trial No.[1]	Upper quartile length	Mean length	Coefficient of variation	Fibers longer than 1 inch	Fibers ½ to 1 inch	Fibers shorter than ½ inch
Replication 1	*Inches*	*Inches*	*Percent*	*Percent*	*Percent*	*Percent*
Trial 1	1.28	1.08	27	70.9	22.5	6.6
Trial 2	1.26	1.07	28	70.1	23.8	6.1
Trial 3	1.27	1.07	28	70.8	21.3	7.9
Replication 2						
Trial 1	1.26	1.06	28	68.5	24.1	7.4
Trial 2	1.28	1.06	28	68.4	24.2	7.4
Trial 3	1.29	1.07	29	70.7	21.7	7.6
Replication 3						
Trial 1	1.29	1.08	28	70.4	22.2	7.4
Trial 2	1.28	1.06	30	68.3	22.9	8.8
Trial 3	1.29	1.06	30	68.3	23.2	8.5
Replication 4						
Trial 1	1.28	1.06	29	68.4	24.5	7.1
Trial 2	1.29	1.06	30	68.5	22.9	8.6
Trial 3	1.29	1.06	30	69.8	21.3	8.9
Replication 5						
Trial 1	1.29	1.09	27	72.2	21.8	6.0
Trial 2	1.30	1.09	28	71.8	20.8	7.4
Trial 3	1.29	1.05	32	67.4	23.2	9.4

[1] Data for each trial of each replicate cleaning represent average findings for 2 specimens subjected to fiber-array determinations. Each replication consisted of cleaning treatments in which feed-roller speeds of 273 r.p.m., 136.5 r.p.m., 91 r.p.m., and 68.3 r.p.m. were each tested with saw-cylinder speeds of 400 r.p.m., 600 r.p.m., 800 r.p.m., 1,100 r.p.m., and 1,400 r.p.m.

TABLE 35.—*Fiber strength and nep count for cotton processed before experimental lint cleanings replicated 5 times, crop of 1966*

Replication and trial No.	Fiber strength (⅛-inch gauge)[1]	Neps per 100 square inches of web[2]
Replication 1	*Grams/tex*	
Trial 1	22.1	7
Trial 2	21.4	12
Trial 3	22.2	8
Replication 2		
Trial 1	21.6	10
Trial 2	22.4	7
Trial 3	22.5	10
Replication 3		
Trial 1	21.6	11
Trial 2	22.5	13
Trial 3	22.6	13
Replication 4		
Trial 1	22.4	11
Trial 2	22.4	14
Trial 3	22.2	18
Replication 5		
Trial 1	22.0	12
Trial 2	22.1	13
Trial 3	21.7	14

[1] The data for the lint used in each trial for each of the replications represent the average findings from 6 specimens subjected to Pressley-strength tests.

[2] Data for the 3 trials of each replicate cleaning represent nep findings per 100 square inches of web prepared on accessory to the mechanical fiber blender.

TABLE 36.—*Upper quartile length of lint samples after 1 stage of experimental saw-cylinder lint cleanings replicated 5 times, crop of 1966* [1]

Saw-cylinder speed and feed-roller speed (r.p.m.)	Upper quartile length of samples after replicate cleaning—					
	1	2	3	4	5	Average
400 r.p.m.	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*
273.0	1.30	1.26	1.26	1.26	1.27	1.270
136.5	1.28	1.26	1.28	1.27	1.27	1.272
91.0	1.30	1.26	1.25	1.24	1.27	1.264
68.3	1.28	1.25	1.26	1.24	1.26	1.258
600 r.p.m.						
273.0	1.29	1.29	1.31	1.24	1.28	1.282
136.5	1.29	1.27	1.26	1.23	1.28	1.266
91.0	1.27	1.27	1.24	1.27	1.28	1.266
68.3	1.27	1.27	1.24	1.25	1.26	1.258
800 r.p.m.						
273.0	1.28	1.31	1.27	1.27	1.27	1.280
136.5	1.27	1.29	1.28	1.26	1.28	1.276
91.0	1.30	1.27	1.25	1.26	1.27	1.270
68.3	1.28	1.27	1.25	1.25	1.24	1.258
1,100 r.p.m.						
273.0	1.29	1.28	1.27	1.27	1.29	1.280
136.5	1.28	1.28	1.27	1.29	1.26	1.276
91.0	1.28	1.27	1.28	1.26	1.27	1.272
68.3	1.27	1.26	1.26	1.24	1.26	1.258
1,400 r.p.m.						
273.0	1.27	1.26	1.26	1.26	1.26	1.262
136.5	1.26	1.28	1.26	1.26	1.29	1.270
91.0	1.24	1.25	1.24	1.27	1.27	1.254
68.3	1.25	1.25	1.23	1.26	1.26	1.250
Average	1.278	1.270	1.261	1.258	1.270	.....

[1] Data for each replicated cleaning treatment at each interacting speed setting represent average findings for 2 specimens subjected to fiber-array determinations.

TABLE 37.—*Fiber mean length of lint samples after 1 stage of experimental saw-cylinder lint cleanings replicated 5 times, crop of 1966* [1]

Saw-cylinder speed and feed-roller speed (r.p.m.)	Mean length of samples after replicate cleaning—					
	1	2	3	4	5	Average
400 r.p.m.	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*
273.0	1.07	1.02	1.03	1.03	1.03	1.036
136.5	1.05	1.03	1.04	1.01	1.04	1.034
91.0	1.07	1.03	1.01	1.01	1.04	1.032
68.3	1.04	1.01	1.02	1.00	1.02	1.018
600 r.p.m.						
273.0	1.06	1.04	1.05	1.00	1.06	1.042
136.5	1.07	1.04	1.02	.98	1.05	1.032
91.0	1.06	1.05	1.00	1.03	1.05	1.038
68.3	1.03	1.04	.99	1.01	1.02	1.018
800 r.p.m.						
273.0	1.04	1.08	1.04	1.03	1.04	1.046
136.5	1.00	1.06	1.05	1.03	1.05	1.038
91.0	1.06	1.04	1.00	1.03	1.02	1.030
68.3	1.04	1.03	.99	.99	.99	1.008
1,100 r.p.m.						
273.0	1.05	1.04	1.03	1.01	1.05	1.036
136.5	1.03	1.06	1.04	1.07	1.03	1.046
91.0	1.05	1.03	1.02	1.01	1.04	1.030
68.3	1.02	1.02	1.00	.99	1.02	1.010
1,400 r.p.m.						
273.0	1.03	1.03	1.02	1.02	1.04	1.028
136.5	1.00	1.02	1.00	1.01	1.07	1.020
91.0	.98	1.01	.99	1.03	1.05	1.012
68.3	1.00	1.01	.99	1.01	1.03	1.008
Average	1.038	1.035	1.017	1.015	1.037	.....

[1] Data for each replicate cleaning treatment at each interacting speed setting represent average findings for 2 specimens subjected to fiber-array determinations.

TABLE 38.—*Coefficient of fiber-length variation for lint samples after 1 stage of experimental saw-cylinder lint cleanings replicated 5 times, crop of 1966* [1]

Saw-cylinder speed and feed-roller speed (r.p.m.)	Coefficient of variation for samples after replicate cleaning—					
	1	2	3	4	5	Average
400 r.p.m.	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
273.0	29.0	31.0	32.0	32.0	31.0	31.0
136.5	30.0	31.0	32.0	33.0	30.0	31.2
91.0	29.0	30.0	32.0	32.0	30.0	30.6
68.3	31.0	32.0	32.0	33.0	32.0	32.0
600 r.p.m.						
273.0	30.0	32.0	33.0	34.0	30.0	31.8
136.5	29.0	31.0	33.0	35.0	30.0	31.6
91.0	29.0	29.0	34.0	32.0	31.0	31.0
68.3	32.0	30.0	34.0	33.0	30.0	31.8
800 r.p.m.						
273.0	32.0	30.0	30.0	32.0	31.0	31.0
136.5	34.0	30.0	31.0	31.0	30.0	31.2
91.0	32.0	31.0	33.0	32.0	32.0	32.0
68.3	32.0	31.0	33.0	34.0	34.0	32.8
1,100 r.p.m.						
273.0	31.0	31.0	32.0	33.0	32.0	31.8
136.5	32.0	31.0	32.0	28.0	31.0	30.8
91.0	30.0	32.0	33.0	33.0	31.0	31.8
68.3	32.0	31.0	34.0	35.0	32.0	32.8
1,400 r.p.m.						
273.0	31.0	31.0	32.0	32.0	29.0	31.0
316.5	34.0	33.0	33.0	34.0	30.0	32.8
91.0	34.0	32.0	34.0	32.0	30.0	32.4
68.3	33.0	32.0	34.0	34.0	32.0	33.0
Average	31.3	31.1	32.7	32.7	30.9	.....

[1] Data for each replicate cleaning treatment at each interacting speed setting represent average findings for 2 specimens subjected to fiber-array determinations.

TABLE 39.—*Fibers longer than 1 inch in lint samples after 1 stage of experimental saw-cylinder lint cleanings replicated 5 times, crop of 1966* [1]

Saw-cylinder speed and feed-roller speed (r.p.m.)	Fibers longer than 1 inch in samples after replicate cleaning—					
	1	2	3	4	5	Average
400 r.p.m.	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
273.0	70.2	64.1	65.1	65.2	63.8	65.7
136.5	65.0	63.4	66.1	61.1	66.2	64.4
91.0	68.2	64.9	61.3	62.9	66.1	64.7
68.3	63.1	61.7	62.4	58.6	61.2	61.4
600 r.p.m.						
273.0	68.7	65.4	65.8	60.0	68.5	65.7
136.5	70.0	64.1	61.8	57.5	66.5	64.0
91.0	67.9	66.9	59.3	62.3	66.9	64.7
68.3	63.4	67.0	57.4	59.9	60.6	61.7
800 r.p.m.						
273.0	65.1	70.5	65.5	64.2	66.4	66.3
136.5	60.3	66.2	66.8	64.0	67.7	65.0
91.0	67.6	65.0	60.8	64.2	61.8	63.9
68.3	65.0	63.0	58.0	58.4	57.7	60.4
1,100 r.p.m.						
273.0	67.0	64.3	63.8	61.6	65.4	64.4
136.5	63.6	68.7	64.7	67.3	63.0	65.5
91.0	67.0	63.8	61.4	61.1	66.4	63.9
68.3	62.9	62.3	58.5	59.3	63.2	61.2
1,400 r.p.m.						
273.0	64.2	64.0	62.3	68.5	64.9	63.8
136.5	60.1	61.4	59.2	60.9	69.6	62.2
91.0	57.6	61.6	57.4	62.6	66.8	61.2
68.3	59.0	62.0	57.9	60.0	63.4	60.5
Average	64.8	64.5	61.8	61.7	64.8	.....

[1] Data for each replicate cleaning treatment at each interacting speed setting represent average findings for 2 specimens subjected to fiber-array determinations.

TABLE 40.—*Fibers ½ to 1 inch in lint samples after 1 stage of experimental saw-cylinder lint cleanings replicated 5 times, crop of 1966* [1]

Saw-cylinder speed and feed-roller speed (r.p.m.)	Fibers ½ to 1 inch in samples after replicate cleaning—					
	1	2	3	4	5	Average
400 r.p.m.	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
273.0	21.9	26.1	24.7	24.3	27.0	24.8
136.5	26.6	27.3	23.2	27.5	24.9	25.9
91.0	23.5	25.5	28.6	26.5	25.7	26.0
68.3	27.7	27.6	26.7	30.8	29.5	28.5
600 r.p.m.						
273.0	23.2	25.0	23.8	28.3	23.1	24.7
136.5	22.3	26.5	27.3	29.7	26.0	26.4
91.0	24.0	25.8	29.3	27.9	24.5	26.3
68.3	26.6	24.3	31.0	29.5	31.3	28.5
800 r.p.m.						
273.0	25.2	21.3	25.3	25.8	24.4	24.4
136.5	27.6	26.4	24.2	27.0	23.3	25.7
91.0	22.4	25.4	27.6	25.9	28.2	25.9
68.3	24.6	27.5	31.0	29.9	30.5	28.7
1,100 r.p.m.						
273.0	23.9	25.3	26.0	27.4	24.5	25.4
136.5	26.5	22.2	25.2	25.9	28.1	25.6
91.0	24.0	26.0	28.2	27.8	24.0	26.0
68.3	26.8	28.1	29.7	28.1	26.0	27.7
1,400 r.p.m.						
273.0	26.7	25.8	27.6	26.3	27.6	26.8
136.5	28.3	27.6	29.7	27.2	22.3	27.0
91.0	29.0	28.3	31.0	27.7	24.7	28.1
68.3	29.5	27.1	30.2	29.0	27.3	28.6
Average	25.5	26.0	27.5	27.6	26.2	.....

[1] Data for each replicate cleaning treatment at each interacting speed setting represent average findings for 2 specimens subjected to fiber-array determinations.

TABLE 41.—*Fibers shorter than ½ inch in lint samples after 1 stage of experimental saw-cylinder lint cleanings replicated 5 times, crop of 1966* [1]

Saw-cylinder speed and feed-roller speed (r.p.m.)	Fibers shorter than ½ inch in samples after replicate cleaning—					
	1	2	3	4	5	Average
400 r.p.m.	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
273.0	7.9	9.8	10.2	10.5	9.2	9.5
136.5	8.4	9.3	10.7	11.4	8.9	9.7
91.0	8.3	9.6	10.1	10.6	8.2	9.4
68.3	9.2	10.7	10.9	10.6	9.3	10.1
600 r.p.m.						
273.0	8.1	9.6	10.4	11.7	8.4	9.6
136.5	7.7	9.4	10.9	12.8	7.5	9.7
91.0	8.1	7.3	11.4	9.8	8.6	9.0
68.3	10.0	8.7	11.6	10.6	8.1	9.8
800 r.p.m.						
273.0	9.7	8.2	9.2	10.0	9.2	9.3
136.5	12.1	7.4	9.0	9.0	9.0	9.3
91.0	10.0	9.6	11.6	9.9	10.0	10.2
68.3	10.4	9.5	11.0	11.7	11.8	10.9
1,100 r.p.m.						
273.0	9.1	10.4	10.2	11.0	10.1	10.2
136.5	9.9	9.2	10.1	6.8	8.9	9.0
91.0	9.0	10.2	10.4	11.1	9.6	10.1
68.3	10.3	9.6	11.8	12.6	10.8	11.0
1,400 r.p.m.						
273.0	9.1	10.2	10.1	10.2	7.5	9.4
136.5	11.6	11.0	11.1	11.9	8.1	10.7
91.0	13.4	10.1	11.6	9.7	8.5	10.7
68.3	11.5	10.9	11.9	11.0	9.3	10.9
Average	9.7	9.5	10.7	10.6	9.0	.....

[1] Data for each replicate cleaning treatment at each interacting speed setting represent average findings for 2 specimens subjected to fiber-array determinations.

TABLE 42.—*Relation of lint-cleaner combing ratio* [1] *to fiber-length distribution, crop of 1966* [2]

Combing ratio	Feed-roller speed	Saw-cylinder speed	Upper quartile length	Mean length	Coefficient of variation	Fibers longer than 1 inch	Fibers ½ to 1 inch	Fibers shorter than ½ inch
	R.p.m.	*R.p.m.*	*In.*	*In.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*
6.2	273.0	400	1.270	1.036	31.0	65.68	24.80	9.52
9.4	273.0	600	1.282	1.042	31.8	65.68	24.68	9.64
12.5	136.5	400	1.272	1.034	31.2	64.36	25.90	9.74
12.5	273.0	800	1.280	1.046	31.0	66.34	24.40	9.26
17.2	273.0	1,100	1.280	1.036	31.8	64.42	25.42	10.16
18.8	91.0	400	1.264	1.032	30.6	64.68	25.96	9.36
18.8	136.5	600	1.266	1.032	31.6	63.98	26.36	9.66
21.9	273.0	1,400	1.262	1.028	31.0	63.78	26.80	9.42
25.0	68.3	400	1.258	1.018	32.0	61.40	28.46	10.14
25.0	136.5	800	1.276	1.038	31.2	65.00	25.70	9.30
28.1	91.0	600	1.266	1.038	31.0	64.66	26.30	9.04
34.4	136.5	1,100	1.276	1.046	30.8	65.46	25.58	8.98
37.5	68.3	600	1.258	1.018	31.8	61.66	28.54	9.80
37.5	91.0	800	1.270	1.030	32.0	63.88	25.90	10.22
43.8	136.5	1,400	1.270	1.020	32.8	62.24	27.02	10.74
50.0	68.3	800	1.258	1.008	32.8	60.42	28.70	10.88
51.6	91.0	1,100	1.272	1.030	31.8	63.94	26.00	10.06
65.6	91.0	1,400	1.254	1.008	32.4	61.20	28.14	10.66
68.7	68.3	1,100	1.258	1.010	32.8	61.24	27.74	11.02
87.4	68.3	1,400	1.250	1.008	33.0	60.46	28.62	10.92

[1] Combing ratio is a ratio of the speed (feet per minute) of the tip of the combing saw and the speed (feet per minute) of the rim of the feed roller.

[2] Data for each combing ratio represent an average of 5 replicate experimental lint cleanings at each interacting speed setting.

TABLE 43.—*Fiber strength (⅛-inch gauge) of lint samples after 1 stage of experimental saw-cylinder lint cleanings replicated 5 times, crop of 1966* [1]

Saw-cylinder speed and feed-roller speed (r.p.m.)	Fiber strength of samples after replicate cleaning—					
	1	2	3	4	5	Average
400 r.p.m.	*Grams/tex*	*Grams/tex*	*Grams/tex*	*Grams/tex*	*Grams/tex*	*Grams/tex*
273.0	22.9	21.7	21.4	22.2	22.4	22.1
136.5	23.1	22.6	22.7	21.5	22.3	22.4
91.0	22.2	22.4	22.2	23.0	21.8	22.3
68.3	22.7	22.7	22.4	22.1	23.1	22.6
600 r.p.m.						
273.0	23.0	22.0	22.2	22.5	22.6	22.5
136.5	22.8	22.6	22.2	21.7	23.1	22.5
91.0	22.6	22.6	20.9	22.2	22.8	22.2
68.3	23.1	22.8	21.7	21.8	23.1	22.5
800 r.p.m.						
273.0	22.4	23.1	22.4	21.4	21.8	22.2
136.5	22.4	22.9	22.9	22.1	22.4	22.5
91.0	22.8	23.6	21.7	21.5	22.9	22.5
68.3	21.8	22.8	22.7	21.8	22.4	22.3
1,100 r.p.m.						
273.0	22.6	24.2	23.5	22.8	22.4	23.1
136.5	22.2	22.4	23.2	23.8	22.4	22.8
91.0	22.6	22.5	23.1	22.6	22.0	22.6
68.3	23.9	22.7	23.1	22.4	22.5	22.9
1,400 r.p.m.						
273.0	22.0	22.7	22.4	22.4	22.8	22.5
136.5	22.0	22.3	21.8	20.7	23.1	22.0
91.0	21.9	22.6	21.8	22.5	22.3	22.2
68.3	22.0	22.6	22.6	23.3	22.6	22.6
Average	22.6	22.7	22.4	22.2	22.5	

[1] Data for each replicate cleaning treatment at each interacting speed setting represent average findings for 6 specimens subjected to Pressley-strength tests.

TABLE 44.—*Nep count for lint samples after 1 stage of experimental saw-cylinder lint cleanings replicated 5 times, crop of 1966* [1]

Saw-cylinder speed and feed-roller speed (r.p.m.)	Nep count for samples after replicate cleaning—					
	1	2	3	4	5	Average
400 r.p.m.						
273.0	12.0	13.0	15.0	16.0	17.0	14.6
136.5	12.0	18.0	21.0	16.0	14.0	16.2
91.0	12.0	14.0	17.0	21.0	13.0	15.4
68.3	9.0	14.0	20.0	24.0	13.0	16.0
600 r.p.m.						
273.0	14.0	12.0	19.0	19.0	14.0	15.6
136.5	9.0	13.0	23.0	17.0	16.0	15.6
91.0	9.0	13.0	19.0	18.0	17.0	15.2
68.3	11.0	17.0	21.0	17.0	18.0	16.8
800 r.p.m.						
273.0	13.0	17.0	14.0	13.0	22.0	15.8
136.5	14.0	14.0	15.0	19.0	21.0	16.6
91.0	13.0	15.0	18.0	14.0	18.0	15.6
68.3	13.0	15.0	22.0	25.0	14.0	17.8
1,100 r.p.m.						
273.0	13.0	21.0	19.0	21.0	16.0	18.0
136.5	13.0	14.0	20.0	22.0	19.0	17.6
91.0	14.0	19.0	20.0	23.0	21.0	19.4
68.3	14.0	17.0	24.0	22.0	20.0	19.4
1,400 r.p.m.						
273.0	18.0	19.0	21.0	24.0	13.0	19.0
136.5	22.0	24.0	26.0	27.0	19.0	23.6
91.0	23.0	13.0	28.0	25.0	19.0	21.6
68.3	18.0	25.0	27.0	33.0	16.0	23.8
Average	13.8	16.4	20.4	20.8	17.0	.....

[1] Data for each replicate cleaning treatment at each interacting speed setting represent neps counted in 100 square inches of web prepared on accessory to the mechanical fiber blender.

TABLE 45.—*Relation of lint-cleaner combing ratio [1] to fiber strength (⅛-inch gauge) and nep count, crop of 1966 [2]*

Combing ratio	Feed-roller speed	Saw-cylinder speed	Fiber strength	Nep Count [3]
	R.p.m.	*R.p.m.*	*Grams/tex*	
6.2	273. 0	400	22. 1	14. 6
9.4	273. 0	600	22. 5	15. 6
12.5	136. 5	400	22. 4	16. 2
12.5	273. 0	800	22. 2	15. 8
17.2	273. 0	1, 100	23. 1	18. 0
18.8	91. 0	400	22. 3	15. 4
18.8	136. 5	600	22. 5	15. 6
21.9	273. 0	1, 400	22. 5	19. 0
25.0	68. 3	400	22. 6	16. 0
25.0	136. 5	800	22. 5	16. 6
28.1	91. 0	600	22. 2	15. 2
34.4	136. 5	1, 100	22. 8	17. 6
37.5	68. 3	600	22. 5	16. 8
37.5	91. 0	800	22. 5	15. 6
43.8	136. 5	1, 400	22. 0	23. 6
50.0	68. 3	800	22. 3	17. 8
51.6	91. 0	1, 100	22. 6	19. 4
65.6	91. 0	1, 400	22. 2	21. 6
68.7	68. 3	1, 100	22. 9	19. 4
87.5	68. 3	1, 400	22. 6	23. 8

[1] Combing ratio is a ratio of the speed (feet per minute) of the tip of the combing saw and the speed (feet per minute) of the rim of the feed roller.

[2] Data for each combing ratio represent an average of 5 replicate experimental lint cleanings at each interacting speed setting.

[3] Per 100 square inches of web.

TABLE 46.—*Results from analyses of variance for differences among fiber properties of lint samples after experimental lint cleaner treatments,*[1] *crop of 1966*

Item	*F* values and significance [2] [3]			
	Replications	Saw-cylinder speed	Feed-roller speed	Interactions [4]
Fiber-moisture content	40. 30**	1. 95	0. 10	0. 50
Lint foreign-matter content	28. 14**	29. 15**	4. 24**	1. 19
Grade index	41. 52**	15. 23**	3. 17*	. 69
Staple length	6. 20**	5. 57**	1. 39	. 51
Upper quartile length	6. 74**	2. 79*	8. 95**	. 42
Mean length	7. 37**	[5] 2. 23	8. 86**	. 34
Coefficient of length variation	10. 49**	[5] 2. 16	4. 49**	1. 10
Fibers longer than 1 inch	7. 98**	[5] 2. 47	11. 92**	. 44
Fibers from ½ to 1 inch	5. 13**	[5] 2. 17	12. 65**	. 36
Fibers shorter than ½ inch	8. 63**	1. 98	3. 82*	1. 10
Fiber strength	[5] 2. 18	2. 83*	. 66	. 66
Neps per 100 square inches of web	18. 20**	15. 26**	2. 14	. 50

[1] For lint-cleaning treatments, feed-roller speeds of 273 r.p.m., 136.5 r.p.m., 91 r.p.m., and 68.3 r.p.m. were each tested with saw-cylinder speeds of 400 r.p.m., 600 r.p.m., 800 r.p.m., 1,100 r.p.m., and 1,400 r.p.m. Each interacting speed-setting treatment was replicated 5 times.

[2] Values required for *F* to attain significance at 5- and 1-percent levels are: replications, 2.51 and 3.60; saw-cylinder speed, 2.51 and 3.60; feed-roller speed, 2.74 and 4.08; and interactions, 1.90 and 2.46.

[3] **=significant at 1-percent level; *=significant at 5-percent level. Other figures are not significant except as indicated.

[4] Interaction relates to saw-cylinder speed and feed-roller speed.

[5] Although not significant at the 5-percent level, these *F* values are significant at the 10-percent level.

TABLE 47.—*Significant differences for fiber properties of lint samples after lint cleaning with 5 experimental saw-cylinder speeds,* [1] *crop of 1966*

Fiber property and significance level	Saw-cylinder speed of—				
	400 r.p.m.	600 r.p.m.	800 r.p.m.	1,100 r.p.m.	1,400 r.p.m.
Foreign-matter content (percent):					
1 percent	2.61 a	2.38 a	2.12 c	2.01 c	1.88 c
5 percent	2.61 a	2.38 b	2.12 c	2.01 cd	1.88 d
Grade index:					
1 percent	95.6 a	97.1 ab	97.7 bc	98.2 bc	98.8 c
5 percent	95.6 a	97.1 b	97.7 bc	98.2 bc	98.8 c
Staple length (1/32)-inch):					
1 percent	34.60 a	34.45 ab	34.39 ab	34.33 ab	34.20 b
5 percent	34.60 a	34.45 ab	34.39 abc	34.33 bc	34.20 c
Upper quartile length (inches):					
5 percent	1.03 ab	1.033ab	1.031ab	1.031a	1.017 b
Fiber strength (grams per tex):					
5 percent	22.4 ab	22.4 ab	22.4 ab	22.8 a	22.3 b
Nep count: [2]					
1 percent	15.6 a	15.8 a	16.5 a	18.6 a	22.0 b
5 percent	15.6 a	15.8 a	16.5 ab	18.6 b	22.0 c

[1] Numbers in the same row followed by the same letter are not significantly different at the level indicated.

[2] Neps per 100 square inches of web.

TABLE 48.—*Significant differences for fiber properties of lint samples after lint cleaning with 4 experimental feed-roller speeds* [1], *crop of 1966*

Fiber property and significance level	Feed-roller speed of—			
	273.0 r.p.m.	136.5 r.p.m.	91.0 r.p.m.	68.3 r.p.m.
Foreign-matter content (percent):				
1 percent	2.35 a	2.18 ab	2.13 b	2.15 ab
5 percent	2.35 a	2.18 ab	2.13 b	2.15 b
Grade index:				
5 percent	96.8 a	97.5 ab	97.9 b	97.7 ab
Upper quartile length (inches):				
1 percent	1.275a	1.272a	1.265ab	1.256 b
5 percent	1.275a	1.272a	1.265ab	1.256 b
Mean length (inches):				
1 percent	1.038a	1.034a	1.028ab	1.012 b
5 percent	1.038a	1.034a	1.028a	1.012 b
Coefficient of length variation (percent):				
1 percent	31.3 a	31.5 ab	31.6 ab	32.5 b
5 percent	31.3 a	31.5 a	31.6 a	32.5 b
Fibers longer than 1 inch (percent):				
1 percent	65.2 a	64.2 a	63.7 a	61.0 b
5 percent	65.2 a	64.2 a	63.7 a	61.0 b
Fibers from ½ to 1 inch (percent):				
1 percent	25.2 a	26.1 a	26.5 a	28.4 b
5 percent	25.2 a	26.1 a	26.5 a	28.4 b
Fibers shorter than ½ inch (percent):				
5 percent	9.6 a	9.7 a	9.9 ab	10.6 b

[1] Numbers in the same row followed by the same letter are not significantly different at the level indicated.

TABLE 49.—*Moisture and foreign-matter contents of wagon seed-cotton samples processed for cleaning with 5 experimental saw-cylinder speeds, crop of 1967* [1]

Lint cleaner saw-cylinder speed and replication No.	Moisture content	Foreign-matter content
460 r.p.m.	*Percent*	*Percent*
1	10.9	5.1
2	6.3	4.6
3	8.1	4.5
4	8.6	4.0
5	8.9	5.3
All replications	8.6	4.7
600 r.p.m.		
1	9.4	4.9
2	7.2	4.2
3	8.3	6.5
4	9.1	3.9
5	9.1	4.7
All replications	8.6	4.8
800 r.p.m.		
1	9.5	6.0
2	8.0	5.7
3	6.6	4.7
4	9.3	4.3
5	8.3	5.1
All replications	8.3	5.2
1,100 r.p.m.		
1	6.6	5.8
2	7.3	3.7
3	7.0	4.3
4	8.5	8.3
5	8.7	5.2
All replications	7.6	5.5
1,400 r.p.m.		
1	7.1	5.6
2	7.5	4.3
3	8.7	4.0
4	8.3	4.2
5	9.9	4.6
All replications	8.3	4.5
Average	8.3	4.9

[1] Data for each saw-cylinder speed used in each replication represent average findings for 3 samples. Moisture contents were determined by the oven method and foreign-matter contents were determined by the fractionation procedure.

TABLE 50.—*Moisture content and germination level of cottonseed samples tested before experimental cleaning with 5 saw-cylinder speeds, crop of 1967*

Lint cleaner saw-cylinder speed and replication No.	Seed moisture content [1]	Seed germination level [2]
460 r.p.m.	*Percent*	*Percent*
1	8.7	89.0
2	9.6	88.0
3	9.5	90.0
4	9.2	91.5
5	9.2	85.0
All replications	9.2	88.7
600 r.p.m.		
1	8.7	86.5
2	9.0	84.5
3	9.5	87.0
4	9.0	87.5
5	9.0	80.5
All replications	9.0	85.2
800 r.p.m.		
1	8.9	85.0
2	9.5	84.0
3	9.7	86.0
4	8.8	90.0
5	9.2	87.5
All replications	9.2	86.5
1,100 r.p.m.		
1	8.5	88.5
2	9.1	79.0
3	9.9	86.5
4	9.6	82.0
5	9.2	92.0
All replications	9.3	85.6
1,400 r.p.m.		
1	8.9	82.0
2	9.2	84.0
3	9.6	85.0
4	8.8	88.5
5	8.8	90.0
All replications	9.1	85.9
Average	9.2	86.4

[1] Data for each saw-cylinder speed used in each replication represent findings for 1 sample subjected to oven moisture-determination tests.

[2] Data for each saw-cylinder speed used in each replication represent average findings for 4 runs of 50 seeds each.

TABLE 51.—*Moisture content after ginning and before lint cleaning, and foreign-matter content of lint samples processed for cleaning with 5 experimental saw-cylinder speeds, crop of 1967* [1]

Lint cleaner saw-cylinder speed and replication No.	Moisture content [2]	Foreign matter content [3]	
		Before lint cleaning	After lint cleaning
	Percent	*Percent*	*Percent*
460 r.p.m.			
1	8.1	3.19	3.81
2	8.2	3.21	4.05
3	8.1	3.10	2.34
4	8.1	3.50	2.82
5	8.2	3.28	2.91
All replications	8.1	3.26	3.19
600 r.p.m.			
1	7.7	2.94	3.45
2	8.0	3.30	3.34
3	7.9	3.32	2.33
4	7.8	3.12	2.72
5	7.9	2.88	2.89
All replications	7.9	3.11	2.95
800 r.p.m.			
1	8.2	3.66	3.54
2	8.1	3.52	3.66
3	8.1	3.30	3.55
4	7.9	3.28	2.54
5	8.1	2.61	2.33
All replications	8.1	3.27	3.12
1,100 r.p.m.			
1	7.9	3.12	3.11
2	8.0	3.43	2.85
3	7.9	3.06	2.33
4	8.0	3.21	2.15
5	8.1	2.92	2.59
All replications	8.0	3.15	2.61
1,400 r.p.m.			
1	8.1	3.21	3.07
2	8.1	3.10	3.63
3	8.1	2.85	1.88
4	8.1	2.52	1.89
5	8.3	2.97	2.31
All replications	8.1	2.93	2.56
Average	8.0	3.14	.....

[1] Ambient conditions during the study were 65.9° F. at 87.2 relative humidity.

[2] Data for each saw-cylinder speed used in each replication represent average findings for 3 samples (taken between gin stand and lint cleaner) subjected to oven moisture-determination tests.

[3] Foreign-matter contents were determined by subjecting samples to analyses with the Shirley Analyzer method. Data for each saw-cylinder speed used in each replication represent average findings from (A), 1 sample for cotton before lint cleaning and (B), 3 samples for cotton after lint cleaning.

TABLE 52.—*Staple length of lint samples before and after 1 stage of experimental saw-cylinder lint cleanings, crop of 1967* [1]

Lint cleaner saw-cylinder speed and replication No.	Staple length	
	Before lint cleaning	After 1 stage of cleaning
460 r.p.m.	*1/32-inch*	*1/32-inch*
1	35. 0	35. 67
2	35. 0	35. 67
3	36. 0	36. 00
4	35. 0	35. 33
5	36. 0	36. 00
All replications	35. 4	35. 73
600 r.p.m.		
1	35. 0	35. 67
2	35. 0	36. 00
3	36. 0	35. 67
4	36. 0	35. 67
5	36. 0	35. 33
All replications	35. 6	35. 67
800 r.p.m.		
1	36. 0	35. 67
2	36. 0	35. 67
3	36. 0	36. 00
4	35. 0	35. 33
5	36. 0	36. 00
All replications	35. 8	35. 73
1,100 r.p.m.		
1	35. 0	36. 00
2	36. 0	36. 00
3	36. 0	35. 67
4	36. 0	35. 67
5	36. 0	36. 00
All replications	35. 8	35. 87
1,400 r.p.m.		
1	35. 0	36. 00
2	36. 0	36. 00
3	35. 0	35. 33
4	35. 0	35. 00
5	35. 0	35. 33
All replications	35. 2	35. 53

[1] Data for each saw-cylinder speed used in each replication represent average findings for (A), 1 sample from cotton before cleaning and (B), 3 samples from cotton after cleaning. All samples before and after lint cleaning were classified with a grade index of 94, and designated SLM. See footnote of appendix table 27 for grade index and grade designation relation.

TABLE 53.—*Fiber maturity data for ginned lint processed for experimental saw-cylinder lint cleanings replicated 5 times, crop of 1967* [1]

Replicate lint cleaning No.	Causticaire		Micronaire reading
	Maturity index	Fineness	
	Percent	*Micrograms/inch*	
1	80	4.9	4.7
2	79	4.6	4.6
3	78	4.6	4.4
4	79	4.9	4.6
5	79	4.9	4.6
Average	79	4.8	4.6

[1] For each replicate lint cleaning, saw-cylinder speeds of 460 r.p.m., 600 r.p.m., 800 r.p.m., 1,100 r.p.m., and 1,400 r.p.m. were used. Data for each replication represent average findings for 1 sample subjected to 2 fiber-maturity determinations.

TABLE 54.—*Fiber length,*[1] *fiber strength,*[2] *and nep count*[3] *data for cotton samples processed before experimental saw-cylinder lint cleanings, crop of 1967*

Item	Experimental data for samples processed for replication [4]—					
	1	2	3	4	5	Average
Upper quartile length.....inches..	1.29	1.31	1.28	1.24	1.31	1.29
Mean length.....inches..	1.12	1.12	1.06	1.03	1.12	1.09
Coefficient of variation.....percent..	24.0	25.0	28.0	30.0	24.0	26.2
Fibers longer than 1 inch.....percent..	76.9	77.5	69.7	66.2	78.6	73.8
Fibers ½ to 1 inch.....percent..	17.9	16.6	21.8	24.3	15.9	19.3
Fibers shorter than ½ inch.....percent..	4.8	5.3	8.2	8.9	5.0	6.4
Fiber strength (⅛ inch gauge) grams per tex..	22.1	22.8	22.2	21.8	21.5	22.1
Neps per 100 square inches of web.....	7.0	12.0	12.0	11.0	11.0	10.6

[1] Data for each replication represent average findings for 2 specimens subjected to fiber-array determinations.

[2] Fiber strength data for each replication represent average findings for 6 specimens subjected to Pressley-strength tests.

[3] Neps counted in 100 square inches of web prepared on accessory to the mechanical fiber blender.

[4] For each replicate lint cleaning, saw speeds of 460 r.p.m., 600 r.p.m., 800 r.p.m., 1,100 r.p.m., and 1,400 r.p.m. were used.

TABLE 55.—*Upper quartile length, mean length, and coefficient of variation of lint samples after 1 stage of experimental saw-cylinder lint cleanings, crop of 1967* [1]

Lint cleaner saw-cylinder speed and replication No.	Upper quartile length	Mean length	Coefficient of variation
460 r.p.m.	*Inches*	*Inches*	*Percent*
1	1. 28	1. 06	29. 0
2	1. 29	1. 06	29. 0
3	1. 26	1. 05	29. 0
4	1. 27	1. 03	31. 0
5	1. 28	1. 05	28. 0
All replications	1. 276	1. 050	29. 2
600 r.p.m.			
1	1. 25	1. 03	29. 0
2	1. 28	1. 03	30. 0
3	1. 28	1. 07	29. 0
4	1. 28	1. 07	28. 0
5	1. 27	1. 06	29. 0
All replications	1. 272	1. 052	29. 0
800 r.p.m.			
1	1. 28	1. 04	31. 0
2	1. 30	1. 08	29. 0
3	1. 29	1. 06	29. 0
4	1. 29	1. 06	29. 0
5	1. 28	1. 05	30. 0
All replications	1. 288	1. 058	29. 6
1,100 r.p.m.			
1	1. 27	1. 05	29. 0
2	1. 28	1. 04	31. 0
3	1. 29	1. 08	28. 0
4	1. 28	1. 06	29. 0
5	1. 28	1. 07	28. 0
All replications	1. 280	1. 060	29. 0
1,400 r.p.m.			
1	1. 26	1. 05	29. 0
2	1. 29	1. 07	28. 0
3	1. 27	1. 06	28. 0
4	1. 27	1. 05	29. 0
5	1. 27	1. 06	29. 0
All replications	1. 272	1. 058	28. 6

[1] Data for each saw-cylinder speed used in each replication represent average findings for 2 specimens subjected to fiber-array determinations.

TABLE 56.—*Percentage of fibers longer than 1 inch, ½ to 1 inch, and shorter than ½ inch for lint samples after 1 stage of experimental saw-cylinder lint cleanings, crop of 1967* [1]

Lint cleaner saw-cylinder speed and replication No.	Fibers longer than 1 inch	Fibers ½ to 1 inch	Fibers shorter than ½ inch
	Percent	*Percent*	*Percent*
460 r.p.m.			
1	68. 2	23. 8	7. 3
2	68. 8	21. 8	8. 6
3	66. 7	24. 3	8. 4
4	63. 5	26. 8	9 0
5	66. 7	26. 2	6. 6
All replications	66. 8	24. 6	8. 0
600 r.p.m.			
1	64. 6	26. 4	8. 5
2	64. 5	25. 4	9. 4
3	69. 1	23. 1	7. 1
4	72. 1	20. 2	7. 1
5	67. 0	24. 5	7. 9
All replications	67. 5	23. 9	8. 0
800 r.p.m.			
1	65. 6	24. 4	9. 4
2	70. 7	20. 9	7. 7
3	69. 0	22. 3	8. 2
4	68. 2	23. 0	8. 3
5	67. 7	23. 2	8. 7
All replications	68. 2	22. 8	8. 5
1,100 r.p.m.			
1	67. 3	23. 4	8. 6
2	65. 9	24. 8	8. 7
3	73. 2	18. 9	7. 3
4	67. 5	24. 0	7. 8
5	70. 5	21. 6	7. 2
All replications	68. 9	22. 5	7. 9
1, 400 r.p.m.			
1	67. 3	23. 5	8. 6
2	68. 1	23. 8	7. 6
3	68. 4	23. 3	7. 7
4	67. 0	24. 0	8. 4
5	69. 5	22. 0	7. 9
All replications	68. 1	23. 3	8. 0

[1] Data for each saw-cylinder speed used in each replication represent average findings for 2 specimens subjected to fiber-array determinations.

TABLE 57.—*Upper quartile length, mean length, and coefficient of variation for lint cleaner waste material from 1 stage of experimental saw-cylinder lint cleanings, crop of 1967* [1]

Lint cleaner saw-cylinder speed and replication No.	Upper quartile length	Mean length	Coefficient of variation
460 r.p.m.	*Inches*	*Inches*	*Percent*
1	1.25	0.98	35
2	1.17	.78	54
3	1.18	.82	49
4	1.28	1.03	34
5	1.13	.77	52
All replications	1.20	.88	45
600 r.p.m.			
1	1.21	.92	41
2	1.30	1.05	33
3	1.26	1.02	34
4	1.19	.84	49
5	1.16	.81	50
All replications	1.22	.93	41
800 r.p.m.			
1	1.22	.95	37
2	1.21	.86	49
3	1.20	.87	46
4	1.21	.90	42
5	1.17	.85	46
All replications	1.20	.89	44
1,100 r.p.m.			
1	1.23	.99	34
2	1.25	.98	35
3	1.19	.87	45
4	1.20	.89	43
5	1.20	.92	39
All replications	1.21	.93	39
1,400 r.p.m.			
1	1.22	.91	41
2	1.22	.92	41
3	1.26	1.03	31
4	1.30	1.06	31
5	1.19	.86	45
All replications	1.24	.96	38

[1] Data for each saw-cylinder speed used in each replication represent average findings for 2 specimens subjected to fiber-array determinations.

TABLE 58.—*Percentage of fibers longer than 1 inch, ½ to 1 inch, and shorter than ½ inch for lint cleaner waste material from 1 stage of experimental saw-cylinder lint cleanings, crop of 1967* [1]

Lint cleaner saw-cylinder speed and replication No.	Fibers longer than 1 inch	Fibers ½ to 1 inch	Fibers shorter than ½ inch
460 r.p.m.	*Percent*	*Percent*	*Percent*
1	59. 7	26. 7	13. 0
2	39. 8	26. 4	33. 3
3	41. 9	29. 7	27. 9
4	65. 5	21. 8	12. 0
5	37. 5	29. 1	32. 9
All replications	48. 9	26. 7	23. 8
600 r.p.m.			
1	52. 0	28. 4	19. 0
2	67. 3	21. 9	10. 3
3	65. 4	21. 6	12. 4
4	45. 8	27. 3	26. 5
5	42. 3	28. 1	29. 0
All replications	54. 6	25. 5	19. 4
800 r.p.m.			
1	56. 9	26. 4	16. 2
2	47. 6	24. 5	27. 2
3	48. 0	27. 4	23. 9
4	49. 5	30. 4	19. 6
5	45. 5	28. 9	24. 9
All replications	49. 5	27. 5	22. 4
1,100 r.p.m.			
1	61. 6	24. 8	13. 1
2	58. 6	27. 0	13. 7
3	48. 2	27. 7	23. 6
4	51. 6	25. 7	22. 2
5	50. 7	31. 6	17. 1
All replications	54. 1	27. 4	17. 9
1,400 r.p.m.			
1	51. 7	28. 1	19. 6
2	53. 6	27. 4	18. 3
3	66. 9	22. 0	10. 5
4	71. 1	18. 2	10. 0
5	45. 8	30. 0	23. 7
All replications	57. 8	25. 1	16. 4

[1] Data for each saw-cylinder speed used in each replication represent average findings for 2 specimens subjected to fiber-array determinations.

TABLE 59.—*Fiber strength (⅛-inch gauge) and nep count for lint samples after 1 stage of experimental saw-cylinder lint cleanings, crop of 1967*

Lint cleaner saw-cylinder speed and replication No.	Fiber strength [1]	Nep count [2]
	Grams per tex	
460 r.p.m.		
1	22.6	11.0
2	21.8	16.0
3	21.5	11.0
4	22.6	15.0
5	21.7	16.0
All replications	22.0	13.8
600 r.p.m.		
1	22.0	12.0
2	21.7	13.0
3	21.2	12.0
4	21.6	16.0
5	21.4	16.0
All replications	21.6	13.8
800 r.p.m.		
1	22.0	14.0
2	21.2	16.0
3	22.2	14.0
4	22.1	16.0
5	21.8	13.0
All replications	21.9	14.6
1,100 r.p.m.		
1	22.2	12.0
2	21.6	19.0
3	21.6	15.0
4	22.4	17.0
5	22.1	16.0
All replications	22.0	15.8
1,400 r.p.m.		
1	22.1	17.0
2	20.8	17.0
3	21.4	14.0
4	22.5	12.0
5	21.4	17.0
All replications	21.6	15.4

[1] Fiber strength for each saw-cylinder speed used in each replication represent average findings for 6 specimens subjected to Pressley-strength tests.

[2] Data for each saw-cylinder speed used in each replication represent neps in 100 square inches of web prepared on accessory to the fiber blender.

TABLE 60.—*Results from analyses of variance for differences among cotton-fiber properties after experimental lint cleaner saw-speed treatments,* [1] *crop of 1967*

Item	*F* values and significance [2] [3]	
	Replication	Saw speed
Lint-moisture content	[4] 2.62	11.08**
Lint foreign-matter content	10.89**	3.35*
Grade index	0	0
Staple length	2.31	1.05
Upper quartile length	3.55*	3.13*
Mean length	1.16	.45
Coefficient of length variation	.73	.73
Fibers longer than 1 inch	.85	.56
Fibers form ½ to 1 inch	.62	.93
Fibers shorter than ½ inch	1.18	.40
Fiber strength	6.48**	1.98
Nep count per 100 square inches of web	[4] 2.61	1.11

[1] For lint cleaning treatments, saw speeds of 460 r.p.m., 600 r.p.m., 800 r.p.m., 1,100 r.p.m., and 1,400 r.p.m. were used. Treatments at each saw speed were replicated 5 times.

[2] Values required for *F* to attain significance at 5- and 1-percent levels, respectively, are: replication, 3.01 and 4.77; and saw speed, 3.01 and 4.77.

[3] **=significant at 1-percent level; *=significant at 5-percent level. Other figures are not significant except as indicated.

[4] Although not significant at the 5-percent level, these *F* values are significant at the 10-percent level.

TABLE 61.—*Results from analyses of variance for differences among fiber properties of lint cleaner waste material as a result of experimental lint cleaner saw-speed treatments, crop of 1967*

Item	*F* values and significance [1]	
	Replication	Saw speed
Upper quartile length	2.27	0.76
Mean length	1.32	.79
Coefficient of length variation	1.15	.96
Fibers longer than 1 inch	1.52	.85
Fibers from ½ to 1 inch	1.35	.61
Fibers shorter than ½ inch	1.25	.95

[1] Values required for *F* to attain significance at 5- and 1-percent levels, respectively, are: replication, 3.01 and 4.77; and saw speed, 3.01 and 4.77. None of the figures are significant.

END