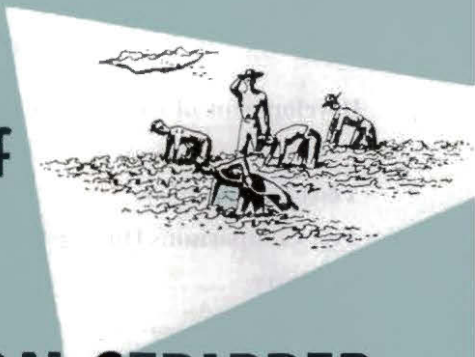
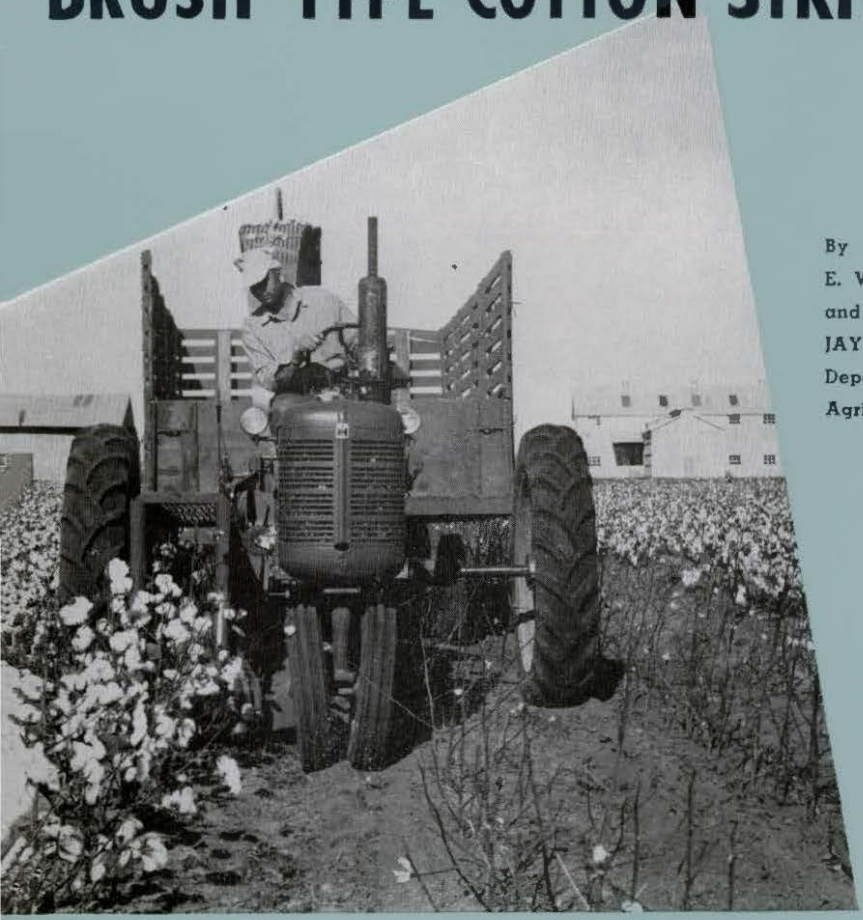


The Development of The Oklahoma BRUSH-TYPE COTTON STRIPPER



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Bulletin No. B-422 April, 1954

CONTENTS

THE RESEARCH on which this report is based is in cooperation with state agricultural experiment stations in other cotton-growing states, and with the Agricultural Engineering Research Branch of the U. S. Department of Agriculture, as part of a regional research project on cotton mechanization.

The Development Of The

Oklahoma Brush-type Cotton Stripper

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Investigations to develop improved methods and mechanisms for mechanical harvesting of cotton were started at the Oklahoma Agricultural Experiment Station in 1947. During the harvest seasons of 1947 and 1948, the commercial strippers and spindle pickers then available were field-tested to study their adaptability for harvesting cotton in the sub-humid plains. These tests indicated that the stripping principle was best adapted to harvesting conditions in the area where tests were made.

The steel-roll strippers tested in 1947 and 1948 lacked certain mechanical features needed for harvesting tall, branchy, high-yielding plants. Therefore, in 1949, a brush-roll type stripper was designed to include the needed features, and an experimental model was built.

The first experimental machine and various models patterned after it were tested at the Oklahoma Station and other state agricultural experiment stations in 1949, 1950, and 1951. In addition, one farm machinery manufacturer with national distribution built models almost identical to the Oklahoma harvester, and tested them extensively across the Cotton Belt. Based on the success of these tests, this company in 1953 manufactured 1,200 brush-type harvesters and placed them on the market.

This bulletin reports the development and performance of the original experimental brush-type harvester built at the Oklahoma Cotton Research Station at Chickasha.

* The information presented herein was compiled from various progress reports relating to development of the Oklahoma brush-type cotton stripper. Research workers engaged at one time or another on development of this stripper include Rex. T. Humphreys, W. J. Oates, R. H. Witt, W. S. Wood, and F. W. Schroeder. Since 1952, agricultural engineering phases of cotton mechanization research in Oklahoma have been under the direction of Jay G. Porterfield. This publication summarizes the development of the brush-type stripper up to that date. Publications from which the summary was made are listed on page 14.

Development of the New Stripper

Development of the new stripper was primarily a matter of finding more adequate stripping and conveying mechanisms.

Many of the stripping problems were solved by using stripping rolls made of brushes, as shown in Figures 1 and 2. These brushes had to be stiff enough to remove the cotton, yet resilient enough to avoid breaking limbs from the plants or removing an excessive number of green bolls. It was also necessary that the stripping mechanism permit both large and small plants to pass through the machine without losing the cotton or pulling the larger stalks. Brushes used in the early tests were made of various materials, including wire, tampico, palmetto, and calaber fiber, and combinations of these fibers. Nylon was later studied as a possible material for use on stripping rolls. Spiral brushes made of tampico and palmetto, and straight brushes made of nylon, seemed to give the most satisfactory results.

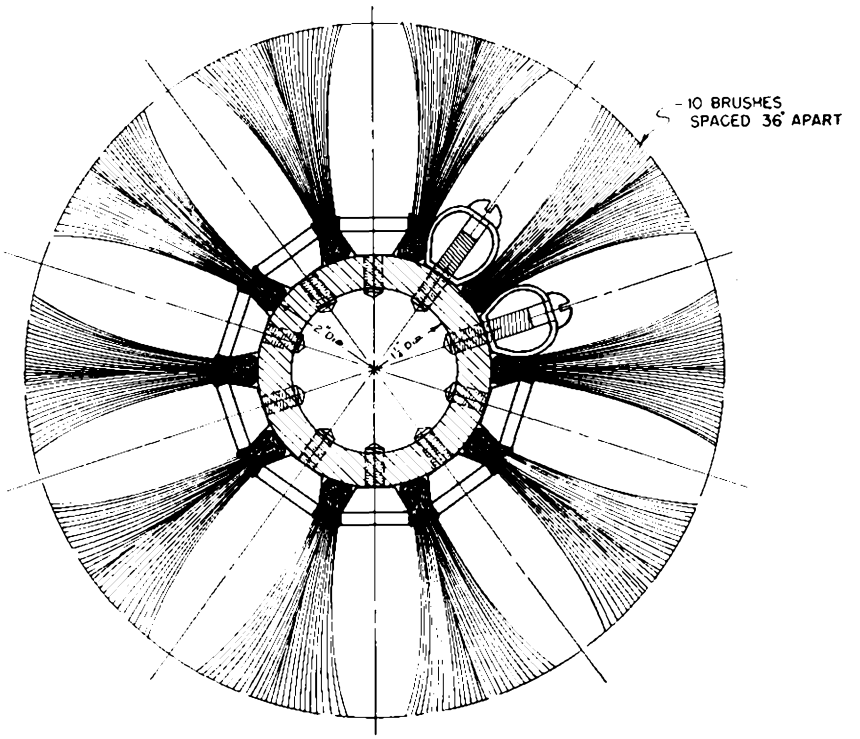

Fig. 1.—Section showing details of the stripping brush of the Oklahoma experimental brush-type cotton stripper.

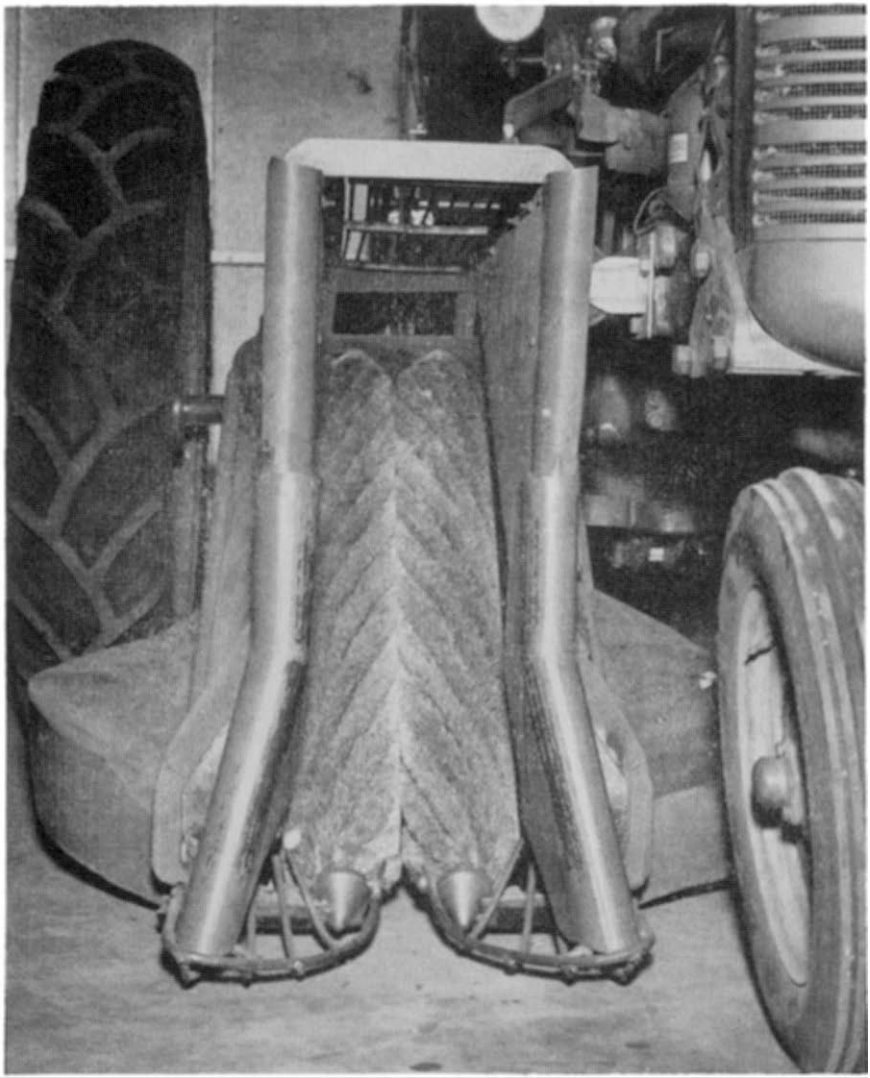

Fig. 2.—Front view of the Oklahoma experimental cotton stripper used during the 1949 season, showing brush stripping rolls and wide throat opening between stalk gatherers. Top center shows grid in discharge pipe through which dirt and trash are blown out.

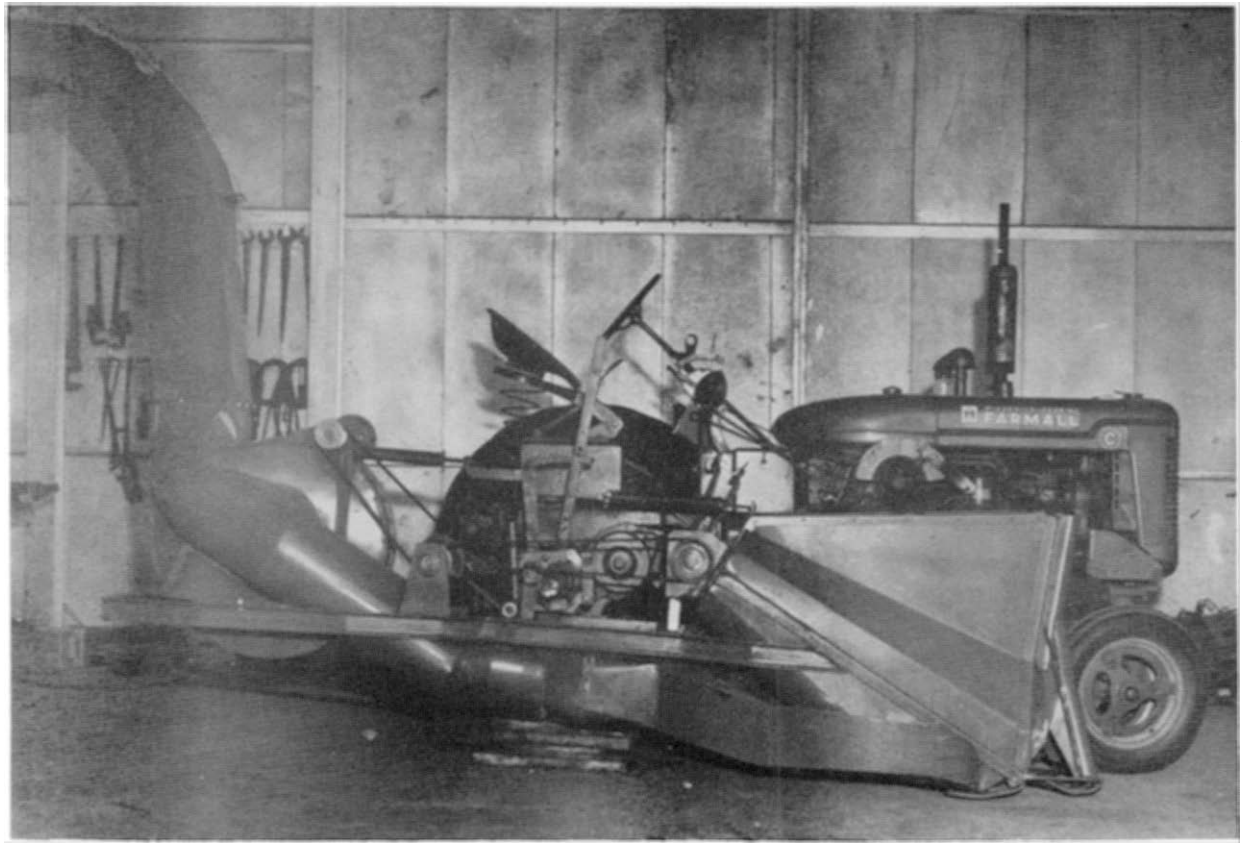

Fig. 3.—Side view of experimental cotton stripper, showing fan scroll and conveyor tube.

The pneumatic conveying system designed for the new machine is shown in Figure 3. The system is mechanically simple. Its merits for conveying cotton have been proven in cotton gins. The cotton is picked up by suction from an inclined receptacle below the brush rolls. It moves back toward a fan driven by a power take-off. The cotton is by-passed around the blades of the fan into the discharge air stream by a special design shown in Figure 4. As the cotton is discharged into the wagon, dirt in high velocity air moves out through the grid in the discharge pipe shown at the top center of Figure 2. The cotton is deposited by an adjustable hood in any part of the wagon. Cotton is passed rapidly into the wagon thus preventing losses while turning at the end of rows. The system has capacity to handle yields of one and one-half bales per acre.

Test Comparisons in 1949

The machine was completed too late in the fall of 1949 to obtain complete harvest test data. However, the performance of the new brush stripper, a spindle picker, and a commercially made steel-roll machine were compared on four different cotton varieties. Machine loss was used as the basis for comparison. The brush stripper harvested a greater percentage of cotton in each variety. The percentage harvested, however, does not necessarily reflect the true measure of the effectiveness of each machine. The brush stripper was able to harvest without choking. This was not true of the steel-roll machine. The brush stripper did not pull a single stalk during the entire season.

Since the brush-type machine is a once-over harvester, best results were obtained in dry, mature cotton. Also, defoliation by chemicals or frost appeared helpful.

Palmetto-tampico brushes lasted well, but calaber fibers broke so rapidly that they were deemed unsatisfactory.

A comparison of results obtained with machines in each variety is as follows:

Macha: The steel-roll type stripper and the Oklahoma experimental brush stripper showed significantly lower losses than the spindle picker. The difference in losses between the steel-roll machine and the experimental brush stripper were not considered significant.

Acala: Significantly lower losses were obtained with the experimental brush stripper followed in order by the steel-roll stripper and an experimental-type picker.

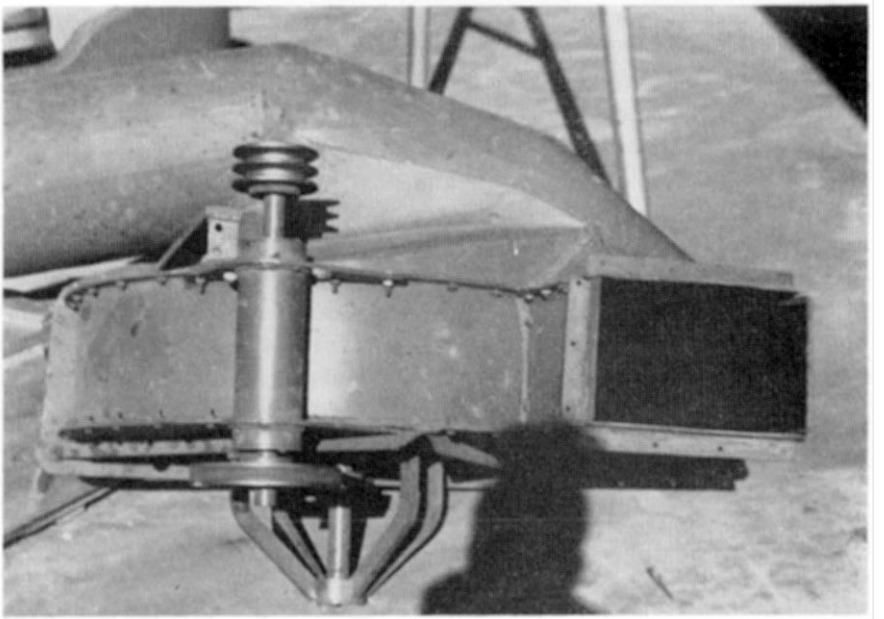

Fig. 4.—Section of the pneumatic conveying system containing a power-driven fan. Cotton by-passes this fan and enters a discharge tube which attaches to the opening shown at the right.

Deltapine 15: Losses with the steel-roll machine and spindle picker were about the same. Machine losses were significantly lower for the experimental brush stripper than for the other two machines.

Lankart 57: No significant difference between the steel-roll and brush-type strippers was noted, but both had significantly lower losses than the spindle picker.

Tests During 1950

By the fall of 1950, two commercial companies had built pilot models patterned after the Oklahoma brush stripper. These machines were available for limited field study during 1950. They did not arrive early enough to make complete comparisons, but excellent observations were made. The commercially available steel-roll stripper was used as a check on all comparisons. Cotton harvested by each machine was from randomized and replicated plots. These plots were of such size as to give results comparable to large field scale operation. Weather conditions during the season caused all plants to have excessive vegetative growth. All plants exceeded four feet in height and some were

more than six feet tall. An early freeze prior to frost prevented natural defoliation and many leaves remained on the plants. Stalks and limbs were killed and some became very brittle.

One of the commercially built experimental machines used air conveying similar to the Oklahoma machine, and the other used a mechanical means of conveying. The latter machine was built mainly for testing the effectiveness of brush rolls for removing cotton from the plants.

The brush rolls did a satisfactory job; however, because of the brittleness of the plants, some limbs were removed which caused clogging and failure in the air conveying system. It was apparent that changes were necessary for the air conveying system to be successful in all types of harvest conditions. With the addition of a mechanical device, this trouble was corrected.

The commercial experimental brush-type stripper using mechanical conveying encountered no difficulty even under these adverse conditions. None of the brush-type machines were subject to stoppages due to pulling plants from the ground.

The commercial steel-roll stripper continually pulled plants from the soil and clogged. However, these tests in 1950 were made in cotton four to six feet tall under the most adverse harvesting conditions.

A good comparison of the commercially available steel-roll machine and a brush-type harvester was obtained. Results are shown in Table I. These results cover only the harvested sample and give no indication of field operation difficulties encountered. There was a tendency for the trash content to be lower in all samples harvested with brush-type strippers.

Table I.—A Comparison of Trash Content of Samples Harvested By Different Machines, 1950.

Machine†	Test Number	Lot Weight Bulk (pounds)	Gin Setup (standard)	Trash Weight (pounds)
Brush roll	1	100	W.O.L.C.*	37.0
Brush roll	2	100	W.L.C.**	35.65
Brush roll	3	100	W.L.C.	36.89
Steel roll	4	100	W.O.L.C.	43.98
Steel roll	5	100	W.L.C.	44.86

† Tests 1, 2, and 3 were made with a commercial experimental brush roll machine. Tests 4 and 5 were made with a commercial steel roll machine.

* Without lint cleaners.

** With lint cleaners.

Test Comparisons During 1951

Technical workers, after observing the results obtained with the Oklahoma stripper, voted to use regional research funds for making three experimental brush-type strippers available for use across the Cotton Belt. One of these machines, known as the regional brush stripper, was available for the Oklahoma Station during the 1951 season.

Plantings were made in 1951 for the purpose of determining the effect of mechanical characteristics of cotton harvesters on their performance. Hi-bred cotton was used for all tests. The principal objectives were to make observations and measurements on such factors as harvesting efficiency, trash content, gin turnout, and grade and staple. All samples were ginned at the ginning laboratory at the Chickasha Station. The cotton was harvested on December 6 and 7. It was placed in trailers in a machine shed from harvest time until it was ginned on January 2.

Since tests were run rather late in the season, the cotton stalks were extremely brittle and considerable shattering took place. This may explain why total losses were high.

For the determination of field losses, a 30-foot length of row was used. The plots were selected at random in the field. All cotton that was on the ground was picked up and weighed. On the same 30-foot row length, a boll count was made on all bolls and locks on the plants. The machine then harvested the 30-foot length of row, and another count was made of all bolls and locks on the ground and those remaining on the plant. Each lock was counted as one-fifth of a boll. Eight plots were harvested with the Oklahoma stripper using straight nylon brushes. Three other strippers—including the regional brush stripper, a commercial steel roll stripper, and an Oklahoma stripper using tampico-palmetto spiral brushes—harvested four plots each. The data obtained are summarized in Table II.

For the ginning tests, sufficient cotton was harvested with each machine so that a 400-pound sample of seed cotton could be taken for ginning. Two such samples were taken from each machine.

Samples were also taken for running the Shirley analyzer test. This test is used to determine the percentage of foreign matter in cotton after it has gone through the ginning process. These tests were run at the Cotton Fiber and Spinning Testing Laboratory, College Station, Texas, January 25, 1952. The trash from each sample was weighed as it was removed by each part of the gin setup. The trash was caught at

Table II.—A Comparison of Machine Loss Among Four Machines Tested in 1951.

Commercial Steel Roll Machine			Oklahoma Stripper (Tampico Palmetto Spiral Brushes)			Regional Stripper (Tampico Palmetto Straight Brushes)			Oklahoma Stripper (Straight Nylon Brushes)		
Boll Count (10 ft.)	Boll Loss (10 ft.)	Percent Loss	Boll Count (10 ft.)	Boll Loss (10 ft.)	Percent Loss	Boll Count (10 ft.)	Boll Loss (10 ft.)	Percent Loss	Boll Count (10 ft.)	Boll Loss (10 ft.)	Percent Loss
69	13	18.8	97	6	6.2	77	10	13.0	72	2.6	3.6
66	8	12.1	70	3	4.3	92	7	7.6	92	6.2	6.7
105	10	9.5	76	8	10.5	85	6	7.1	106	7	6.6
83	5	6.0	102	5.5	5.4	74	6	8.1	98	9	9.2
									85	7.2	8.5
Avg. ---	--	11.6	Avg. ---	--	6.6	Avg. ---	--	8.9	87	6.6	7.6
									70	8	11.4
									47	5.2	11.1
									Avg. --	--	8.9

Table III.—Ginning Test Of Cotton From Different Strippers.*

Machine Used	Trash Weight (lbs.)						Moisture** Content (percent)			Foreign matter (percent)				Lint† Weight (lbs.)	Seed Weight (lbs.)	Gin Turn out (percent)	Grade & Staple
	ALC	BM	7C	Feeder	Huller	R.C.	S	WS	FS	Lint	WS	FS	Shirley Analyzer				
Commercial Steel Roll Machine	21	82.3	11.3	33.0	5.72	1.80	0.72	8.4	8.6	4.9	42.1	2.8	7.85	80.4	150	21.2	SLM-TG-28
Oklahoma Brush Stripper	38.4	87.2	11.0	29.0	5.50	1.87	0.63	9.2	7.2	4.8	39.8	1.7	8.09	84.6	135	22.2	SLM-TG-27
Regional Brush Stripper	34.8	91.7	10.8	28.3	4.52	1.68	0.66	10.0	6.8	5.4	42.7	2.5	7.40	79.7	125	20.9	SLM-TG-27

* Samples of Hi-bred cotton weighing approximately 400 pounds were used.

** A tower drier at 180° F. was used between the air line cleaner and burr machine.

† Does not include 20-pound samples used for moisture and foreign matter determinations.

ALC —Air line cleaner
BM —Burr machine
7C —Seven cylinder cleaner
Feeder —Feeder cleaner
Huller —Huller front
R.C. —Reciprocating cleaner
S —Standard gin stand
WS —Wagon sample
FS —Feeder sample
SLM-TG —Strick low middling-tinge

the airline cleaner, the burr machine, seven-cylinder cleaner, feeder cleaner, the huller front, the reciprocating cleaner, and the standard gin stand. From these data, the gin turnout was calculated.

The Oklahoma machine had the highest gin turnout. On the basis of the Shirley analyzer tests, this higher turnout may be partially explained by the difference in the type of trash present in the cotton harvested by this machine. Cotton harvested with the Oklahoma machine had more fine-particle trash than that harvested with the other machines. The data are summarized in Table III.

Summary

A cotton stripper, known as the Oklahoma brush-type stripper, was developed in 1949, after earlier tests indicated that the stripping principle was probably best adapted to cotton harvesting conditions in Oklahoma. The machine was designed to improve the stripping mechanism by using brushes, and the conveying mechanism by using a pneumatic system.

In 1949 the percentage of cotton harvested by this machine was compared with the percentages harvested by a spindle picker and a commercial steel-roll stripper, on four different varieties of cotton. The brush stripper harvested a greater percentage of cotton in each variety. The percentage was significantly greater in two open-type varieties. Also the brush stripper harvested without choking or pulling stalks.

Models patterned after the original Oklahoma stripper were used in tests during the 1950 and 1951 seasons. These tests included comparisons of machines on such factors as harvesting efficiency, trash content, gin turnout, and grade and staple. The brush-type stripper again proved equal or superior to other machines in all comparisons. However, results from the Shirley analyzer tests showed that cotton harvested with machines using pneumatic conveying had more fine-particle trash than that harvested with machines using mechanical conveying. Improvement of this feature and evaluation of the basic principles of stripper harvesting of cotton are being studied.

APPENDIX

Publications reporting on the development and performance of the Oklahoma brush-type cotton harvester:

(1) Humphreys, Rex T., John M. Green, and Edward S. Oswalt.
Mechanizing cotton for low-cost production. Okla. Agri. Exp. Sta. Bulletin No. B-382. March, 1952.

(2) Oates, W. J., R. H. Witt, and W. S. Wood.
The development of a brush-type cotton harvester. Agricultural Engineering 33, No. 3: 135-136, 152. March, 1952.

(3) Oates, W. J., and R. H. Witt.
Engineering management aspects of mechanical cotton harvesting in the southwest. Agricultural Engineering 30, No. 10: 492-495, October, 1949.

(4) Schroeder, E. W. Proceedings fifth annual cotton mechanization conference. National Cotton Council, Memphis, Tennessee. p. 29.

(5) Mechanization of cotton production. Southern Cooperative Series, Bulletin No. 33. June, 1953.

(6) Regional Cotton Mechanization Annual Reports. 1948, 1949, 1950, 1951.