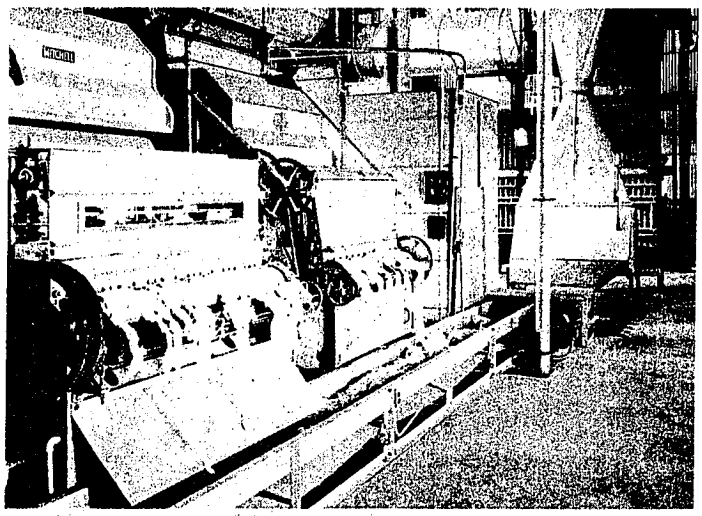
Roller Cotton Ginning Developments



by

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Acknowledgements

Acknowledgement is hereby made to all who have assisted in the preparation and assembling of this material. An appendix list of special acknowledgements will be found at the conclusion of this publication. For information purposes and not as a Government endorsement on price, quality, or performance, the author has endeavored to give full credit for illustrations, drawings, and quotations made available from various sources. After some 30 years of experiments and experiences with roller ginning, the author frankly admits that he has yet to see a perfect roller gin, but rejoices in the progress made by the ginners and manufacturers of the United States of America in this field.

Part I

COMMERCIAL ENGINEERING DETAILS AND DATES

Primitive and Churka-Type Roller Ginning

Neither history nor archaeology have established when mankind first began to use cotton fibers, but fabrics of cotton are quite definitely known to have been in use as far back as 4,000 years B. C. in India and probably served people long before then.

Undoubtedly the first method of ginning cotton was with the human fingers, a method that has continued in use throughout the centuries. This can hardly be called either roller or saw ginning, but it might perhaps be termed pinch ginning. The second method, believed by the author to have logically followed the pinch ginning, is that of the archaic foot-roller somewhat as depicted in fig. 1.

Figure 1.

Old fashioned foot-roller gin, used to a limited extent to this day in the remote areas of India.

In his 1949 report to the National Cotton Council of America, "Cotton in Pakistan and the Indian Union", Mr. Read P. Dunn, Jr., published this figure which was credited to the East India Cotton Association, Ltd., to whom we are in turn grateful. The observant reader will note that in this ginning method the women do the work, a practice of the western Indians as well, although the author has not been successful is putting this into practice at his own abode. Perhaps from this foot-roller idea arose that of the rolling pin and other feminine utensils.

At any rate, Mr. Dunn said that about 10 percent of the Indian Union cotton crop was ginned by primitive churka and foot-roller gins. The churka method of ginning, a true roller gin with small diameter pinching rollers that took the fiber from the seed without crushing, has been thought to have been named from Sanscrit whence came the term "Jerky" (which has long been spelled churka).

There are several types of the small, hand-operated churka gins, two of which are shown in fig. 2a, b, and c. The diagrams give approximate dimensions in inches.

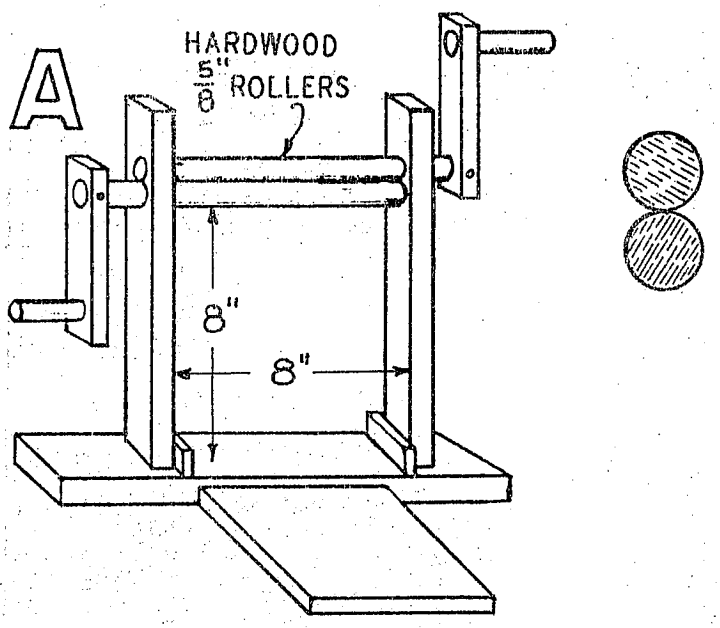
Figure 2a.

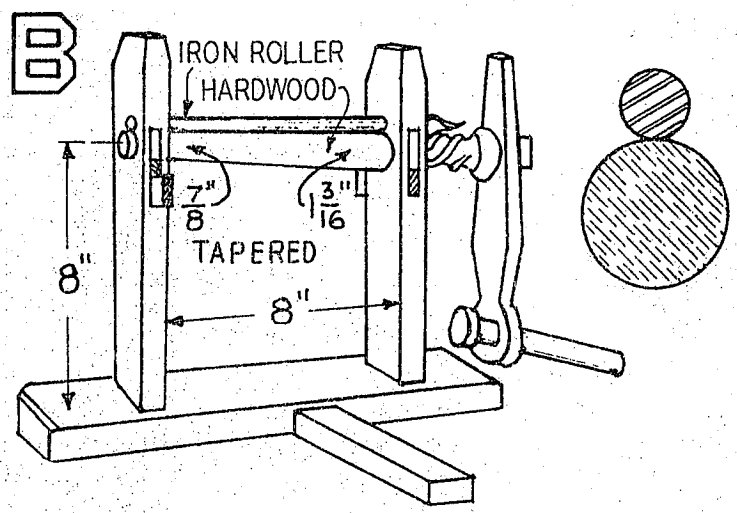
A sketch of a double crank gin with two hand cranks and no gearing.

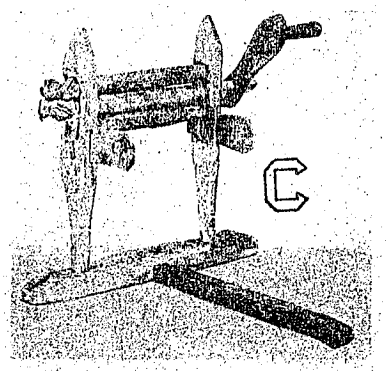
Figure 2b.

Sketch of a single crank churka gin, made from the model owned by the late Walter Going.

The sketch in 2b shows the reproduction of the Hindu churka brought back from India about 1936 by the late Walter Going, Continental Gin Company, Birmingham, Ala. Master Mechanic Russell G. McWhirter made the replica which is on display at the USDA Southwestern Cotton Ginning Research Laboratory at Mesilla Park, New Mexico, where the department now centers its roller ginning research. Such a hand churka gin would probably turn out about five pounds of fiber in a long day.







It can only be conjectured as to what kind of primitive ginning methods were used in ancient Mexico, Yucatan, and Peru, as no records or models are available on the subject.

Figure 2c.

Photo of a Pakistan small churka gin owned by Alfred M. Pendleton.

It is a historical fact that, until the invention of the McCarthy gin in 1840, roller ginning efforts and ideas were largely centered about the ancient churka type of gin, and much thought was given by the more progressive cotton growers and merchants toward attaining larger sizes and greater capacities than were feasible in the hand-operated units. Accordingly, the general development of roller ginning is henceforth listed more or less chronologically in order to present a clearer view of American activities in particular.

1742 - In this year it was reported that M. Dubreill, a French planter in Louisiana, had invented an improved roller gin that had greater length of rollers and more capacity than other gins then in use. Unfortunately we have not been able to locate sketches or detailed description of the M. Dubreill gin.

1772 - In the Mississippi-Gulf areas, considerable publicity accrued to a Mr. Krebs of Pascagoula who invented a roller cotton gin having a daily outturn of some 70 pounds of ginned lint, while competing units could only deliver approximately 30 pounds. In a history of Florida, Captain Roman of the British Army was quoted as saying that the Krebs roller gin had foot treadles and two well polished, grooved iron spindles set into a frame approximately four feet high.

1777 - At this time Kinsey Burden of Burden's Island, South Carolina, constructed a roller gin that was made from old round gun barrels. These rollers were fastened at the ends on suitable trunnions, and the unit claimed a daily capacity of 20 pounds. This unit was currently dubbed the "barrel gin," and was said to have been quite popular in the Carolinas, Georgia, and Florida.

1790 - Dr. Joseph Eve, residing near Augusta, Georgia, introduced some form of foot treadle gin into Georgia and was given much advertisement about this time. It is not known whether he employed Krebs' foot treadle drive or not. However, we here refer to the Cotton Planters' Manual (J. A. Turner) that came out in 1857 for additional information on the Eve gin. We quote from a statement made by Thomas Spalding of Sapelo, Georgia, under date of January 20, 1844:

"1st. Eve's gin was invented by Joseph Eve, who died lately at Augusta, somewhere about the year 1790, in the Bahama Islands, where Mr. Eve then resided.

"Mr. Eve was the son of a Loyalist from Pennsylvania, who had been a friend of Franklin; and Joseph Eve was himself qualified to have been the associate and companion of Franklin, or any other; the most enlightened man I have ever known.

"His gin consists of two pairs of rollers, more than three feet long, placed the one set over the other, upon a solid frame that stands upon the

floor, inclined at an angle of about thirty degrees - so that the feeder may the more easily throw the cotton in the feed by the handful upon a wire grating that projects two inches in advance of the rollers, just below them; between these protecting wires, the feeding boards, with strong iron, or in preference brass teeth pass, lifting the cotton from the wire grating, and offering it to the revolving rollers. The feeders should make one revolution to every four revolutions of the rollers. The rollers are carried forward by wheels supported over the gin, and upon the axle or shaft of these rollers; at the center there is a crank similar to a saw-mill crank, the diameter of whose revolvement is as one to four of the diameter of the wheels, carrying by bands the rollers.

"It is the crimping produced by the teeth and the wire grating, which has served as a cause for carping by the cotton buyers, and which has gradually led to the disuse of these gins, the only gin efficient for the cleaning of long cotton, which has ever been used in this or any other country. With Mr. Eve's gin, as originally sent to this country from the Bahamas, the rollers were 5/8's of an inch in diameter, made of stopper wood, a very hard and tough wood, and they were graduated to make four hundred and eighty to five hundred revolutions per minute, depending of course upon the gait of the horses or mules, within these limits.

"Soon after Mr. Eve sent his gins to Georgia, some of his own workmen followed them, and began to make them on their own account. To show as much change as possible in the gins, besides other alterations, they increased the size of the rollers to three-fourths of an inch, and increased its velocity to six hundred times in the minute. These two changes, while they greatly increased the quantity ginned, very much injured the appearance of the ginned cotton.

"Mr. Eve had expected and guaranteed to the purchasers of his gins when well attended, in fine weather, from two hundred and fifty to three hundred pounds of cotton in the day. I have known these altered gins do sometimes six hundred, but the injury was greater than the increased quantity warranted, add to which the quicker movement of the feeder made the more impression upon the cotton passing from the feeder to the roller.

"2d. The first bale of Sea Island cotton that was ever produced in Georgia, was grown by Alexander Bisset, Esq., of St. Simon's Island, and I think in the year 1778. In the winter of 1785 and '86, I know of three parcels of cotton seed being sent from the Bahamas, by gentlemen of rank there, to their friends in Georgia; .....;this cotton gave no fruit, but the winter being moderate and the land new and warm, both my father and Mr. Bisset had seed from the ratoon, and the plant became acclimatized.

"In 1788, Mr. Bissett and my father extended the growth, but upon my memory it rests, that Mr. Bissett was the first that found the means of sep-

arating the seed from the cotton, by the simple process of a bench upon which rose a frame supporting two short rollers revolving in opposite directions, and each turned by a black boy or girl, and giving as a result of the day's work five lbs., of clean cotton."

1827 - Although there seems to have been little doing in roller gin improvements in the United States until this time, it was reported by William Elliott of Beaufort, South Carolina, that foot treadle gins (see fig. 3) had superseded the earlier kinds of churka gins, and that the treadle gins were being imported from the West Indies at about ten dollars ($10) per unit.

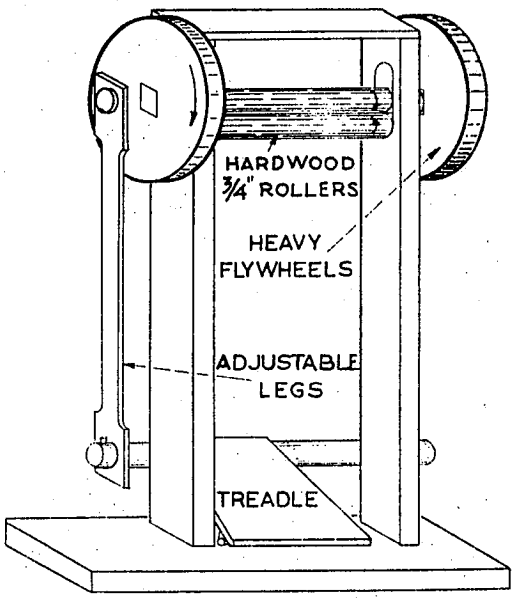


Figure 3.

Author's diagram of one form of a foot treadle churka-type roller gin having heavy fly wheels on the top roller shaft. Other forms than this probably have been made with the two flywheels, but one being placed at the end of each roller, in which condition the flywheels would then revolve in opposite directions and necessitate care in starting.

Referring back to the quoted article written by Mr. Thomas Spalding under date of January 20, 1844, it may be remarked that his statement is not very clear as to who unveiled the first gin, Eve or Bissett. He says that Eve's gin was the best ever, yet follows that with the declaration that Mr. Bissett was the first man that found the means of separating the seed from the cotton. If so, several centuries passed very rapidly between the time of Mr. Bissett and Mr. Eve, because we know the churka gin is ancient, and Mr. Spalding describes a churka gin perfectly when he tells about Mr. Bissett's.

It is no wonder that a dollar went further in those days, if a man could buy even a churka gin stand for ten American dollars! Elliott said in one of his writings that tapered hardwood rollers were paired together (presumably tapered from about 5/8-inch diameter at one end to 1-1/4 inches at the other and that with speeds well above 100 revolutions per minute the daily ginning capacity reached approximately 30 pounds of ginned lint.

In reviewing these various statements, it seems that some ginners made up as many as five pairs of either the Eve or gunbarrel rollers per ginning unit, and that when these five pairs were used, the daily outturn was about 135 pounds of lint; but the competing Whitney saw gins were delivering 2 pounds

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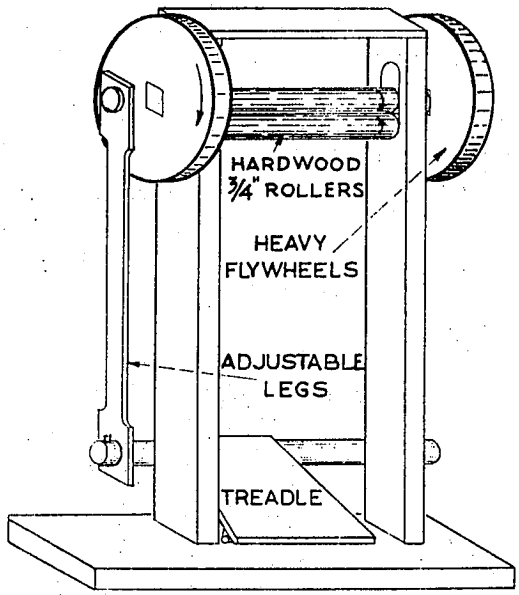

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per saw per hour on 8-inch diameter saws, so that in a day one Whitney type saw gin delivered from 600 to 900 pounds of ginned lint according to the reports of various papers and writers. However, the mills, mostly in England, seemed to prefer roller ginned cottons when they could have their choice because there were fewer neps.

1835-1839 - William Whittimore, Jr., of West Cambridge, Mass., began to attract attention with his roller gins. He obtained one patent in 1834 and another in 1839. Figure 4 shows the main elements of these inventions in items a, b, and c. The Charleston, South Carolina, Mercury of 1835 made favorable note regarding his gin.

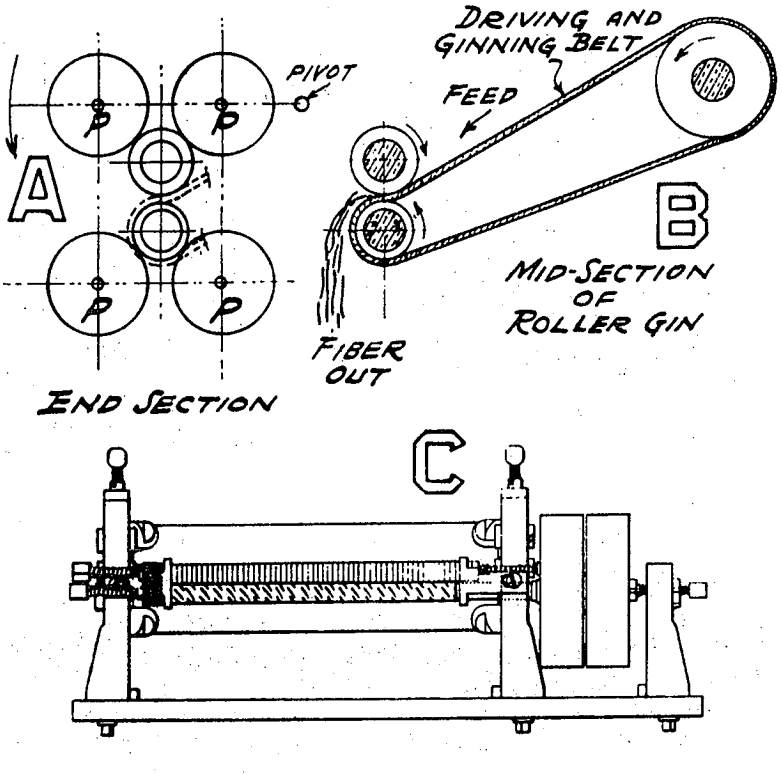


Figure 4.

W. Whittimore, Jr., roller ginning inventions: a and b, features of his 1834 patent in which he employed a belt and squeeze rollers as the assisting agents in ginning; and c, the side elevation of his 1839 invention, where he used one roller made of leather disks, and the other made of roughened metal.

1838 - In this year an old maestro in the ginning world tried his hand at the subtleties of roller ginning, the maestro being none other than Eleazor Carver who had moved from Washington, (near Natchez) Mississippi, to the manufacturing centers of East Bridgewater, Mass. Carver had a rather clever idea in using spiralled rollers in pairs, virtually similar to gears, so that they could be fed on a flat plane for several pairs of rollers, and so that the seeds would be augered to the ends of the rollers whilst the ginned lint went down to a traveling belt. Figure 5 (on the next page) delineates in sectional form the Carver invention.

The shop construction of such rollers would have been difficult in many of the machine shops of that period, and the author has been unable thus far to locate models or reports of commercial use of this Carver gin.

Before taking up the most important roller gin invention of the century, that, of Fones McCarthy in 1840, two other inventions should be mentioned; namely, those of Richard Reynolds, Beaufort, South Carolina, and Theodore Ely, New York, New York.

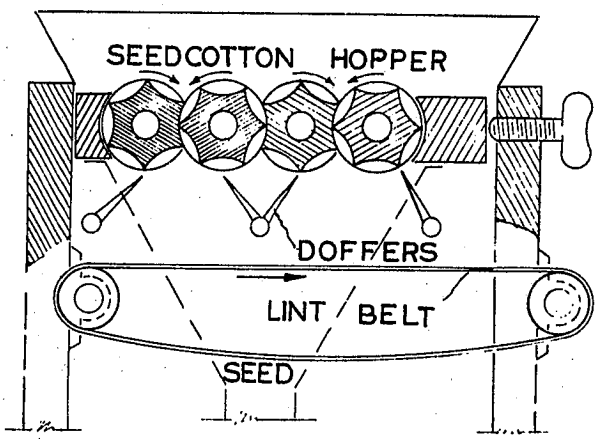


Figure 5.
Cross-section of Model 1838 Carver roller cotton gin, which was not limited to the number of pairs of spiral meshing rollers, although only two rollers are shown here

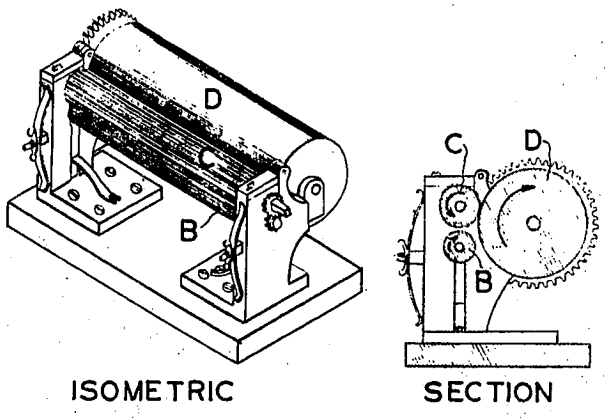


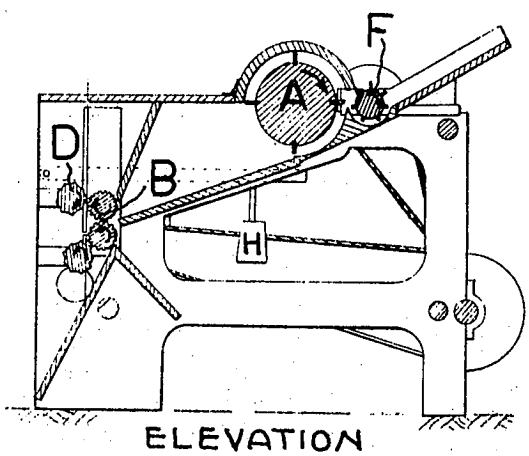
Figure 6.
Reynolds 1844 roller gin: an isometric view and a cross-section, wherein B and C were the ginning rollers and D did the clearing of the ginned fiber by taking it from Roller B. The hand lever or crank is not shown here.

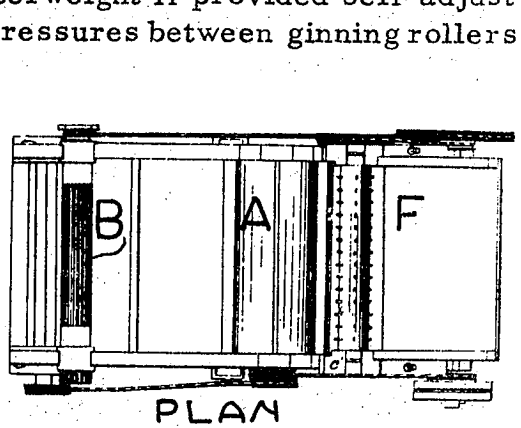
The Reynolds roller gin was primarily a triple roller churka type of gin having the two pinching rollers ahead of a special larger clearer roller, all as shown in figure 6.

The Ely invention displayed some genuine mechanical ability, since it comprised both feeder, ginning rollers, and clearers, as shown in figure 7.

Figure 7.

1845 model Ely roller gin. This unit employed a feeding cylinder, F; a fanning or direction cylinder, A; two fluted rollers B for ginning; and two clearers or strippers, D. Counterweight H provided self-adjustment of pressures between ginning rollers.



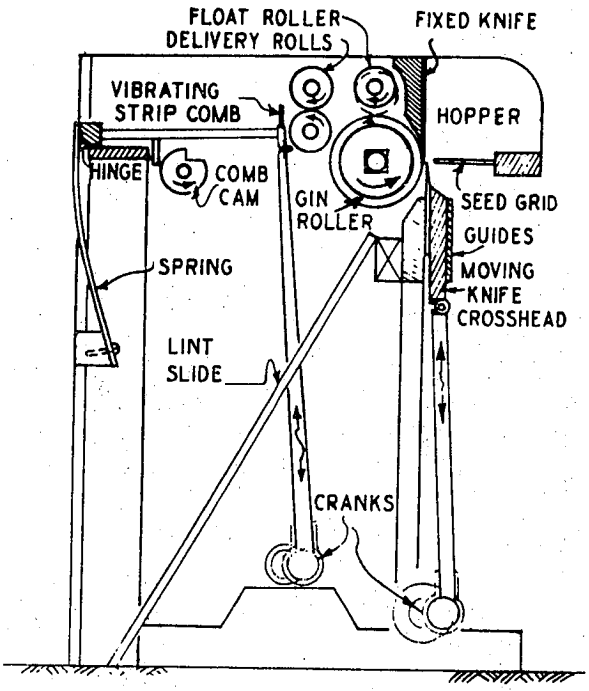


THE McCARTHY (or Macarthy) ROLLER GIN AND ASSOCIATED INVENTIONS

On July 3, 1840, a roller gin patent was issued to Fones McCarthy, Demopolis, Marengo County, Alabama, that revolutionized the ginning practices throughout the world and especially in some countries foreign to the U. S. This new type of roller gin which his invention provided became as popular in most countries as the Whiteny saw gin was to our nation. The British refer to the gin as the Macarthy gin, but it sounds the same regardless of spelling.

This first patent, No. 1675, was followed by others of McCarthy, such as re-issue No. 262 of April 18, 1854; re-issue No. 1675 dated 1856; and No. 67,327 dated July 30, 1867.

In figure 8 is given a cross-section diagram of the first form of the McCarthy roller gin.



Cross-section of the 1840 McCarthy roller gin which revolutionized roller ginning by the use of a fixed blade (sometimes called a doctor knife) held tightly against a ginning roller, and having a moving knife which cooperated with the roller and doctor knife in performing the separation of the fiber from the cotton seeds.

There were several other names for the parts. The moving knife, as we now call it, was termed a hacker blade because it seemed to hack at the seed which were held between the ginning roller and the fixed knife or doctor blade. The single McCarthy ginning roller was much greater in diameter than churka type rollers and hence had greater capacity from the start. Its porcupine-like surface seized the fibers and drew them between roller and fixed blade so that there was a constant pull against the seed in order to make a clean separation. McCarthy's first moving knife had fine teeth on its working edge and was called by him the saw.

The McCarthy roller was made up of coarse leather, grooved to permit motes and other unyielding matter to pass the knife without injuring it. He also had a stripping comb behind the ginning rolls, but interposed small float and delivery rolls between the ginning roller and this comb. From what we can ascertain, the first McCarthy gins used rollers that were about 4 inches in diameter and 3 feet in length. By 1850, however, the rollers had been increased in size to almost 7 inches diameter and their lengths shortly thereafter became standardized into 3 sizes; namely, 40, 60, and 72 inches. Single roller McCarthy gins stayed at 40 inches in length almost universally until the 1940 era of new roller ginning practices began in the United States. Double roller gins became popular, too, and these adopted longer rollers ranging from 60 to 72 inches in most cases. Other improvements in the popular McCarthy type roller gin brought about the reciprocating pusher board, the vibrating grid for shedding seeds, the first sort of rock-and-roll link between moving knife crank and a secondary center to facilitate clearance and afford better action in ginning, and the revolving stripper roller to wipe ginned lint from the roller.

For years, however, a stationary brush stick or plain scraper bar combed ginned lint from the roller and was popular because of its cheapness. Figure 9 gives a section through the conventional gin of 1900 that was sold internationally by many well known firms.

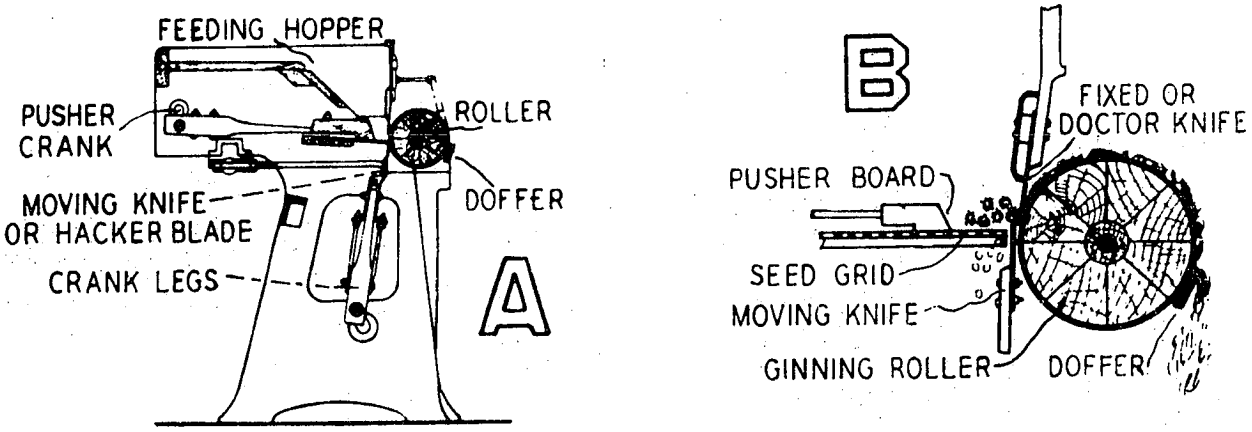


Figure 9.

Cross-section of McCarthy roller gin as of 1900, drawn by Professor D. A. Tompkins and lettered by author; A, main section through roller gin; and B, enlargement of the roller, moving knife, and other ginning elements employed in the 1900 McCarthy model.

Figure 10 on the next page, is a photo-reproduction from sales catalog literature that is representative of almost all better makes of the McCarthy type roller gins in the 40-inch single roller size between 1900 and 1930. American and British manufacturers had also gone to the making of double roller gins.

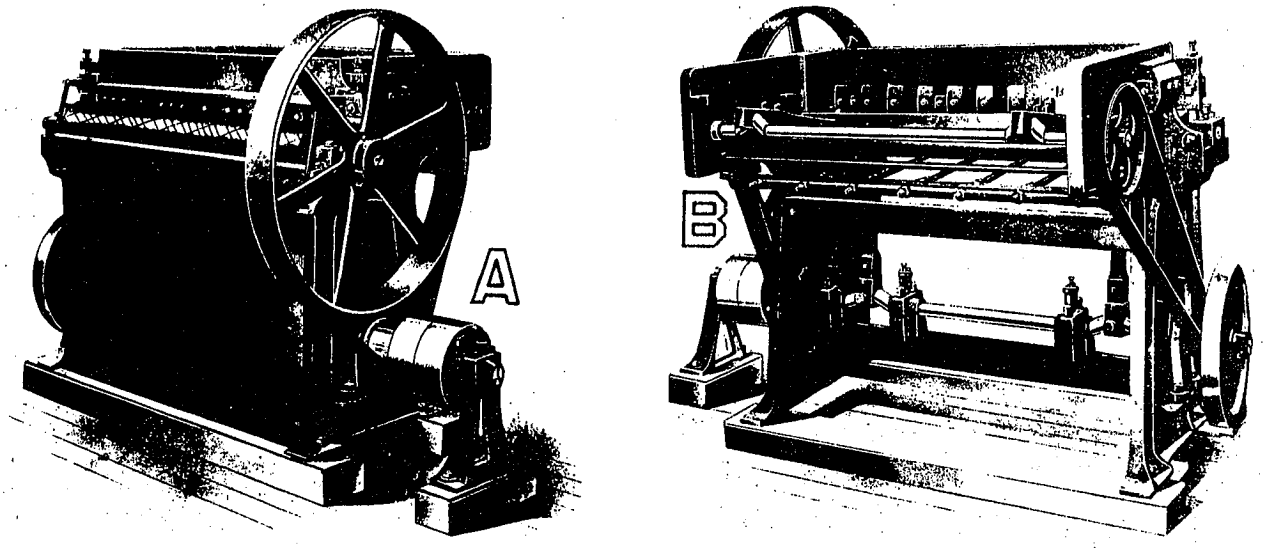


Figure 10.

A, delivery side (with hopper removed) of an American McCarthy type roller gin; and B, front or feeding side. Courtesy of the Continental Gin Company.

The British Middleton model of double roller gin retained the shorter roller that was virtually interchangeable with single roller gins; but the American Foss model double roller gin generally used 60-inch rollers. The approximate overall dimensions and characteristics are delineated in the plain line sketches of figure 11.

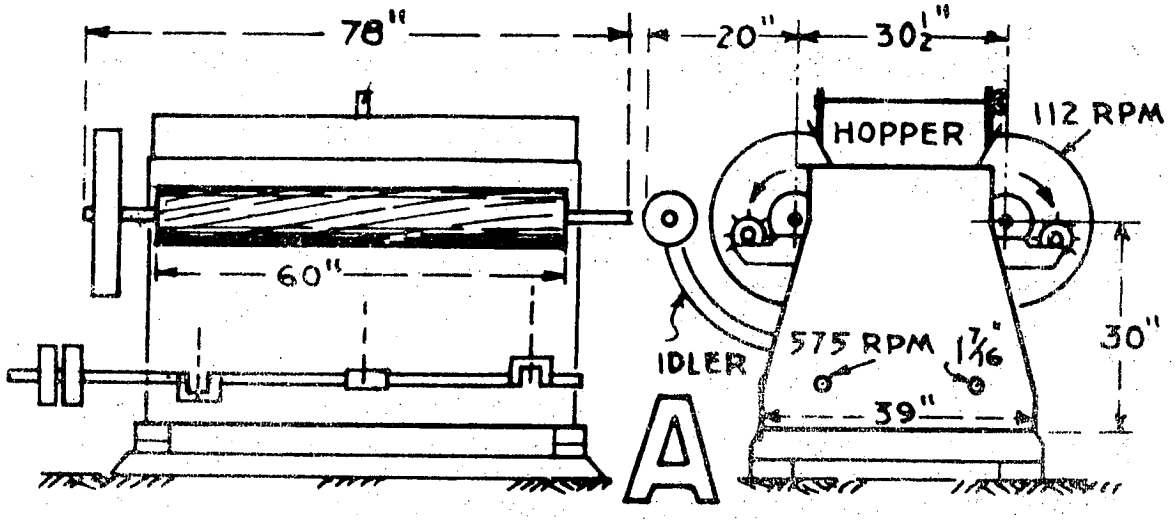


Figure 11a.

Double roller cotton gin of the McCarthy type: Figure 11a, American made 60-inch "Foss" sea-island gin. The diagrams and dimensions were taken from research units of the U. S. Department of Agriculture Southwestern Cotton Ginning Research Laboratory, Mesilla Park, New Mexico.

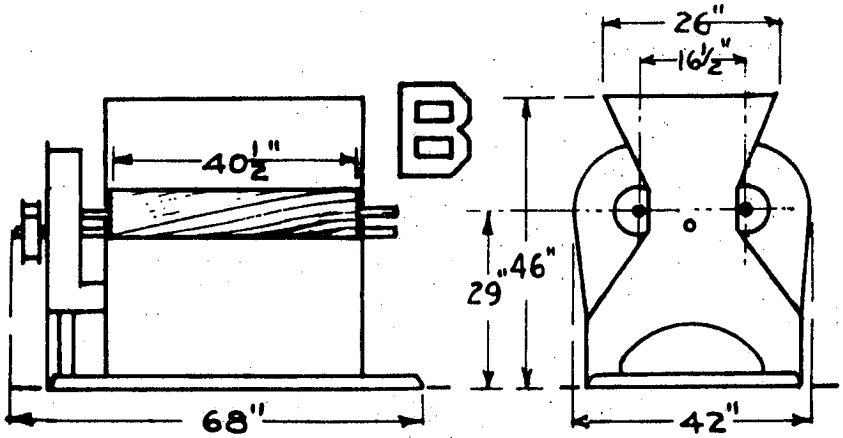


Figure 11b.

Double roller cotton gin of the McCarthy type: Figure 11b, British-made 40 inch Middleton gin. The diagram and dimensions were taken from research units of the U. S. Department of Agriculture Southwestern Cotton Ginning Research Laboratory, Mesilla Park, New Mexico.

Much could be said about the advantages and disadvantages of the McCarthy type roller gins which have been in almost world-wide use for many years. They have usually been lower in cost than saw gins and have been more readily operated by unskilled labor, and on all varieties and staple lengths of cottons, regardless of whether the cottons have smooth or fuzzy seeds.

Saw gins, on the other hand, are not universally adaptable to all cottons. They have not served well in ginning sea-island or American-Egyptian long staple cottons, and their ginned lint has met with objections from the cotton mills. They blend the cotton fibers much better, however than do roller gins.

Capacities of the McCarthy type roller gins are usually far less than saw gin stands of equal floor space. For example, in the United States a roller gin usually produces from 1 to 1-1/2 pounds of ginned lint per hour per inch of roller length or from 60 to 90 pounds for a standard 40-inch roller length; while a saw gin having 12-inch diameter saws will deliver 9 or more pounds of ginned lint per hour for each inch of the saw cylinder net length, since the saws are usually set on approximately 3/4-inch centers. Thus, a saw gin has about 5 to 7 times greater capacity than a roller gin of equal length.

Small McCarthy type cotton gins for laboratory use and cotton genetics work usually are to be obtained in 8-, 12-, and 16-inch roller lengths. Figure 12 on the next page illustrates a British made 12-inch roller gin, and figure

13 shows a cross-section view of the late J. S. Townsend design which is used for governmental purposes in both 8- and 16-inch roller lengths.

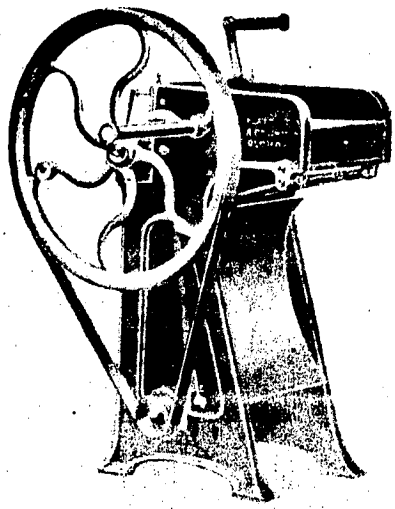


Figure 12.

Hand roller gin with 12-inch roller. Courtesy of Platt Bros., Ltd., Oldham, England.

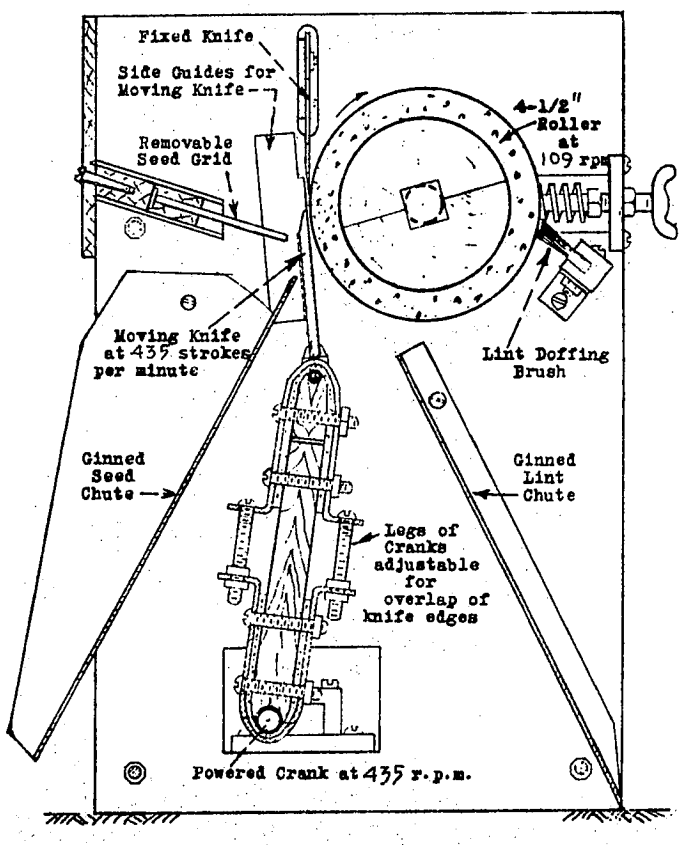


Figure 13.

Cross-section of Townsend design motor-driven laboratory roller gin for 8-inch roller. Roller speeds now maintained at 109 rpm and cranks at 435.

In setting up American roller gins between 1900 and 1930 it was customary to frame a row of vertical heavy timber posts to provide bracket supports for the feeders and shafting hangers. Figure 14 is a line drawing showing such a typical gin stand and timber set-up.

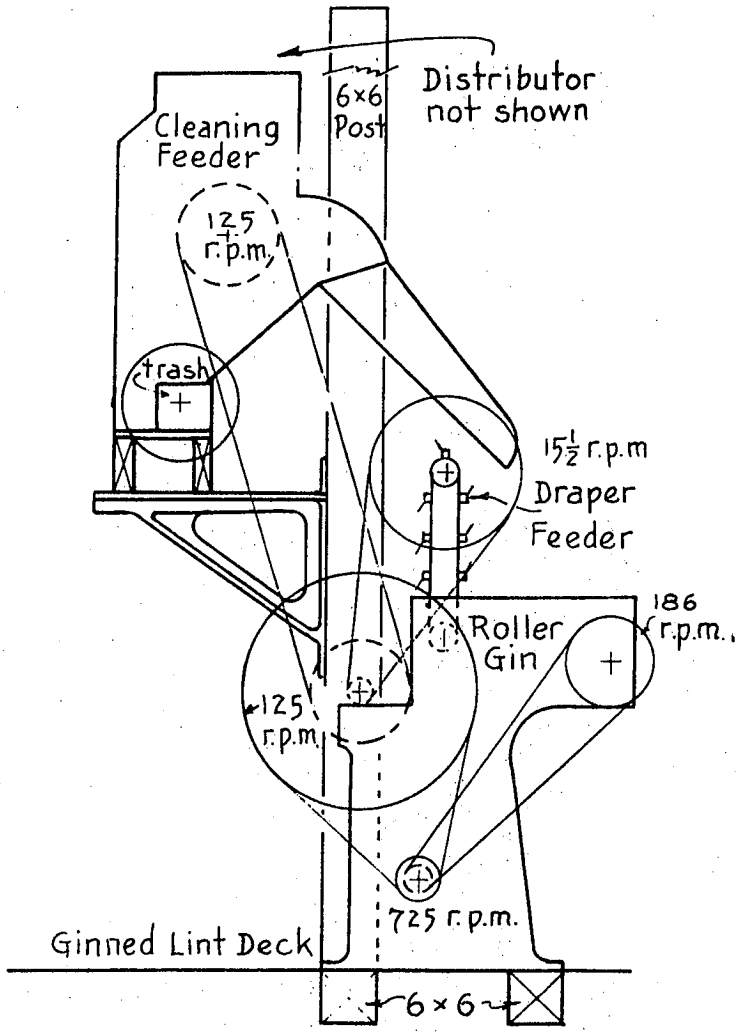
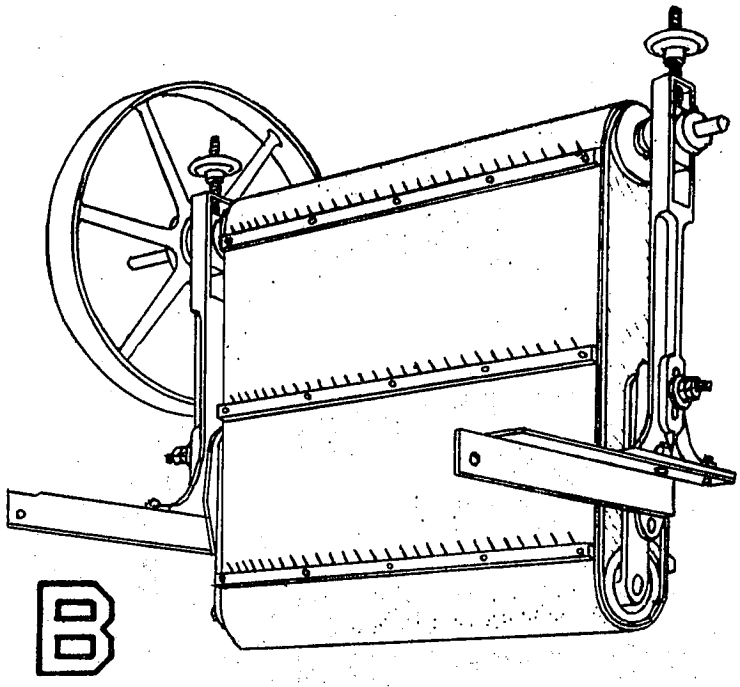


Figure 14.

End elevation diagram of roller gin stand, draper feeder, overhead feeder, and timber posts as used at roller gins. Courtesy of the Murray Company of Texas, Inc.

Interesting factory line isometric drawings of 1917 are shown on the next page to indicate the type of roller ginning equipment that was generally used during the period of World War I. The three figures, 15a, 15b, and 16 were lifted from the repair handbook of The Murray Company by the author who deleted numerals in order to make small size illustrations for the pur-

pose of this report.



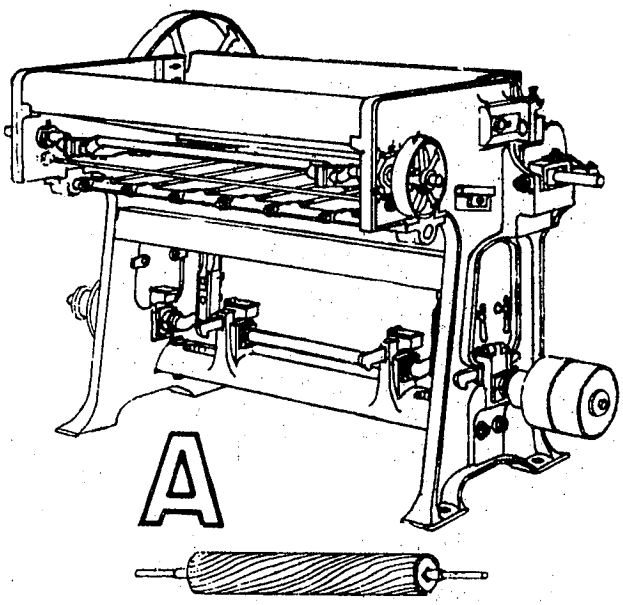


Figure 15.

Isometric sketches of McCarthy roller gin stand and feeder, 1917 model units; A, the gin stand proper; and B, draper or spiked belt feeder that was usually interposed between the ginning roller and the overhead cleaning feeder to give more uniform and slower feeding at the working zones. Courtesy of The Murray Company of Texas, Inc.

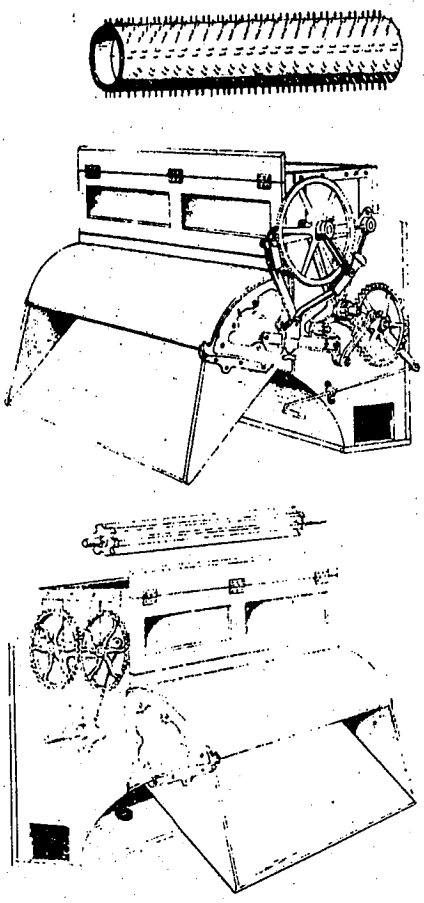


Figure 16.

Isometric sketch of 1917 model overhead small drum cleaning feeder as used in ginning Pima cotton. Courtesy The Murray Co. of Texas, Inc.

Since the floor plans of roller ginning establishments have varied a great deal, they will be shown in a later section of this article. However, views in different roller ginning plants that operated between 1930 and 1950 are here shown in figures 15 to 17 inclusive.

In most of these ginning plants the heavy vibrations of the roller gins necessitated sturdy sills set into concrete at ground level. Cleaning and other auxiliary machinery has likewise been kept as low as possible, although balcony installations of smaller extracting and cleaning units are comparatively common.

Figure 17.

Interior view of an Arizona roller cotton gin.

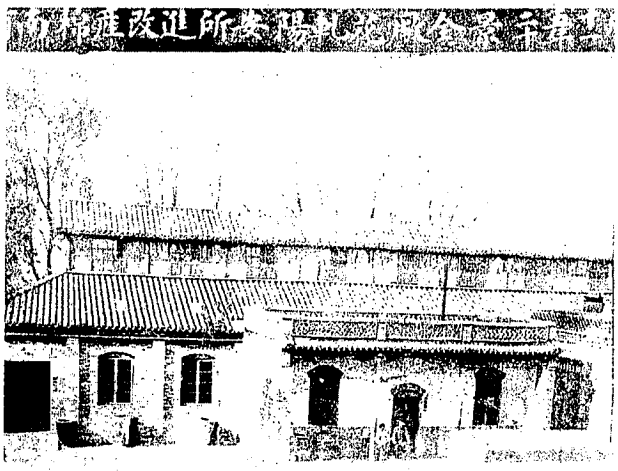


Figure 18.

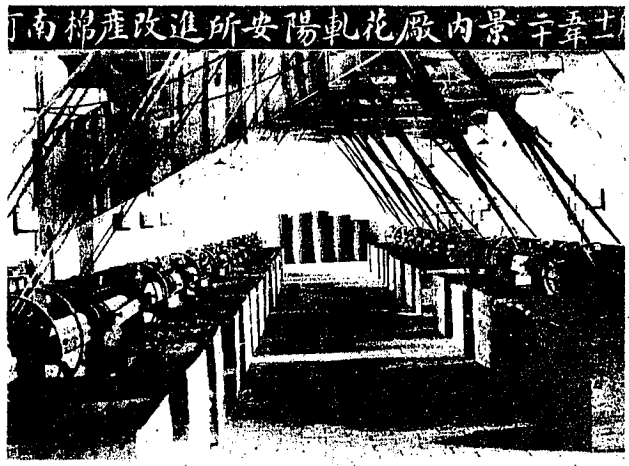


Figure 19

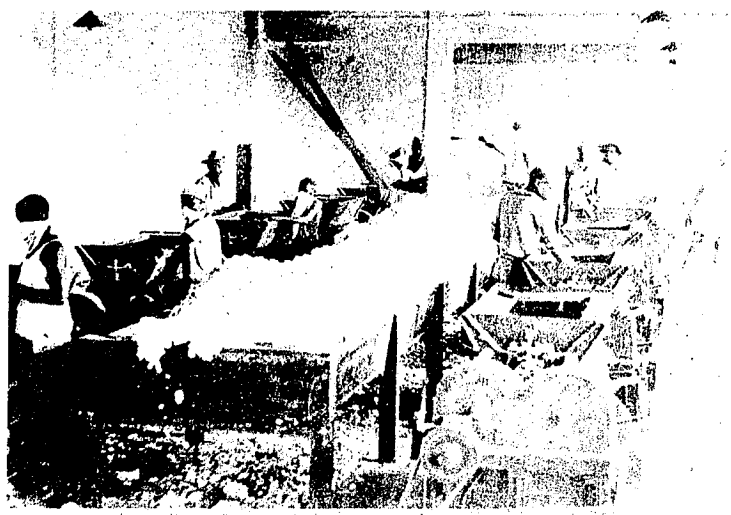
A Chinese roller ginning establishment. Exterior and interior views.

Figure 20.

A roller gin in Syria. Courtesy Mr. Read P. Dunn, Jr., National Cotton Council of America.

Figure 21.

A roller gin in Kenya, Africa. Courtesy Mr. Read P. Dunn, Jr., National Cotton Council of America.



From previous descriptions of the older roller gins of the churka type, it is evident that they were either hand or foot operated. Oriental McCarthy type roller gins have also been similarly powered, and for smoother operation the treadle gins of all kinds seemed to be forced to the use of heavy flywheels. However, very small churkas and the present day laboratory gins may be obtained for hand drive or for electric motor propulsion. The motors have usually ranged from 1/4 to 1 h. p. for roller lengths that vary from 8 to 16 inches.

In the United States limited water power provided means for cotton gin propulsion at a few fortunate locations, but steam engine drives became common until the supply of wood became scarce or other fuels became too expensive, after which electrical and internal combustion engines took over the field. However, natural gas and fuel oils were and still are being used at some steam-powered gins where steamboilers are retained for various reasons.

A few steam-driven threshing engines served to run small cotton gins, while both portable and stationary internal combustion engines of various kinds have been pressed into service. Farm tractors also still provide temporary power for some of the smaller cotton gins in the United States, although such roller ginning establishments are few in number.

Power requirements for commercial McCarthy type gins vary from 5 hp. for a 40-inch roller gin stand plus small drum feeder (refer to figure 14) to as much as 25 hp. per gin stand unit in larger roller ginning establishments that utilize extensive accessories and auxiliary equipment. A simple rule of thumb applying to a roller gin stand only is, for commercial gin, to allow 1-14 hp. for each lineal foot of roller length in the stand, plus 1/2 hp. for each spiked belt draper feeder (refer to figure 15b). Power consumption of other ginning auxiliaries such as conveyors, fans, separators, driers, cleaners, extractors, lint cleaners, and presses are tabulated in cotton ginners handbooks or obtainable from the manufacturers of ginning machinery.

The principal elements of the McCarthy designs that revolutionized roller ginning have already been set forth in Figure 9; namely, 1, the ginning roller; 2, the fixed knife whose working edge bears heavily against the ginning roller at its axis centerline; 3, the reciprocating moving knife which has an arcuate stroke across the working edge of the fixed knife; 4, the seed grid; 5, the pusher board for feeding seed cotton against exposed roller surfaces between the moving knife strokes; and 6, the doffer which clears ginned lint from the ginning roller surface.

Between 1840 and 1900 a surprising number of patents were granted on improvements suggested for one or more of these major elements in addition to the patents that have been listed for McCarthy himself. These inventions endeavored to overcome some of the roller ginning troubles such as the destructive vibration of unbalanced moving knives, difficulties in adjusting and

maintaining overlap and clearance settings, ginning roller bending or lack of stiffness, short life of roller covering, and seed crushing or chipping.

A few of the inventions prior to 1900 will be only briefly mentioned without illustrations. From 1900 to 1957 we have more fully described and illustrated the inventions that are deemed to be of significance as contributing to the field of roller ginning. Foreign inventions and patents are not fully covered because of the lack of reliable information.

1861 - James F. Furguson, Miconopy, Florida, advanced ideas for improved rollers by using spiral winding, together with better ginning by having a more adjustable fixed knife and a vibrating moving knife whose working edge comprised a row of alternating long and short comblike teeth. From that time on some roller gin inventors began to toy with all three ideas in different ways.

1862 - 1881 - The following list of roller gin patents is given for references without description because they do not seem to have introduced significant changes in the arts of roller ginning.

U. S. Patent Number	Name of The Inventor	Date of Patent Issue
36,789	Platt & Richardson	Oct. 28, 1862
1,422 (Re-issue)	H. W. Brown	Feb. 24, 1863
45,695	I. F. Brown	Jan. 3, 1865
51,402	C. Brackell	Dec. 5, 1865
51,892	J. E. Carver	Jan. 2, 1866
53,753	E. A. Cowper	Apr. 3, 1866
58,187	Ackland Mitchell et al	Sep. 18, 1866
89,890	C. G. Sargent	May 11, 1869
121,365	W. M. Henderson	Nov. 28, 1871
140,218	Rushton & Dobson	Jan. 24, 1873
209,049	J. B. Hull	Oct. 15, 1878
245,086	J. P. Miner	Aug. 2, 1881
245,072	A. C. Jennings	Aug. 2, 1881

1889 - D. S. Chapin, Milford, Massachusetts, brought out a roller gin design that placed the fixed knife horizontally above the ginning roller (i.e., 90 degrees change from standard McCarthy practice) and used a rotating bladed beater or multi-bladed moving knife over the fixed knife. This was a sort of innovation on the subject of moving knives, and the idea of a revolving rather than reciprocating knife has from time to time been tried out by other inventors and practical ginners.

1890 - F. H. Chase, Haverhill, Massachusetts, invented two significant roller gin improvements that we have not previously noted in the art. First, he emphasized the construction of the ginning roller by assembling leather or fiber disks with square holes clamped upon a shaft of rectangular cross-section.

And, second, he made up a 4-bladed stripping roller or doffer to operate adjacent to the ginning roller. The blades were at right angles to the rotation. It may be that these disclosures led to rather wide adoption in foreign countires more than in the United States because Egypt in particular had plenty of soft leather from their water buffaloes.

1892 - J. R. Montague et al, Syracuse, New York, went back to rather elaborate churka roller ginning ideas in their design, using a vertical pair of small and large rollers, a fan suction, and several other elements, making the unit quite complicated. This patent, No. 485,015, was issued October 25, 1892, and was granted 15 claims. No reports are available as to whether a roller gin was actually constructed in line with these designs.

1894 - D. F. Goodwin, Valdosta, Georgia, made a design for a double roller gin in which one roller was placed above the other, but employing the standard McCarthy reciprocating knife and other conventional features. For reference, it may be noted that he was granted U. S. Patent No. 530,941 on December 18, 1894.

1895 - Although other inventors seem to have tried out segmental moving knives on long roller McCarthy roller gins, J.E. Coleman was granted a patent on one phase of the idea.

1895 - J. Daig, Gainesville, Florida, brought out an important improvement in fixed knife adjustment for McCarthy type gins. His invention was that of using two special springs that would hold the fixed knife firmly against the roller at fixed pressure. This idea was tested at the U. S. Department of Agriculture Cotton Ginning Research Laboratory, Stoneville, Mississippi, and was found to have considerable merit. A pressure of 30 pounds per inch of fixed knife against the roller gave optimum results. Martin, Townsend, Walton, and Baggette conducted most of the tests during the years 1941-43.

1895 - S. L. Johnston, Boston, Mass., designed a roller gin that was upside down to the McCarthy conventional design. He reversed the position of the fixed and moving knives and added a sort of comb at right angles to the moving knife blade on the cotton feeding side so that it would stir up the seed cotton better.

1899 - J. W. Graves, then a resident of Little Rock, Arkansas, designed a multi-roller gin. However, his radical design will be illustrated in the 1900 group to follow.

1900 - In this year J. E. Cheesman, New York, New York, organized the Cheesman Cotton Gin Company to promote his several roller ginning inventions and designs. He brought out a single roller gin stand on these patents about 1902 for public use. This unit was rather highly publicized. In it he had reversed the position of the knives as was done by Johnston in 1895, but he went all out for eccentrics in place of cranks, and he employed a whole series of

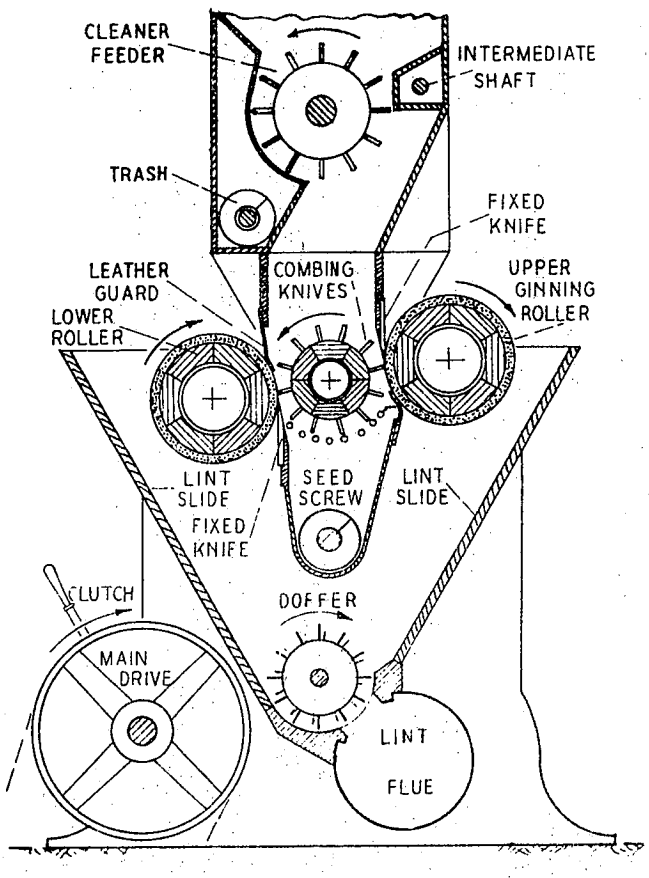
relatively short, eccentrically driven moving knife segments in lieu of one blade. Along with this design of gin stand, which had cast iron end frames and was largely of metal otherwise, Cheesman used a small-drum cleaning feeder with regulated flow of seed cotton. The feeder was not a basket type that came later for saw gins but was an almost 25-year advance over other feeders then being built.

The Valdosta (Georgia) Times, under date of July 18, 1902, was quoted in some advertising pamphlets as saying that 32 of the Cheesman gin stands were being installed at the Valdosta Ginning Company which would then be the largest American Roller Ginning Establishment and that it would be able to gin out more than 100 bales of sea-island cotton per day.

About 1909 Cheesman delivered a special address to the American Cotton Manufacturers' Association in which he detailed a cross-section design of his improved roller gin being manufactured under the name of Empire Duplex Gin. The construction of this second unit of his is shown, in part, by the diagram section given in figure 22.

Figure 22.

Sketch depicting a cross-section of Cheesman's Empire Duplex Roller Gin, showing the rotary comb moving knife inlieu of his segmental reciprocating blades in the 1902 design.



Inquiries have not yet revealed whether there are any of either of the Cheesman roller gins in existence at this late date; but his feeder design and the use of eccentrics were a practical improvement over previous practices.

A reference to fig. 22 will also indicate another far-sighted improvement of Chessman's that lapsedinto obscurity for many years. It was his use of large steel pipe cores for the foundation of the roller wood and covering.

This design would not only eliminate buckling and whipping at higher speeds but also would materially stiffen and strengthen long rollers. With such design the shearing of drive shafts on the rollers could be easily overcome.

Also in 1900 an active figure in roller gin design was Matthew Prior, Watertown, Massachusetts, who used the upside-down McCarthy idea but, experimented over several years with metal ginning rollers and oscillating moving knives of the comb type. One feature that he patented in 1900 was that of an agitating feed bin, at the bottom of which was a reciprocating comb knife. These and other items are shown in the diagram of fig. 23. Among the several roller gin patents that Prior obtained, one that is described for the year 1911 may be of interest.

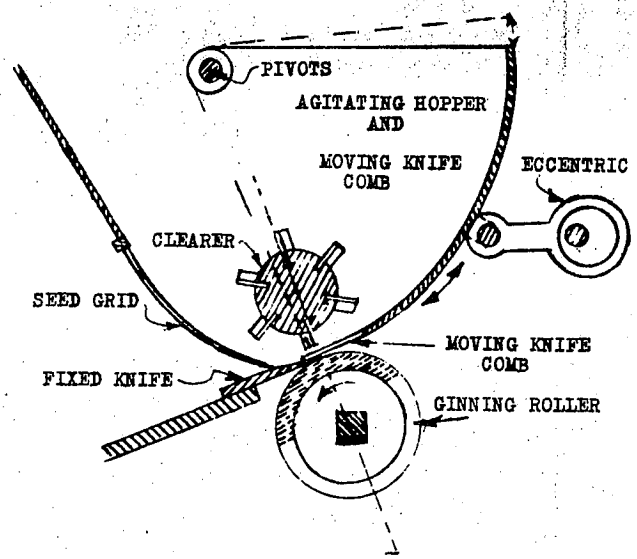


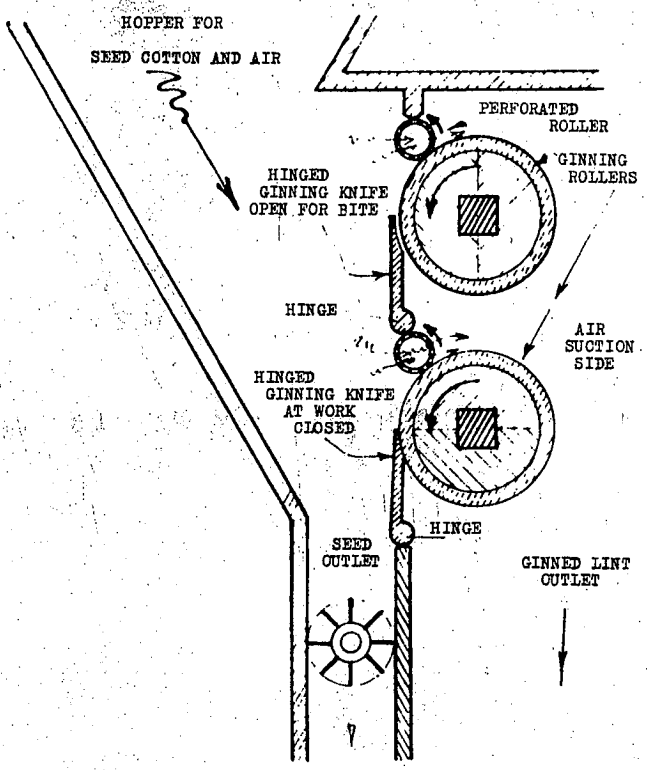
Figure 23.

Diagram section of Matthew Prior's 1900 model roller gin, having an eccentrically driven hopper side with moving comb knife at the bottom, a rotating clearer or agitating cylinder with stub paddles, a fixed knife placed in an almost horizontal plane, and a seed grid opposite the clearer.

During 1900 J. W. Graves, who seems to have moved from Little Rock, Ark., to Covington, Tenn., between inventions, introduced a novel idea for roller gin construction by using hinged knives so that the fiber could be blown between them and the ginning rollers at timed intervals or bites. Graves did not use a rotating or reciprocating moving knife for pushing the seeds from the doctor blade (another name frequently used for the fixed knife, but he did use small perforated rollers above the ginning rollers, and he operated the hinged blades by exterior cams. Figure 24 is a diagram section of the Graves roller gin idea.

As the entire gin stand of Graves was somewhat elaborate the reader is referred to U. S. Patent No. 655,734 issued September 11, 1900, for further details. Although figure 24, shown on the next page, does not indicate some features of Graves' invention, it is well to call attention to the fact that the bites of his hinged blades were in sequence, depending upon how many rollers were used, and that the seed cotton entered into the main hopper through a sealed wheel so that air pressure might be exerted through the perforated small cylinders and blade gaps.

Figure 24.



Model 1900 Graves duplex roller cotton gin shown in cross-section diagram to illustrate the principles employed.

1901 - At San Antonio, Texas, W. H. Wentworth submitted as his invention a fully vertical roller cotton gin. In his design he used six vertical ginning rollers, six vertical fixed knives, and six vertical knives that reciprocated horizontally to reproduce the conventional McCarthy action, plus other vertical elements such as frames, chutes, and the like. A central core supplied seed cotton to each ginning compartment, and all moving elements were propelled by internal and external gearing located about the circular casing. The patent figures indicate a roller gin of size suitable for laboratory use, but with sufficiently large gears it would have been possible to make a 6-roller ginning unit in relatively small floor space. Since a suitable illustration of this invention is not available for reproduction here, the reader is referred to U.S. Patent No, 668,470 issued February 19, 1901. It is believed that the Wentworth roller gin is the only vertical gin of its kind on record.

1902 - C. J. McPherson, South Framingham, Massachusetts, devised a very elaborate roller gin combination that is partially depicted in the two sections given in figure 25. This invention was the first of several duplex roller gins along this general order.

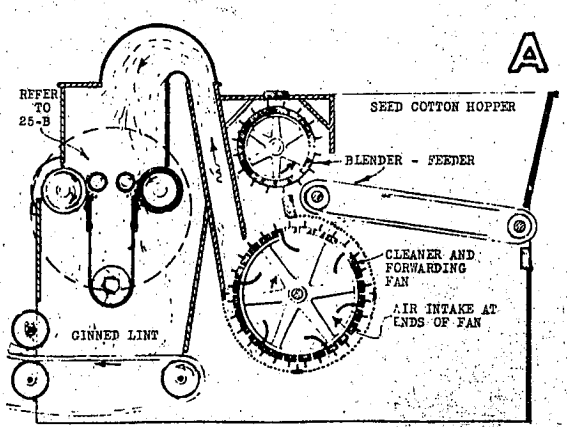
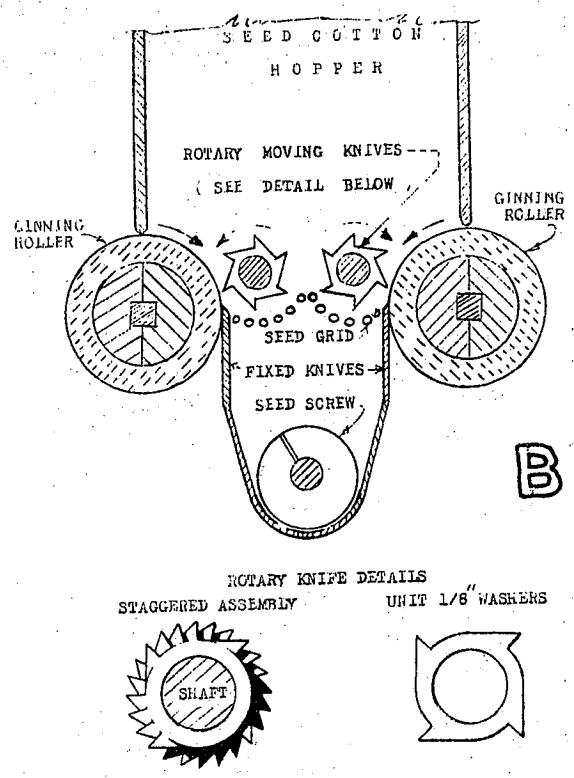


Figure 25a.

McPherson's model 1902 roller gin: A, cross-section of entire unit showing blending and feeding sections, fan deliver to rollers, duplex rollers, and the rotary knives, etc.

Figure 25b.

McPherson's model 1902 roller gin. B, author's diagrammatical enlargement of the ginning section proper, together with rotary moving knife details and other elements not clearly shown in Part A view.



However, McPherson evidently had the spinning mill practices in mind because he sought to convert each roller gin stand into a combination of spinning mill blender, airborne feeder, and ginned lint belt conveyor all in one which would have been, in cost at least, out of the reach of most commercial roller gin operators.

1903 - Multiple roller gins were by this date no novelty although the records show very few conventional McCarthy gins having more than two rollers. However, A. M. Dastur, Jalna, Hyderabad, India, invented a 4-roller gin stand and obtained an American patent on it. When viewed from the end of the gin stand, his rollers were positioned in a sort of vee relationship so that all four moving knives might shrug on a common rocker assembly. Overlap had to be the same for all four fixed knives, and to obtain satisfactory distribution of the cotton to all rollers Dastur employed small kicker rollers, one on each side at the top of the common cotton hopper that lay between the vee form of rollers. In case the reader is interested further in this Indian patent, he is referred to U. S. Patent No. 736,227 issued August 11, 1903.

J. Brandon, New York, New York, during 1903 obtained a patent (No. 731,273) on a roller gin that used eccentrics in lieu of cranks for the moving knife, and he employed a sliding stripping comb across the face of the moving knife. As several other inventors have presented ideas somewhat along the same lines, some of these will hereinafter be mentioned and illustrated.

1910 - J. C. Boesch and J.H.G. Von Oven, Charleston, South Carolina, invented an ingenious combination of moving and fixed knife for their roller gin, which also had a metal roller with diamond grid indentations on its surface as shown in figure 26. The sliding moving knife reciprocated sideways along the fixed knife.

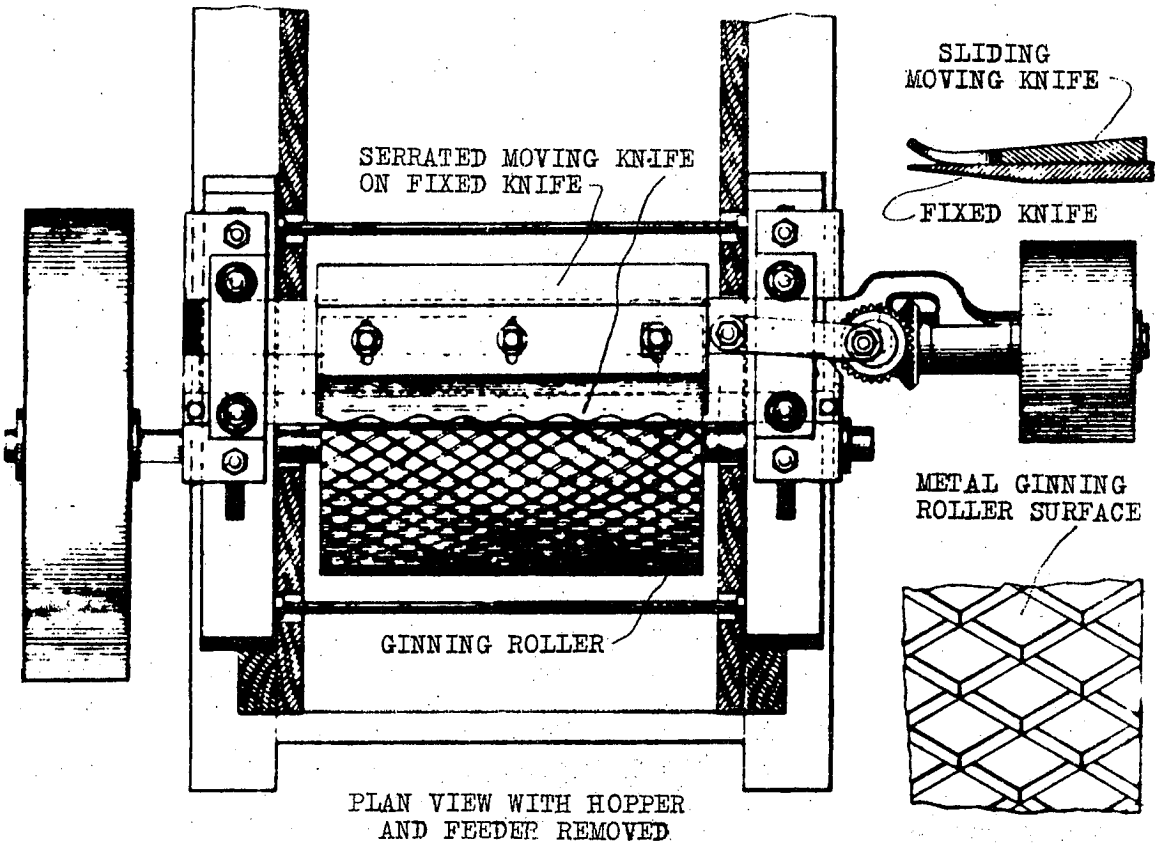


Figure 26.

Plan view of Boesch model 1910 roller gin with side details of the knives and roller. Collar button type of retainers held the sliding serrated moving knife in alignment along the surface of the fixed knife. This gave a mowing machine action, so to speak, for the serrated knife. The inventors claimed that the diamond indentations readily seized the cotton fiber.

1911 - Matthew Prior, Watertown, Massachusetts, was previously mentioned for his model 1900 roller cotton gin. In 1911 he constructed models and obtained a patent on an upside-down arrangement of the McCarthy type roller gin, the position of the knives being reversed so that the moving knife reciprocated downwardly from overhead. In place of a straight blade moving knife, however, he employed the comb type for which he claimed much in actual practice. The model of this invention is now at the Southwestern Cotton Ginning Research Laboratory, Mesilla Park, New Mexico, where the United States Department of Agriculture conducts the roller ginning research. In 1938 when the author had the pleasure of visiting Mr. Prior, who was then almost 80 years old, he learned of Prior's roller ginning activities in the Orient. Prior claimed that bronze rollers with a fine-grained roughness were the best constructions he knew of, but he had obtained excellent clingability for roller surfaces by using alternate layers of grass cloth or haircloth fabrics and canvas pressed into strips somewhat like pump packing and then wound spirally around the roller. Prior also used a 4-flap rubber doffer to remove the fiber from his ginning roller. A small Townsend 8-inch Government model roller gin, obtained about 1941 by Deane Stahmann of Las Cruces, New Mexico, was turned upside down

Prior fashion, and it has been claimed to do very fast and good work.

1913 - S. D. Shepperd, Neward, New Jersey, came out during this year with a very well designed duplex roller gin whose cross-section is shown in fig. 27. In this design Shepperd used rotary moving knives that were constructed of 3-tooth washers which were strung and keyed to their shafts. Plain washers of small outside diameter were placed between the toothed knockers so as to give a combing action as well as a moving knife separation of seed from fiber.

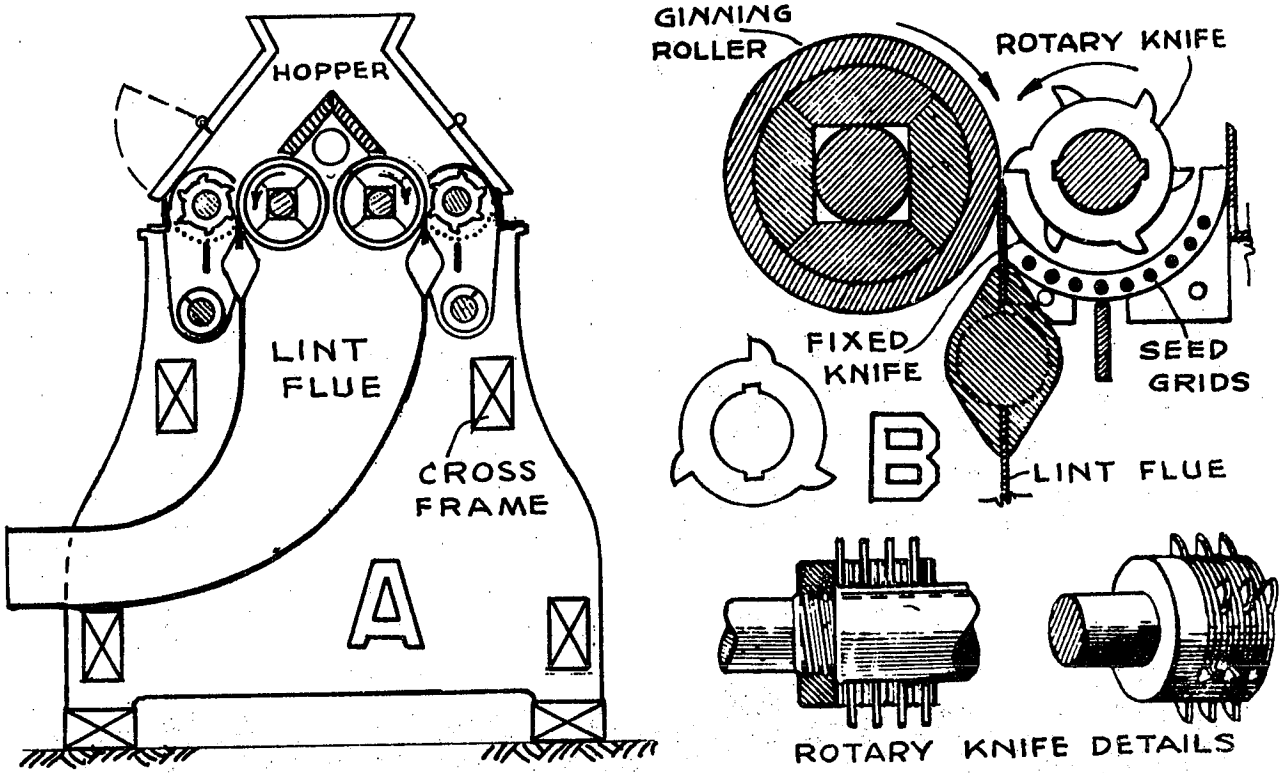


Figure 27.

Section through 1913 model Shepperd duplex roller gin. Note the duplex seed grids and rotary moving knives at each side of the section with the lint flue central.

The Cheesman gin of fig. 22 had a similar form of rotary knife, as did McPherson's 1902 duplex model.

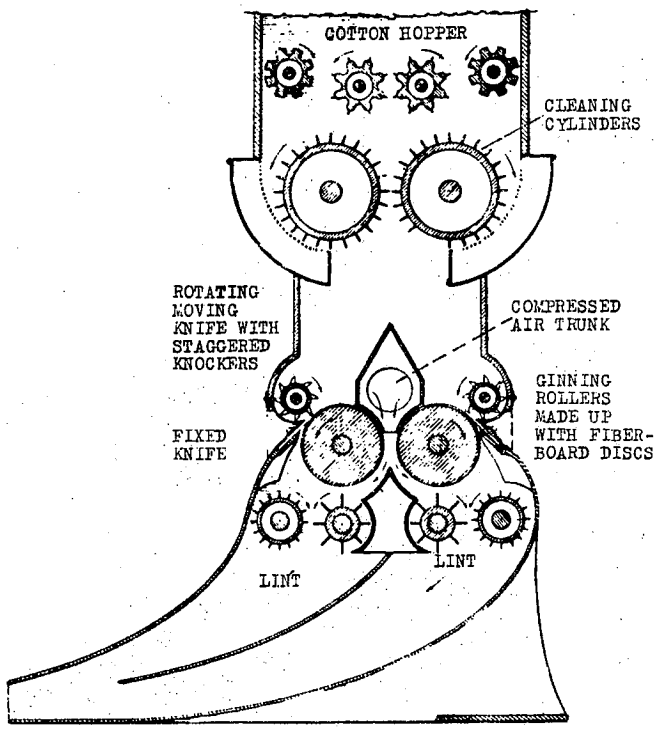
1914 - To obtain better balance and moving knife action, E. G. Trepani, of Liverpool, England, and Adana, Turkey, obtained a U. S. Patent on his idea of using double segmental moving knives to which he added a secondary thin set which oscillated sideways between a heavier moving knife and the fixed knife. He claimed a better balance and a double ginning action.

1917 - The elaborate designs of W. T. Dodd, Brooklyn, New York, during

1917 added another duplex roller gin that could be classified as being of the McCarthy type but which differed from previous inventions such as those of Graves and Shepperd. Dodd, like Cheesman, used a cleaning feeder, but here it was a dual cylinder unit and fed down upon a splitter to serve two rollers. Knocker-type rotary cylinders served as moving knives, and an air blast from beneath the ridge served to keep the fiber stripped from the ginning roller and directed downwardly into a dual gin flue system where the lint was conveyed pneumatically to the press. Figure 28 gives a cross-section of the Dodd unit which will be readily understood.

Figure 28.

Cross-section of Dodd's 1917 model duplex roller gin that had rotary staggered knockers for the moving knives, an air jet doffer and conveyor for the ginned lint, and a duplex overhead cleaner feeder for each gin stand.

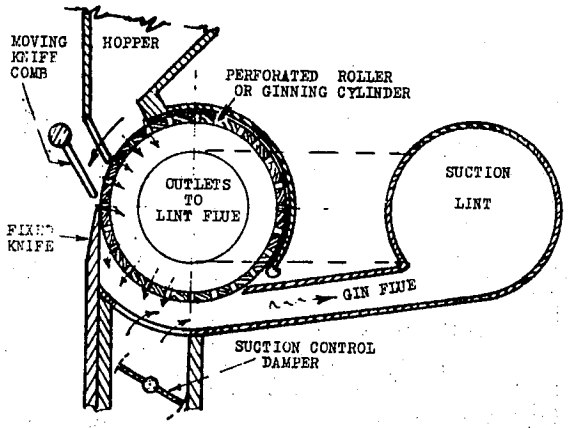


1922 - Although we have no suitable illustration of the invention of W. W. Conway, Humbolt, Arizona, it appears that he invented a churka type of roller gin that was somewhat similar to the Whittimore 1835 model as he depended upon a belting surface and rollers to do the ginning. However, he had a horizontally raking spreader to keep the seed cotton uniformly spread at the gripping point of the belt and roller. Conway was issued U.S. Patent No. 1,408,343 on February 22, 1922. While his gin probably did not have the capacity of the conventional McCarthy, the design would seem to be superior to an orthodox churka roller gin.

Also in 1922 James C. Garner, Houston, Texas, well known for his regin and other cotton machinery inventions, was granted a patent on a very interesting principle of roller ginning that utilized suction in its operation. Figure 29 gives a diagram section of the principles advanced by Garner for this gin. The diagram will show that the action centered upon a perforated roller through which the ginned lint passed enroute to the gin flue. Below the centerline of this ginning roller Garner placed his fixed knife and diagonally above the fixed knife he reciprocated horizontally a comb form of moving knife. If and when ginned lint did pass through the walls of the perforated ginning roller, it was pneumatically carried to the ends of the roller and there discharged in

an auxiliary flue to the main lint stream. Although the author enjoyed many contacts with Mr. Garner on re-ginning and other problems, he was not informed as to whether this suction roller cotton gin was put into field use for any length of time. It is probable, however, that it was thoroughly tested by Garner because he was a practical ginner and ginning designer who was not content to leave his inventions in a paper stage.

Figure 29.

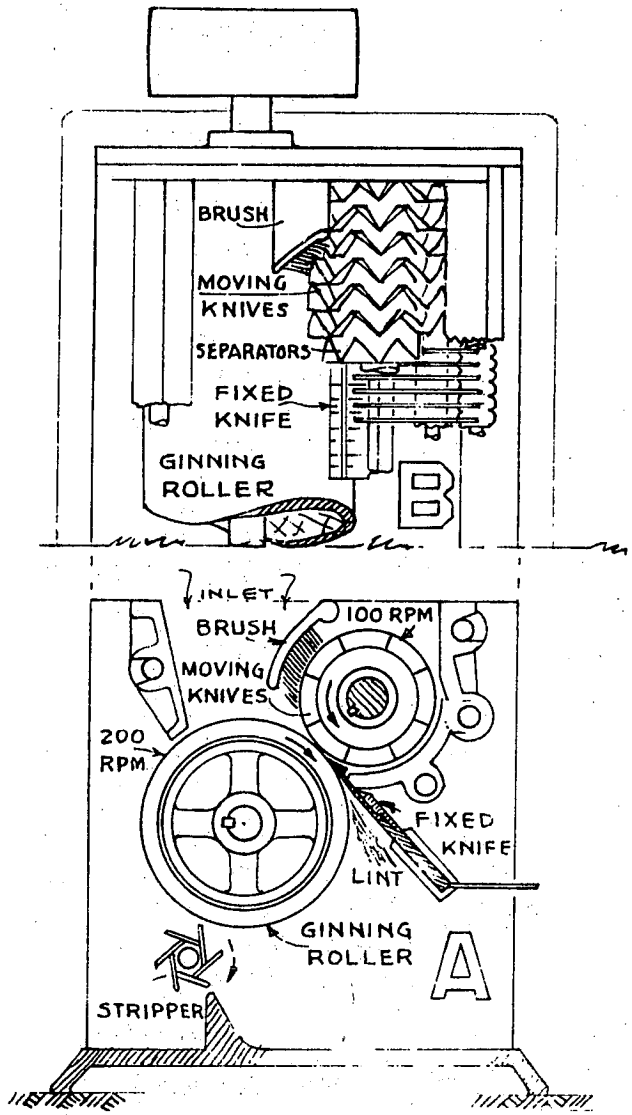


Garner's 1922 model suction roller cotton gin. This sketch section was made during a study of diverse principles which inventors offered for improved cotton ginning and is not one of Garner's drawings.

1923 - H. E. Werner, Houston, Texas, followed Garner with another form of suction roller cotton gin on which he obtained U. S. Patent No. 1,452,667 that was issued April 24, 1923. This patent specification gives a voluminous description, illustrated by 28 figures, but there has been no record of its use by the trade. The designs show a built-in fan, hollow perforated suction rollers to grip the fibers so that a fixed knife would do the work without need for a moving knife. No figure is available for this invention.

1924 - H. Cross and A. Korosinki, Naberth, Pennsylvania, were in this year the patentees of a very unique design of roller gin. In general it followed the McCarthy principles, but it employed a cylindrical moving knife of zig-zag cuffs on a central tube, much like the sleeves of the French dandies in the time of the Three Musketeers. The fixed knives were sections, built up to make one rigid unit, and the ginning cylinder was of rigid design being formed upon a central pipe with wheel and spoke ends. Two details have been here shown as parts of fig. 30 in an effort to convey the major details of this peculiar roller gin. A special feature of this invention seems to have been the roll-box action that would be obtained by the zig-zag disks which formed the moving knives. These were spaced apart by cast washers having the same contours so that pockets were formed between the disks wherein seed cotton could be carried around until fully ginned.

Figure 30.



Model 1924 Cross and Korosinki roller gin. A, cross-section of the working portion of the gin; and B, a plan view of the gin with cutaway segments to display the several parts. U. S. Patent No. 1,490,915 of April 22, 1924.

1925 - As a sort of unclassified form of cotton gin that was strictly neither roller nor saw, but deserves mention at this point, is the 1925 posthumous patent granted to the estate of W. E. Collins, of Houston, Texas. Mr. Collins used two large grooved drums arranged so that an endless wire could form upper and lower grids between the two. These wires ran approximately 3/16 of an inch apart. The lower plane of wires were fed seed cotton from between the drums. This seed cotton was then carried toward one drum where the seed were pinched out between the wires while the fibers were gripped in the drum grooves. On the upper and outer surfaces of the ginning drum, final separation took place between seeds and ginned fiber and the mechanisms. (U. S. Patent No. 1,547,164 dated July 28, 1925).

1928 - As the state of Arizona has long been an intermittent producer of long staple cottons, its roller ginning history has likewise risen and fallen into activities and idle seasons that were not conducive to rapid improvements in roller ginning processes, even if it at times did lead therein. The roller gin invention of Gus Talley (U. S. Patent No. 1,678,794 of July 31, 1928) marks an interesting development. In addition to reversing the conventional position of the fixed knife, Talley brought out a cycle-bar or mowing-machine type of crank-driven knife that moved horizontally along the face of the fixed knife, as did Boesch. The machine design was of high grade craftsmanship and the relatively high cost of the ginning unit may have precluded its extensive use because the claims for its improved operation seem to have been numerous.

Neither photo nor suitable drawing is now available for illustrating this gin, but information has been given that there is a complete Talley gin in existence at Phoenix, Arizona.

McCARTHY GIN DESIGN DETAILS

Concurrent with the ginning inventions and improvements already cited there were advances in better construction of roller gin crank legs and so forth, but the limited quantities of cotton to be roller ginned and the fluctuations in cotton crops did not make for development of lower cost roller ginning machinery. Although eccentrics and rocker arm drives of more balanced types had long been advocated, in 1930 the majority of roller McCarthy type gins used crank legs that were similar to the design drawings given in fig. 31.

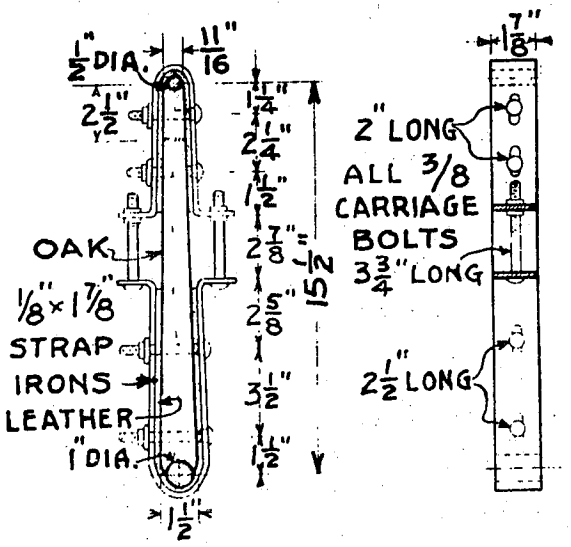


Figure 31.

USDA standard design roller gin crank leg as used on Government research roller gins across the cotton belt.

At Phoenix, Arizona, about 1932, L. A. Brewster, Master Mechanic for the Western Cotton Products Company, devised ball bearing eccentrics and all metal crank legs for their roller gin stands. Micarta wedges were used in the wrist pin bearings for the moving knives. The Brewster design, with dimensions as given by Brewster to the U. S. Department of Agriculture Cotton Ginning Research Laboratories, are shown in figure 32.

From 1938 to 1944 there was an increased interest in roller ginning in the Southwestern states to such an extent that the art of roller ginning received an impetus in improved designs and equipment.

Overhead cleaning, extracting, and drying equipment began to be used rather extensively. Pneumatic elevator droppers, inherited from saw ginning days of yore, were frequently used in handling seed cotton from the trucks or

storage to the overhead machinery because they were of ample capacity for roller gins and were simple to maintain.

In Governmental research one of the Ginning Laboratory machinists, Ray C. Young, now mechanical engineer at the Southern Regional Research Laboratory at New Orleans, devised a special selflubricating roller gin crank leg, part of which is delineated in figure 33. Young also devised a well-housed splash lubricating system and housing for the main bearings of the roller gin stands.

New designs of improved roller gins were brought out during this era by two United States firms, one being a standard 40-inch unit and the other a 54-inch stand. Figure 34 gives two diagrams of the crank, roller, and other drives used in the 40-inch Streun-H.E. gin stand.

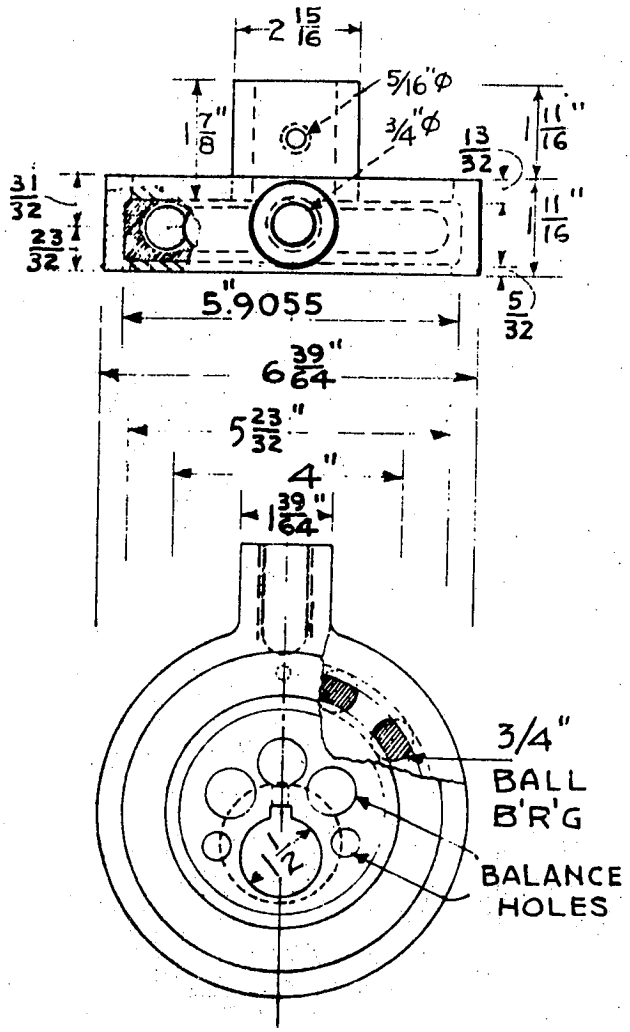
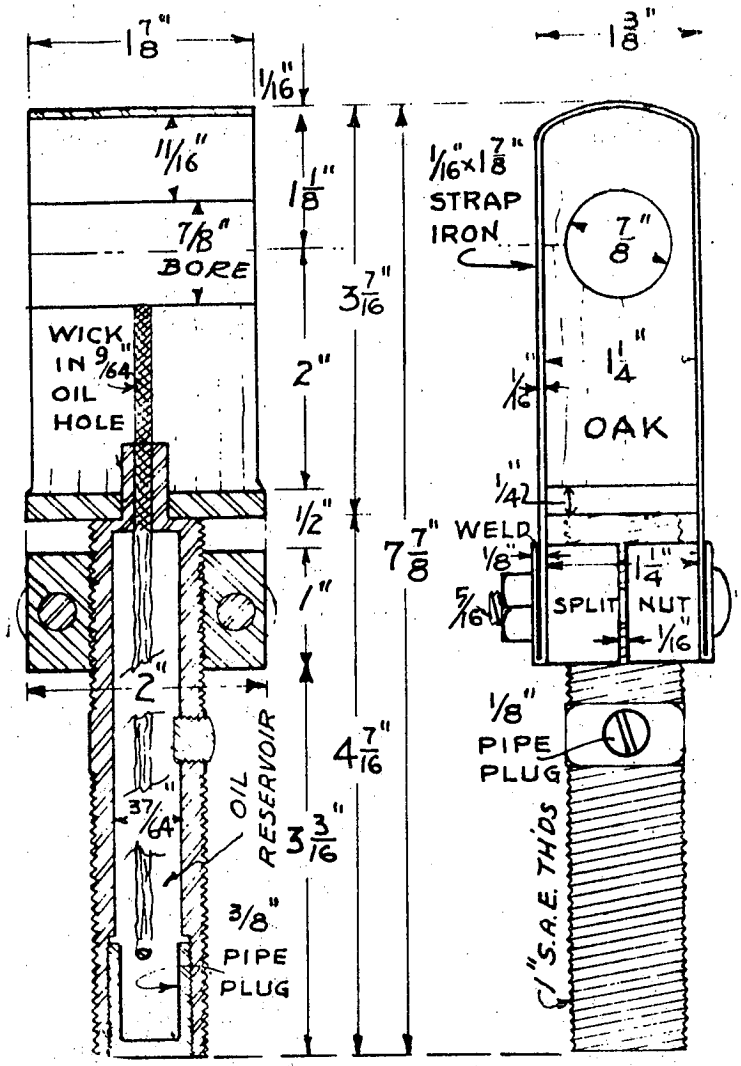


Figure 32.

L. A. Brewster's 1932 model ball-bearing roller gin crank eccentric for McCarthy type roller gins.

Figure 33.

Upper portion of Young's "Honey" model 1942 hollow crank leg for McCarthy type roller gins in governmental tests. The nickname of "Honey" came from the bear and hollow tree idea where the bears found the honey. This design was a real honey in the tests.



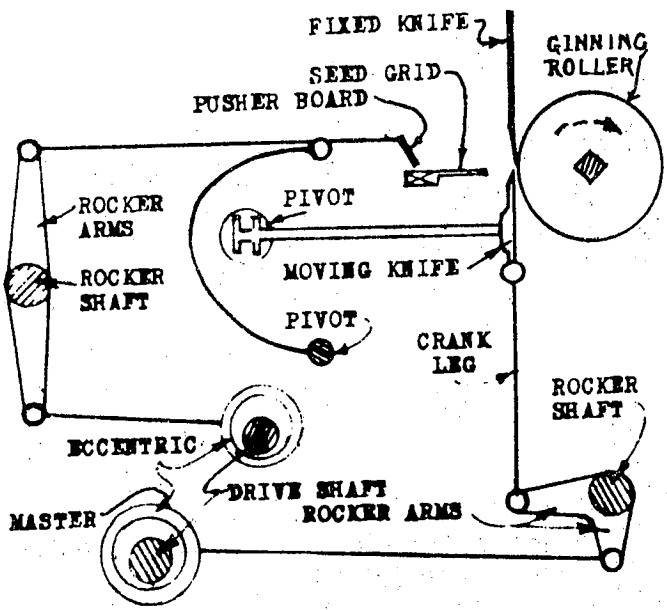


Figure 34.

Diagrams of the late John Streun roller gin as made by the Hardwicke - Etter Co., of Sherman, Texas.

In order to eliminate some of the troubles attendant to the reciprocating moving knife, the Foss double 60-inch roller gin was provided with a link motion as diagrammed in figure 35.

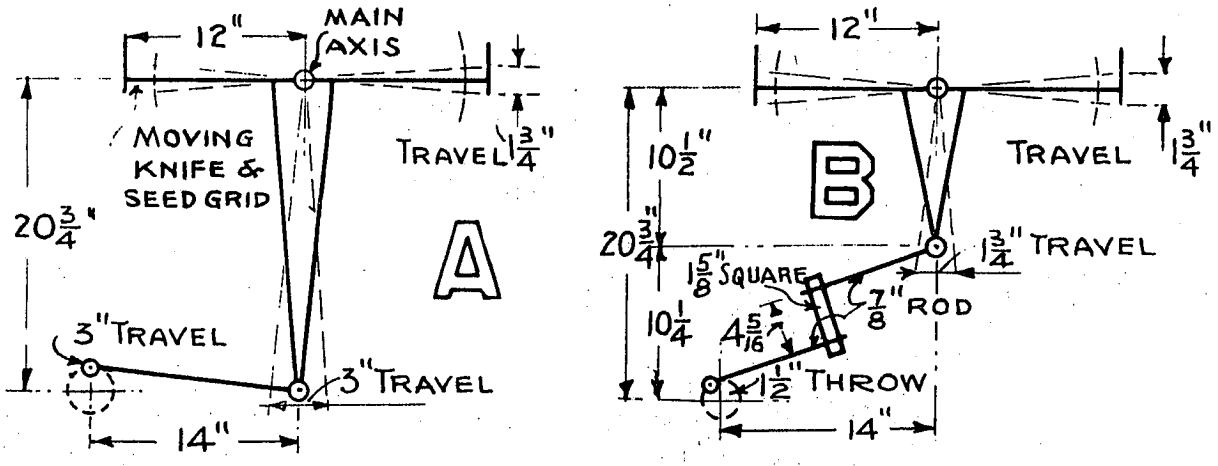


Figure 35.

Diagram of the moving knife links and drives of the Foss Sea Island Cotton Gins; A, old style system, and B, the improved method.

In 1941 when interest became greatly renewed in roller ginning, the late John Streun of Sherman, Texas, developed a commercial roller ginning unit at the Hardwicke-Etter Company's factories and made use of a master eccentric and rocker arms in order to obtain a sturdy moving knife mechanism and other elements. Their present Chief Engineer, Dick Shelburne, contributed materially to the designs and improvements, all as indicated in figure 34.

British roller ginning manufacturers also made marked construction improvements in their gin stands. One, for example, was that of the Platt Bros. Co., from whose catalog the fig. 36 has been here shown, with acknowledgment to that firm.

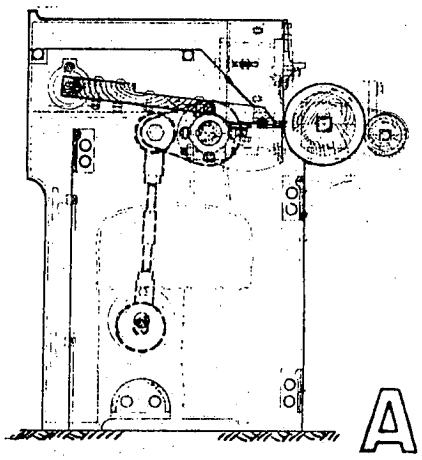


Figure 36a.
Improved roller cotton gin of the Platt Bros. Co. Cross-section through the gin stand.

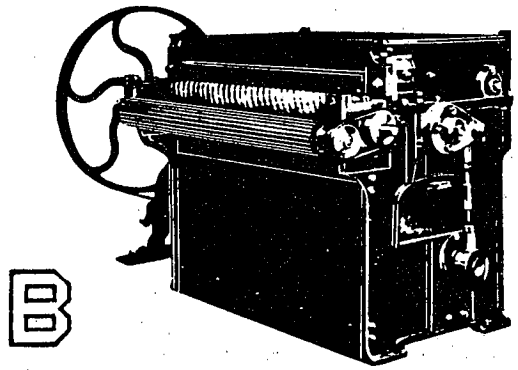


Figure 36b.

Improved roller cotton gin of the Platt Bros. Co., end view of the stand showing eccentric and rocker arm.

Double roller gins, other than the American Foss, have usually employed somewhat different methods of rocking their central assemblies of combined knives and grids so that both rollers are in constant operation. A catalog illustration of this taken from literature on the Middleton British-made gin that was purchased by the Department of Agriculture for experimental tests is shown in fig. 37.

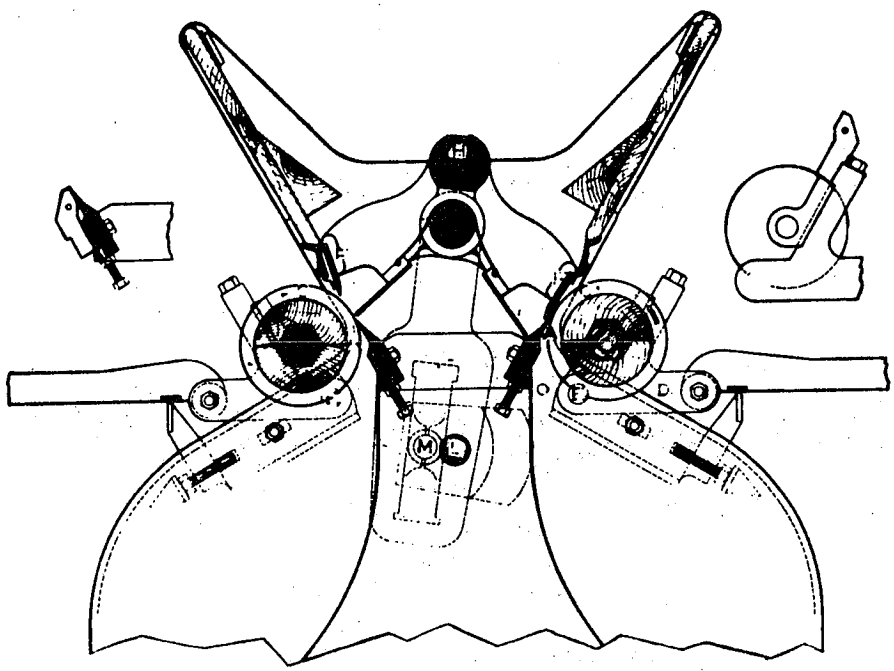


Figure 37.

Catalog diagram of partial section through the Middleton double roller cotton gin now at Mesilla Park, New Mexico.

In research tests of 1942 at Stoneville, Mississippi, Dr. Waldo H. Kliever successfully demonstrated the possibilities of operating moving knives by means of electric solenoids.

Since the revival of roller ginning in the United States during the early forties, roller ginning construction has been materially improved by the adoption of ball and roller bearing eccentrics, direct drives, or better rocker arm devices, and other elements such as controlled feeders and the like.

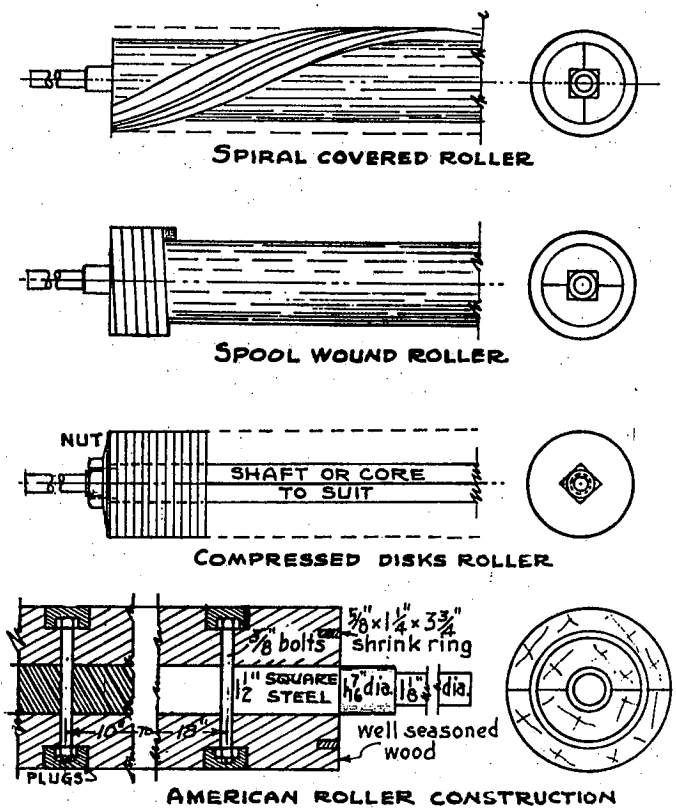


Figure 38.

Forms of covering and roller construction commonly used in the United States from 1932 to the present time.

Ginning roller construction differs from one part of the world to another because each cotton growing region seems to have different makes of roller gins and local covering materials of their own for the rollers.

Prior to 1940 in this country, most of the ginning rollers were covered with walrus hide which is imported from England and is quite expensive. The three most common forms of roller gin coverings used in the U. S. are shown in figure 38, which also depicts the construction of the wooden core that is bolted to the driving shaft. These types of construction and coverings have been fully tested at the Ginning Research Laboratories. Both the spool and spiral types of windings are well known, but leather or composition disks have not been so widely used in this country.

In March 1941, the Department released a report, ACE No. 85. 1/ which was authored by Townsend, Walton, Baggette, and Martin of the Stoneville Staffs and which afforded very valuable information pertaining to optimum methods of ginning roller covering. Prior to that time the Laboratory had promoted the use of composition packings that comprised multiple plies of heavy cotton, canvas, and rubber cut into rectangular strips of from 5/8- to 7/8-inch working depths when attached to the wooden cores of the rollers. Black rubber was at first used but some stains resulted from it, and white rubber then came into use. This type of covering has proved to be more economical and uniform than walrus hide, and the use of the latter has subsequently dwindled. The subject release, ACE 85, "Development of Roller Covering

1/ -- Out of print.

for Roller Cotton Gins," is here reproduced, with illustrations renumbered to maintain sequence and other minor changes.

NEW METHOD OF COVERING ROLLERS (ACE No. 85)

Since the roller gin has been in use, walrus hide and many kinds of composition including rubber packing have been used as a covering on the roller of the roller gin. Of these, walrus hide has proven most satisfactory but has been found short-lived and recently very expensive. Efforts to find a longer-lived and more economical material which would do equally good or better ginning have been carried on for some time. Recently an improved method of using rubber packing for covering the roller has been devised.

When the Pima Egyptian cotton was first planted in the Salt River Valley of Arizona, the walrus roller covering was used there exclusively, but the ginners found that the life of this covering was very short, making ginning too expensive.

About 1900, a roller with a strip of friction paper inserted between the strips of walrus hide was shipped to the Valley. This combination doubled the life of the roller, and the Pima Seed Association at Tempe and other ginners in Arizona used this roller for a number of years. About 1918 the paper was replaced by a wider strip of rubber packing which reduced the amount of walrus hide, making the roller less expensive and easier to build, but more susceptible to backlash. 2./

During the past 10 or 12 years the Arizona ginners have been trying to use an all-packing roller, but the backlashing on this sort of roller prevented satisfactory operation. Static electricity was causing most of the trouble. Two of the all-packing rollers have been used on the gins in Florida for sea-island cotton. By using the slow speed "doffer" to take the lint from the roller excellent results have been obtained there. The "doffer" not only prevents backlashing, but it straightens the fibers and gives smoother ginned lint. 3./

On account of the static, this "doffer" cannot be used satisfactorily in Arizona or any hot dry climate as the flaps on the "doffer" take the static from the roller, causing some of the lint to stick to and be carried under the roller and then dropped into the seed. Therefore, it is necessary to devise some means to place a small amount of moisture on the bottom side of the roller, just enough to dampen the surface but not enough to wet the fabric. Any ginner knows that a damp cloth held on a roller for a few seconds will stop backlashing promptly. Not only will the moisture stop the backlashing, but it will allow a

2./ See multilithed report, "Roller-gin Construction, Maintenance, and Operation." August, 1940

3./ See multilithed report, "Roller-gin Construction, Maintenance, and Operations".

continuous bat of cotton to come over the rollers; and then, when the bat is taken off by the "doffer", the grade is improved and ginning capacity increased.

If the "doffer" is to be used under present installation conditions, most of the existing roller gins would have to be raised about 24 inches from the floor to allow the ginned cotton to remain under the gin until a sufficient amount collects to make one charge for the press. If this is not done, the lint will have to be moved too often to be practicable, or the "doffer" would accumulate the lint under the roller and thus cause backlashing.

Since walrus leather is costly and difficult to obtain, the industry has reached the point where it is imperative to replace it with some other material. Indications are that the rubber packing when properly used is the best and most economical substitute.

On account of this need for a substitute for standard walrus leather covering for gin rollers, a number of different makes of rubber packings have been tried out at the U. S. Cotton Ginning Laboratory. The results indicate that two of these packings can be used successfully and that as much or more cotton can be ginned per day with them as is ginned on the walrus covering The tests also indicate that the packing costing about half as much will last longer than the walrus leather.

Both of these packings can be obtained commercially at any time and in any quantity, the price ranging from 50 cents to 75 cents per pound, depending on the quantity purchased. Both of these packings are 5/8-inch thick by 5/8-inch wide, but the manufacturers will cut the material to any other width desired and, no doubt, they will make it in any thickness. A packing 3/4-inch x 3/4-inch may be preferable as fewer strips could be used, and the extra thickness on the roller would insure a longer life to the roller.

When using this packing for roller covering, the most important thing to consider is the method of attaching it to the roller. At present the usual method with all packing is to "spool wind" and since this is the quickest and easiest way, it is used by some of the ginners who are trying it out. However, the Laboratory (Stoneville) has found that "spool-winding" is not the best method for several reasons. The pressure which the roller gin's "fixed" knife exerts against the roller produces extreme heat, which tends to soften the rubber in the fabric, after which the constant pressure which is lengthwise on the strips will cause them to stretch and become loose from the stock. When this occurs the strip may bulge and be torn from the roller by the moving knife, or at least be lumpy and irregular. It has also been observed that when the packing encircles the roller, the knife is directly in contact with the rubber which is between the layers of fabric, causing considerable backlashing, and at the same time making the roller difficult to "break in".

After several methods of attaching the packing to the roller had been tried, the most satisfactory one found was to make one turn per full length on

the roller, which places the packing almost at right angles to the knife so that the pressure of the knife is against the side of the strip; and as each strip is backed up by another strip, it cannot be stretched lengthwise as is the case in "spool-winding". Also, when the knife is in this position, it tends to push the fabric over the rubber and prevents sticky rubber from coming in contact with the lint, thereby reducing the backlash.

Although there are enough good reasons for using the "one-turn" method of attaching the packing to a roller, "spool-winding" will undoubtedly be practiced by those ginners and gin manufacturers who need the easier and quicker methods, because the "one-turn" requires more time and skill to do a good job. However, if the "spool-winding" method is used, it is suggested that the strip be stretched tightly on the stock and that a lot of glue be placed under the strip. Also, the wood pegs should be driven through the strip into the stock every three or four inches. This will help to hold the packing on the roller should it tend to stretch and become loose.

A packing roller will gin as much or more cotton per day than will the walrus leather or half-and-half combination, but in order to do so, and at the same time obtain good ginned lint, it is necessary to cut V-shaped grooves on the surface of the roller. These grooves should make one diagonal turn and should be spaced from 1-1/2 to 2 inches apart, about 1/8-inch deep and 3/16-inch wide. The purpose of these grooves is two-fold; namely, they prevent abortive seeds and motes from sticking under the knife; and they provide place for the fiber to enter readily under the knife, assuring a constant flow of fiber over the roller, thereby increasing production.

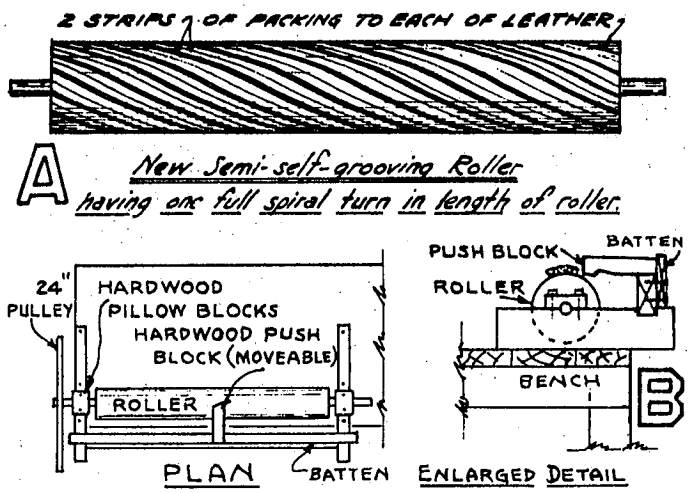
Some ginners claim that it is not necessary to groove a roller and assert that if the knife is set below the center of the roller the lower edge will gap or open sufficiently to allow the abortive seeds and motes to pass under and be carried over with the lint. This may be quite true if all the working parts of the gin would remain in the same position after they have been set, but there is a constant wearing of both the roller and knife which must change the vertical position of the knife and cause the gap to close and the knife to rest tightly against the roller. It is also true that the knife may be opened too much when setting and thereby cut or chip the seeds.

To meet this covering and grooving problem, a packing roller designated as a "semi-self-grooving-roller" has been designed and developed at the U. S. Cotton Ginning Laboratory. This roller is constructed with a strip of 3/16-inch to 1/4-inch leather belt between every two strips of packing; and since the leather is softer than the packing, it will wear down faster than the packing; and its surface will stay just below the packing surface, thereby serving as a groove to clear the knife of abortive seeds and motes, or other foreign matter which may be in the seed cotton. Refer to drawing, fig. 39a.

Two of these rollers were operated intermittently for four weeks on a

Figure 39.

Special roller and covering rig, designed by the U.S.D.A. Cotton Ginning Laboratory, Stoneville, Mississippi; A, improved semi-self-grooving roller; and B, outline of home-made rig for applying the covering materials to the roller.



sea-island gin in Florida, each roller ginning approximately 70 bales before it was necessary to open the grooves, which was quickly done by cutting out a small piece of the leather strip. These leather strips, alternating with the packing, are spaced just the proper distance apart and the soft leather makes an ideal place for grooving and can be easily and quickly cut with a parting chisel. An important fact is that this method of grooving leaves the surface of the roller smooth, in which condition it remains until worn out. This leather strip method of grooving does not cause any extra wearing of the roller as in the case when the roller is grooved across the strips on the surface.

It is important to understand the proper construction of the wood core or roller "stock" to which the packing is attached. In some gin plants a number of rollers have been laid aside, which if properly constructed, had sufficient packing left on them to gin forty or fifty more bales. These rollers were discarded on account of a loose spindle or mashing on the ends, which caused the roller to wabble. If a little more time and care were spent in constructing a roller "stock", it would save both money and time later when the roller is needed most.

Specifications for building a roller "stock" have been released by the U. S. Department of Agriculture. 4./ This stock should be built of well seasoned red or black gum or any cross-grained wood that does not split. It should be fairly hard so that the spindle will not mash the wood on the end and cause the roller to wabble. However, the ideal roller "stock", and the one which has given the best service is a black gum stock which is constructed by boring a 1-1/2-inch hole through a piece of green black gum and driving a steel shaft through the center. This rough roller with the bark still on is stored in a dry place until the wood dries and shrinks on the spindle. This drying may take three or four months before it is ready to be turned.

4./ See multilithed report, "Roller-gin Construction, Maintenance, and Operation". August, 1940.

In order that the strips of packing will lie close together on the roller, it is necessary to bevel the sides of the strips. This can be done either by grinding or by cutting down with a jack-plane. When the plane is used, the strip is stretched and nailed to a workbench having a batten fastened at the back of the strip to keep it in place. Instead of making the bevel only on one side of the strip as most do, it is suggested that both sides be beveled to make a symetrical wedged-shaped strip.

A home-made rig (please refer to fig. 39b, page 38) can be built with which to hold the roller firmly while each strip of packing is being stretched and pushed tightly against the next one. This is very necessary when a thin strip of leather is to be inserted between the strips of packing, because the leather can be held in place only by being squeezed between the packing strips and by being glued on the bottom where it lies upon the stock. On the left hand end of a good workbench a short 2-inch x 4-inch crosswise runner is secured to the bench, and a similar one is fastened at a spacing to allow the roller stock to lie between. Two hard wood pillow blocks are bolted to these crosswise runners, and the ends of the roller shaft are clamped in place in the blocks. A 24-inch pulley is placed on the left end of the shaft, overhanging the workbench so that the roller can be pulled forward against the friction of the clamped boxes as the work proceeds. On the bench in front of the roller, a lengthwise 2 x 4 is fastened down so that its top is level with the center line of the roller and kept about 1-1/2-inches from the stocks. On top of the 2 x 4 is placed a hard wood 3/4-inch by 2-inch batten whose back edge is flush with that of the 2 x 4. The batten may be screwed or bolted to the 2 x 4. A hand-tool hard wood block, 3/4-inch x 2-inch x 4-inch should be made, having one end slanting to fit the curve of the covering strips on the roller and the other end square to rest against the batten. This hand tool is used to push each strip tightly against the one which has been previously placed upon the roller stock.

The roller is laid off for the first strip by driving small nails part way in at each end of the roller, both being in line parallel to the shaft. A string is tied to one nail and passed around the roller to the other nail, making one complete spiral turn. A marking line is then drawn along the string and the string is removed. This line is the position of the first strip. A 1-inch glue brush is used to paint a band of glue along the line for the first strip and to apply glue for the succeeding strips. A strip of packing is started by driving a 6d common nail through the end of the strip at the end of the roller, stretching the strip along the line until it reaches the other end of the roller and fastening it with another nail, then starting at the first end and driving a nail every three or four inches along the strip. After two strips of packing have been attached, the leather strip is then placed alongside the packing and held in place by driving a small nail in each end. Then a strip of packing is started at the left end of the roller by placing the angled end of the push block against the packing and the other end against the hard wood batten, and by pulling the roller forward, the packing and leather strip are forced tightly

against the two strips which are on the roller. This is followed by another strip of packing which is pressed on in the same way and after two of these have been attached, another leather strip is used. This procedure is repeated until the roller is covered.

The following table give the relative quantities and costs of different methods of covering rollers for roller gins and shows that the new packing-belting roller covering is inexpensive as compared to any form using walrus leather.

Table I.
Cost of Material
For Covering a 40-Inch Gin Roller on a Stock 5-Inches in Diameter

Type or roller	Material	Amount	Unit Cost (1941)	Cost	Total Cost
All packing	5/8 x 5/8 packing	18.0 lbs.	$ 0.75	13.50	13.50
Packing and belting	5/8 x 5/8 packing	16.5 lbs.	0.75	12.38	
	single ply leather belt	44.0 ft.	0.06	2.64	15.02
	3/4 x 3/4 packing	19.6 lbs.	0.75	12.70	
	single ply leather belt	43.0 ft.	0.06	2.58	15.28
1/2 walrus and 1 2 packing	Walrus	11.5 lbs.	1.80	20.70	
	5/8 x 5/8 packing	9.0 lbs.	0.75	6.75	27.45
All walrus		23.0 lbs.	1.80	41.40	41.40

Note: 6d common nails, glue, and hardwood pegs are also needed, but the amount of these materials required will be the same regardless of the type of roller covering shown here. The LIFE of 40-inch all packing covered rollers ranges from 200 to 250 bales per roller.

Figure 40 shows an improved and more elaborate roller covering rig which is recommended for ginners having several rollers to cover. Its advantages are: (1) a uniform stretch can be secured on packing, and (2) one person is enabled to cover a roller without assistance in turning roller or stretching packing.

The first improvement is pusher "B". This was added by placing on top of the lengthwise 2 x 4 a piece of 1-1/2 x 1-1/2 x 1/8-inch angle iron with one flange on the ends turned up and welded so as to form box ends through which a 5/16-inch rod is bolted. A short piece of 2 x 1 x 3/16-inch channel

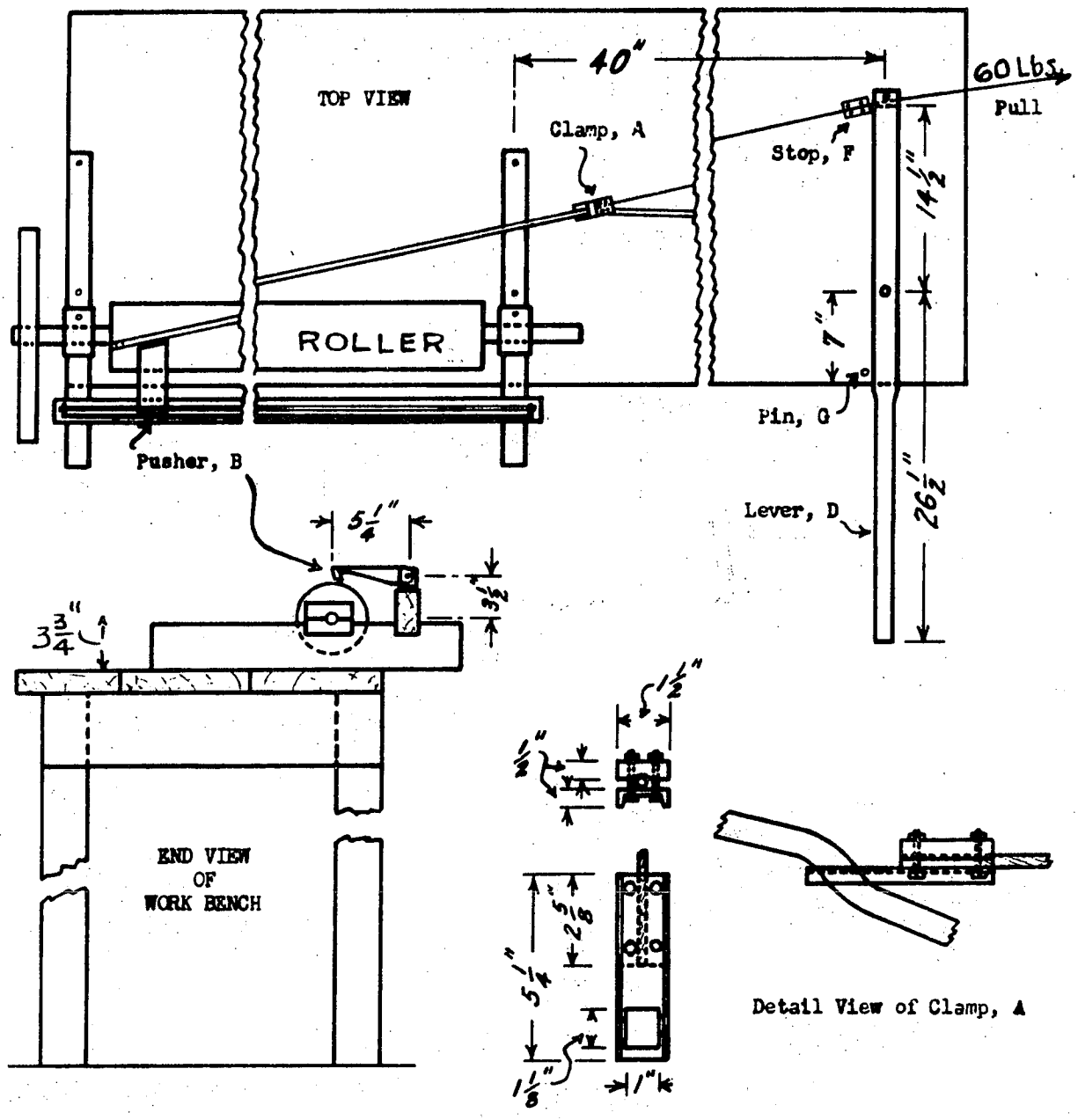


Figure 40.

Townsend's improved roller covering rig of 1941. This outfit comprises a work table or bench, bearings, Clamp A, pusher B, Lever D, stop F, pin G, and a 60-pound weight, all as described or shown.

iron is placed on this 5/16-inch rod so that it will slide. The flanges on the other end of this channel iron are so cut out and the back bent straight down to a right angle and on such an angle that it will fit against the packing which lies on the roller at approximately 24 degrees from the center line. On this part

of the pusher that is bent down, four holes are drilled and tapped for 3/16 x 6/8-inch sharpened machine screws, inserted so that their points make contact with the packing.

The second improvement is in the method of stretching the packing by means of a clamp, cable, weight, and lever. Clamp "A" is attached to cable "C" which passes over a small pulley and is fastened to a weight which is free to move up and down. The arm of lever "D" is moved to the right and fixed with pin "G" raising weight and allowing clamp "A" to be slipped on packing about 6 inches from right end of roller. Pin "G" is then removed to allow the weight to exert its force on packing. The roller is then turned one revolution and packing is nailed to the right end of the roller. The arm of lever is then moved back to the right releasing the pull of the weight and the packing is cut off. The strip which has just been laid on is nailed to the roller using pusher "B" to press it firmly against the previous strip. In order to place the packing on the roller so that the strips will lie close together, it is necessary to bevel the sides of the strips. Since this is a tedious and difficult job with a jack-plane, the laboratory has developed a beveling machine as shown in fig. 41.

It consists of a coarse emery wheel, an adjustable guide, and a small wheel to press down on the packing so that it will not be displaced when the emery wheel strikes the side of the strip. The machine can be improved by placing a circular saw on one side of the emery wheel. If this is done, the packing is fed in so that it will be hit first by the saw which should be slightly smaller in diameter that the emery wheel. The saw takes off most of the material and the emery wheel finishes and gives a smooth cut. This results in faster work and less clogging of the emery wheel. The saw cannot be satisfactorily used alone as it leaves a rough jagged cut. A low speed is recommended because the emery wheel has a tendency to clog up and burn the material at high speeds. Satisfactory results were secured at 800 to 1000 rpm with an emery wheel of 8 inches diameter."

(End of ACE No. 85).

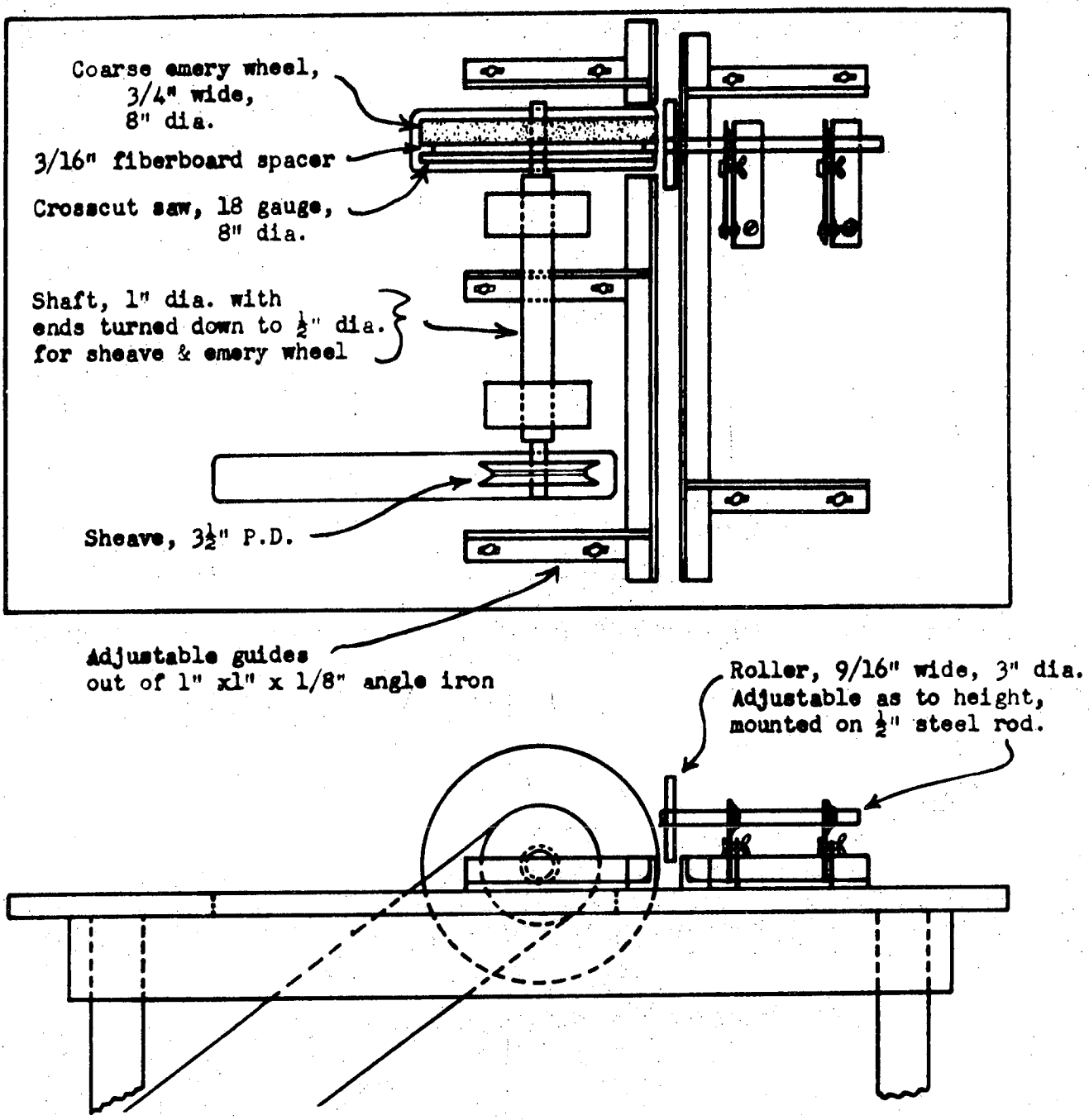


Figure 41.

Machine devised at the U.S. Department of Agriculture Cotton Ginning Laboratory, Stoneville, Mississippi, for cutting a bevel on the sides of the roller covering strips to facilitate their application to the roller.

MISCELLANEOUS ELEMENTS IN McCARTHY ROLLER GINS

Auxiliary elements in McCarthy-type roller gins have not shown much change during the years except in the case of the doffers which have largely changed from stationary to rotary types. The 1900 form of the McCarthy gin, as previously described in fig. 9, utilized a drag form of doffer to clear the ginned fiber from the roller and to prevent carryover. Brush sticks from saw gins were later used on some roller gins in lieu of the drags, and in the work of the late James S. Townsend the Department developed a rotary doffer shortly prior to 1930 which was later improved somewhat by him at Stoneville, Mississippi, and is shown with the brush doffer in figure 42.

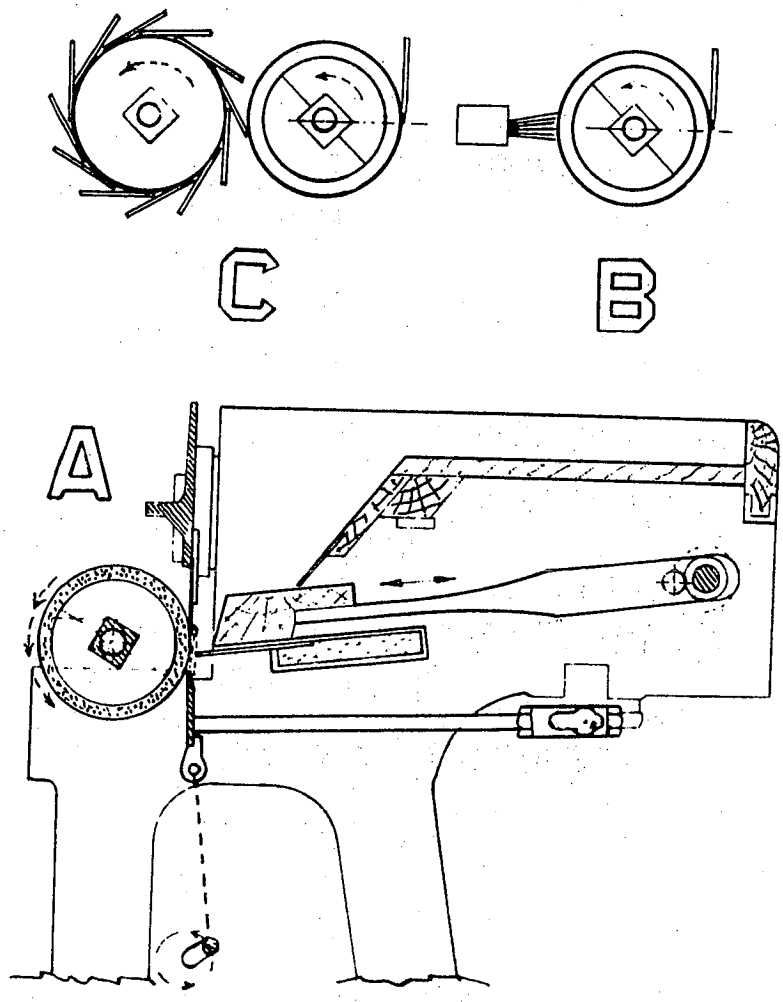


Figure 42.

Section through a current single roller McCarthy type gin, with types of doffers used in the United States at present; A, the cross-section of the stand whose well known elements need no special nomenclature; B, brush type doffer; and C, rotary wiping type doffer which uses soft rubber or composition

blades.

It will be noted in the section that the pusher board has its own reciprocating drive and that it rests upon a seed grid that is free to oscillate or chatter as the pusher moves to and fro. The complete details of the gin cranks and legs to the moving knife have been omitted from these details since the crank legs have previously been portrayed in figs. 31, 32, and 33. In double roller gins the seed grids are carried integrally with the moving knives and their spacings for seed discharge are arranged to suit the varieties of cotton to be ginned. Improved models of American-made cotton gins such as the present Murray and Hardwicke-Etter units provide for ample agitation of the grids to afford rapid shedding of the ginned seed.

Static electricity disturbances have been common to roller gins, frequently causing the ginning fiber to adhere to the ginning rollers and cause "backlash" and carryover, as well as to accumulate in objectionable clumps and wads at various points in the system.

Much research work of very creditable nature has been conducted by Physicist Clarence Leonard and associates at the Department's Southwestern Cotton Ginning Research Laboratory in Mesilla Park, New Mexico, from 1952 to date. The findings have been extensive and have been officially released so that no attempt will here be made to do other than make brief note of some of the factors.

To obtain good doffing from the ginning rollers, it has been found that high potential static eliminator bars, such as are used in the textile industry, afford a means of counteracting and overcoming static. Such bars are placed parallel to and slightly above the ginning roller so as to create an ionized area adjacent to the roller without obstructing the flow of the lint, but very careful adjustments must be made in order to obtain satisfactory operation. In the arid and irrigated regions of Texas, New Mexico, and Arizona, these bars have proved to be somewhat effective, although not widely used. These bars have also been used at the lint slide of the condensers in saw gins with varying success.

A second method of static elimination has been that of moisture application by water mists or steam vapor. The Department's Research Cotton Ginning Laboratories conducted many tests in the late thirties with various spray nozzles, atomizers, and other moisture applications across the Cotton Belt and their effectiveness was well demonstrated. Dr. Earl Heard, now a leader in the Cotton Textile Research in the Southeastern States, rendered a very valuable service to the cotton industry in his work while he was in charge of the Textile Department of the Texas Technological College at Lubbock, Tex. His cooperation with the Department of Agriculture Staff of the Stoneville, Laboratory is cheerfully recognized and appreciated.

A steam vapor application to roller gins, as a typical example of this

form of static counteractant is shown in fig. 43. In the experiments of the Department, Dr. Heard and several ginning manufacturers it was found that where a relative humidity of the atmosphere within the roller cotton gin buildings could be maintained at 45 percent or more, the static disturbances were generally eliminated. To that end the use of moisture mist nozzles, damp filters at air intakes and windows, spraying nozzles on suction telescopes as the cotton was drawn from the trucks and trailers, and even sprays at the overflow bins were employed.

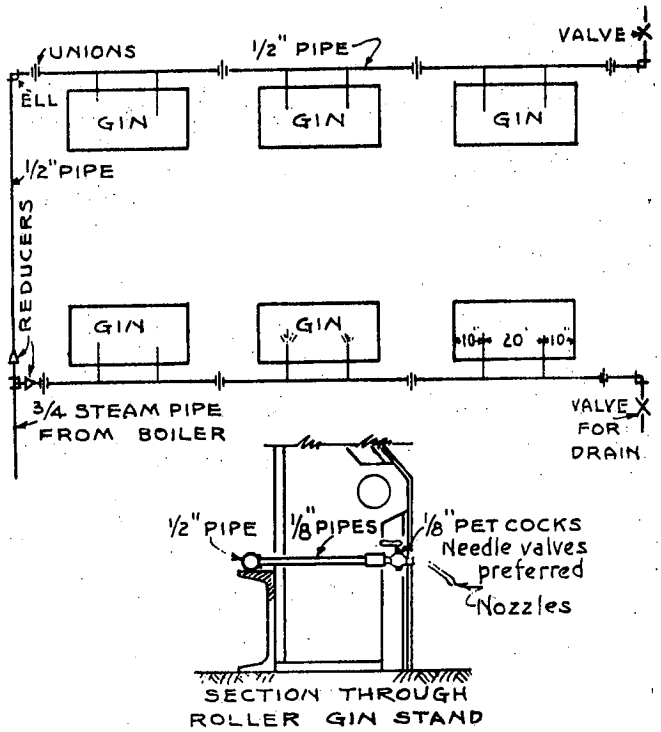


Figure 43.

Steam vaporizer method for static elimination and improved roller gin operation as used in the Southwestern States during 1940-44. Courtesy the Hardwicke-Etter Company.

The power necessary for compression of the ginned lint into bales was found to vary inversely with the moisture content of the ginned lint, and after many field tests by the research staffs of the Department's cotton ginning investigations, a standardized method of applying approved wetting agent solution on the cotton lint slides to the press was developed by the Laboratories. These, when correctly operated, added not more than four pounds of moisture to the bale, but the abuse of this beneficial system, as perverted by greedy individuals who wanted to sell water, has caused considerable controversy.

As of the present time, 1958, the roller ginner is well acquainted with the methods for static elimination, roller moistening by vapor and air conditioning requirements in the cotton gin building.

Leonard's findings in regard to the grounding of the moving and stationary parts of cotton gins have also been of great benefit to the industry in reducing insurance costs.

At the Southwestern Cotton Ginning Research Laboratory of the Department a comprehensive setup of the roller ginning equipment is maintained for experimental and research activities. The diagram of arrangement of the machinery is, in part in fig. 44, here shown to give a clearer picture of the

machinery combinations. These are now generally accepted systems in the roller ginning industry.

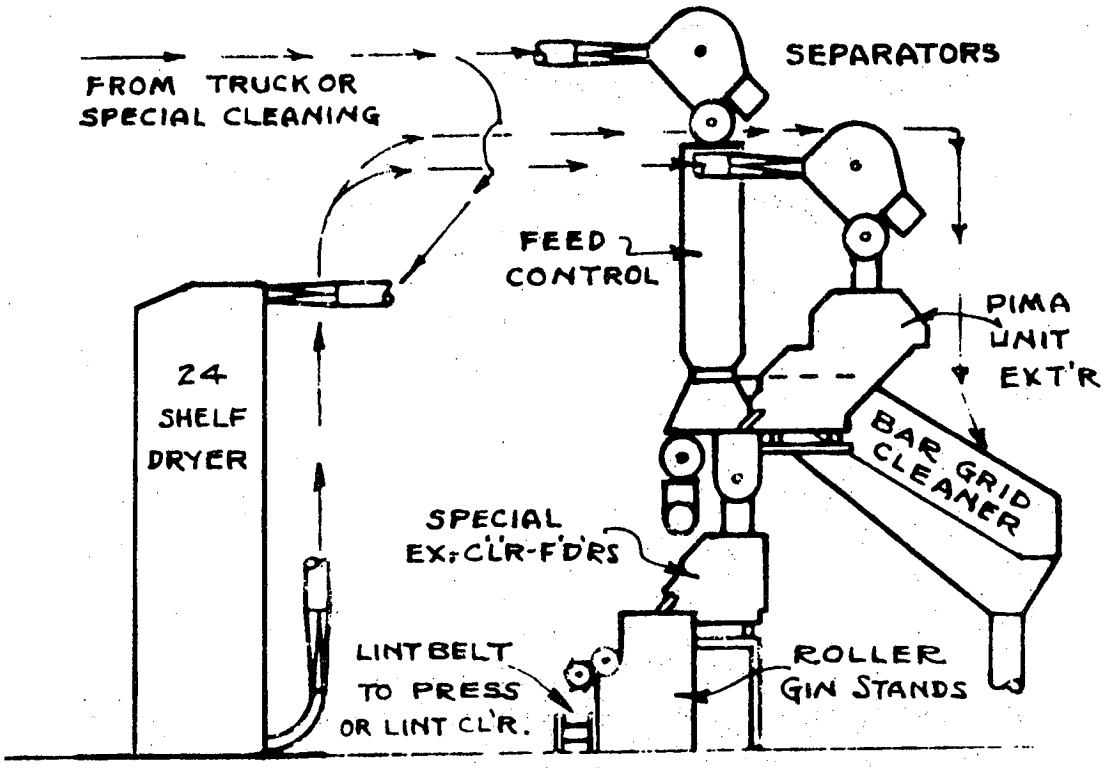


Figure 44.

Line diagram of the roller cotton ginning research setup at Mesilla Park, New Mexico, for research studies in drying, cleaning, and extracting prior to roller ginning, and lint cleaning immediately thereafter.

Artificial drying of long staple seed cottons for roller ginning in the Southwestern States of Arizona, New Mexico, and Texas, between 1932 and 1940 was principally and infrequently accomplished by warm air blown across a down discharge screened chute that conveyed seed cotton from distributors to the ginning feeders. After 1940 the increasing use of Government-type vertical cotton driers in saw gins also spread to roller gins, since which time they have become familiar to the entire cotton industry of this nation.

The feeders now used by modern roller gins in these states and in the Southeastern States of South Carolina, Georgia, and Florida are of the type known as cleaner-extractor-feeders that are provided with feed regulation suitable to roller gins. Many such installations have employed these feeders as overhead platforms for bulk handling of the cotton flow, after which it is fed to the distributors and again reduced to small supplies delivered through regulation to the gin stands. This method is also employed in the Laboratories of the Department. Figure 45 shows a "Pima Unit" type of overhead cleaner-

feeder-extractor.

As an alternative to full pneumatic lint handling as done at the San Carlos gin in 1942-45 by the Laboratory, the Murray Company of Texas, Inc., developed a satisfactory system that combined a lint conveying belt at floor

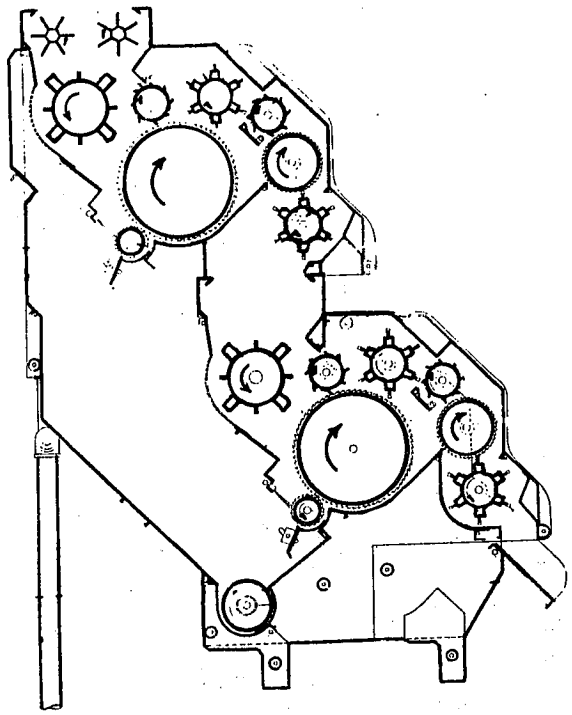


Figure 45.

Mitchell Pima Unit. Courtesy of John E. Mitchell Company.

level below the ginning rollers, with an airblast jet to blow the lint from the belt discharge to a lint cleaner and the condenser. In this system the lint falls from the ginning rollers in an open stream into the belt box and is then conveyed mechanically to the point of pickup where an inverted airblast nozzle receives the lint and pneumatically carries it to lint cleaner and condenser in the same manner as in saw gins.

Figure 46 is a photograph of such a combination lint belt and airjet pickup in experimental use at the Southwestern Cotton Ginning Research Laboratory.

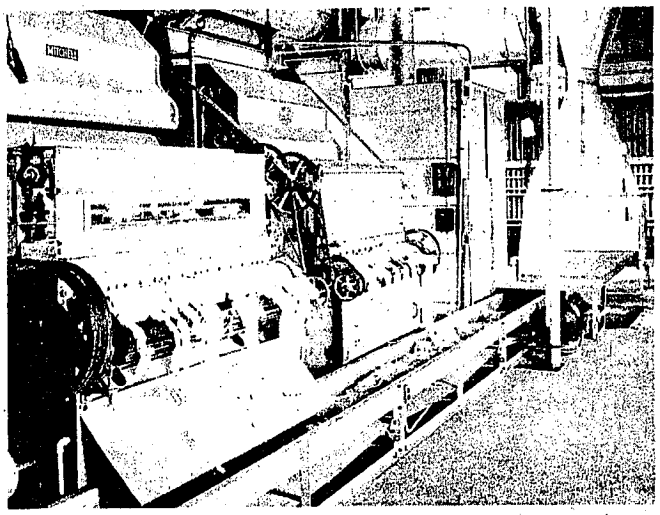
The first known use of commercial lint cleaners on roller gins was accomplished in 1952 at the USDA Southwestern Cotton Ginning Research Laboratory. Individual tests were made with Murray air-centrifugal and with Lummus super-jet pneumatic types of lint cleaners inserted in the lint flue between pickup nozzle and suction condenser of the roller gin laboratory press.

Another commercial development in conveying ginned lint from the rollers to the press is exemplified in the 1958 model submerged lint flue system of the Community Gin Company, Glendale, Arizona. Mr. Andy O'Neal,

inventor of this system, employs a pressure nozzle and aspirator design of lint doffer to deliver to the submerged lint flue and press.

Figure 46.

Lint conveying belt from roller gin stands to airblast pickup nozzle and thence upward in pneumatic lint flue to lint cleaner and condenser. Government Photo No. 12-53-194 by Leonard.



Foreign makers of McCarthy roller gins have experimented in the field of pneumatic applications to roller gins, including seed cotton handling, feeding and dust collection. From a 1936 catalog of Platt Bros. & Co., Ltd., of Oldham, England, given to the writer by Mr. Fred Taylor, we take the liberty of showing their drawing and our lettering on their worthwhile dust collection system as per figure 47.

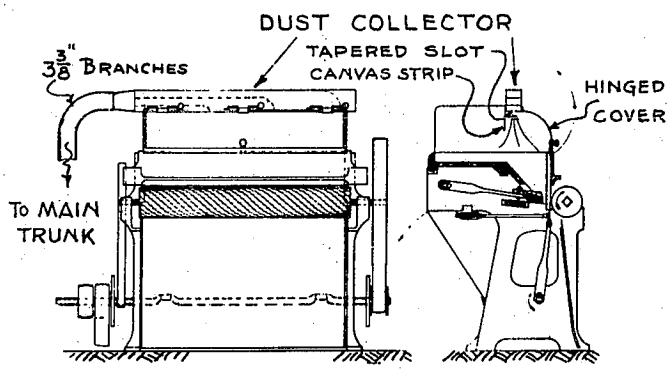


Figure 47.

Front elevation and cross-section showing pneumatic dust extraction system for McCarthy roller gins. Courtesy Platt Bros. & Co. Ltd., Oldham, England.

In concluding Part I of this engineering review, mention is due regarding present day roller gins which embody a number of worthwhile improvements. Some of the modern roller gins of the United States are depicted in figs. 48 49, and 50; and an Israeli motor-driven roller gin battery recently installed at Ramat-Hasharon, Israel, shows the roller ginning modernizations of the mid-East.

This Israeli roller gin is housed in a cement block building, uses a single-box-up-packing press, and Mitchell Pima Units for cleaning.

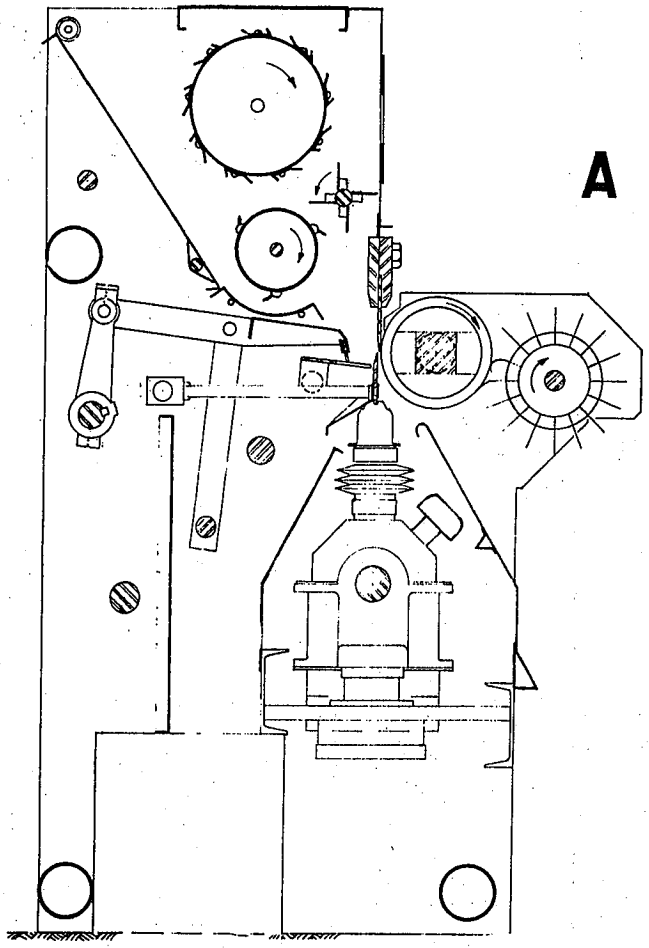
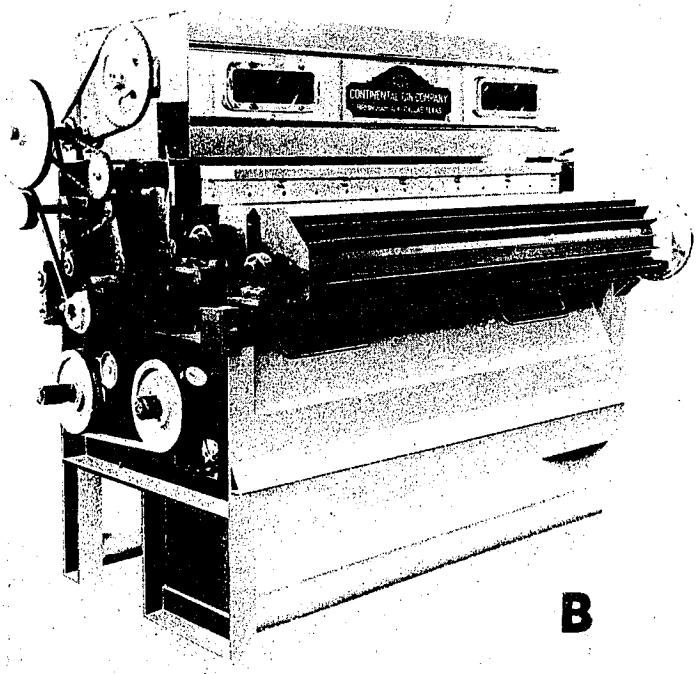


Figure 48a.

1958 model Continental roller gin used on the 1958-1959 crop of long staple cottons. Cross-section of 60-inch gin stand. Courtesy of Continental Gin Company.

Figure 48b.

Isometric photo of the 1958 model Continental roller gin used on the 1958-59 crop of long staple cottons. Courtesy of Continental Gin Co.



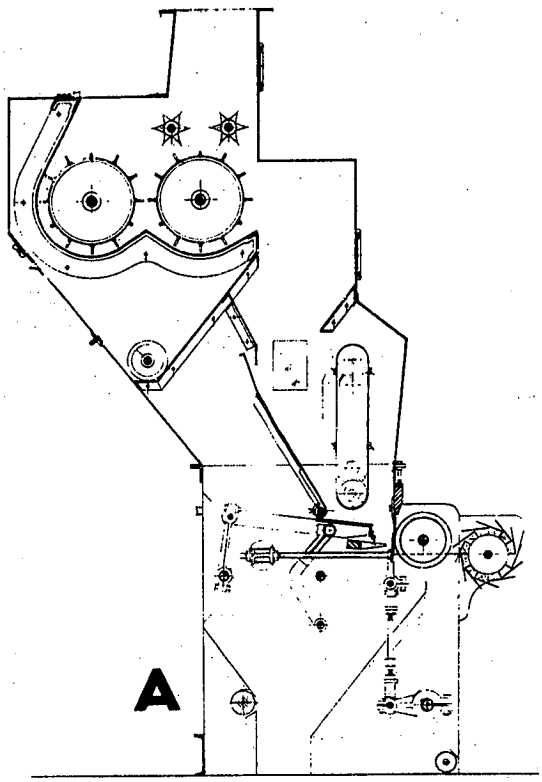
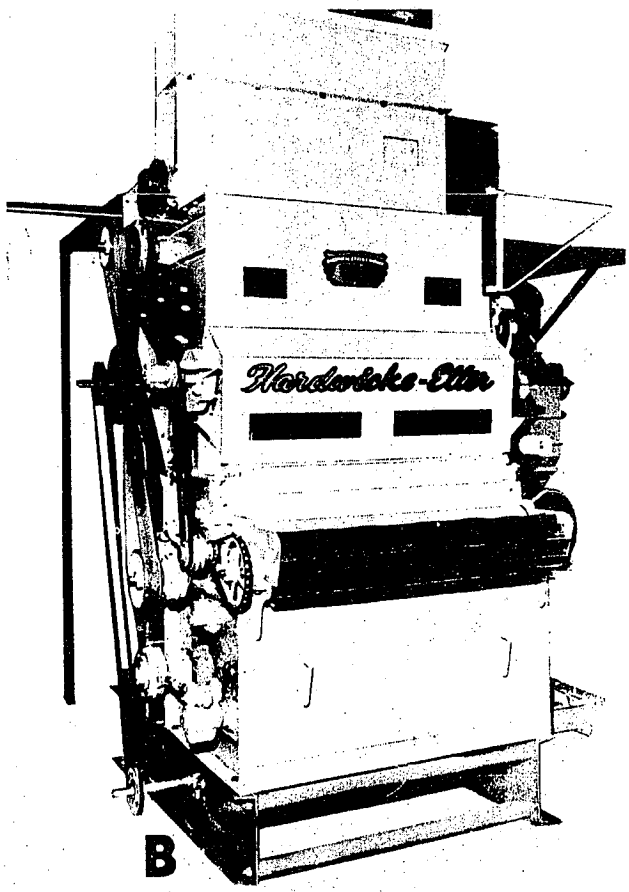


Figure 49a.

1959 model Hardwicke-Etter roller gin used on 1958-59 crop of long staple cottons. Cross-section courtesy of Hardwicke-Etter Company.

Figure 49b.

Photo of Hardwicke-Etter 1958 model roller gin used in 1958-59 crop of long staple cottons. Courtesy Hardwicke-Etter Company.



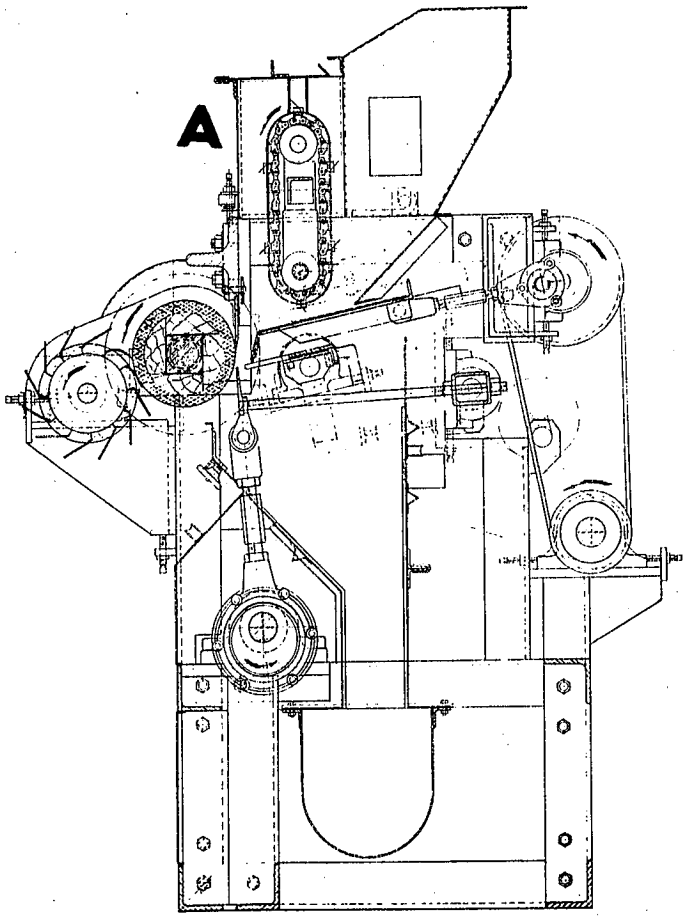


Figure 50a.

Cross-section of gin stand of the 1958 model Murray roller 60-inch gin used on 1958-59 crop of long staple cottons. Courtesy The Murray Co. of Texas, Inc.

Figure 50b.

Photo of 1958 model Murray roller 60-inch gin used on 1958 - 59 crop of long staple cottons. Courtesy The Murray Co. of Texas, Inc.

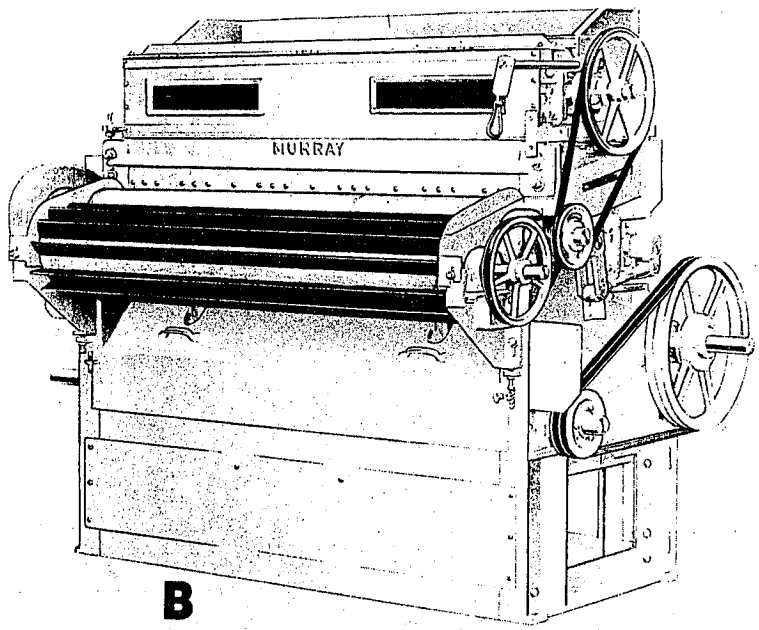


Figure 51.

A modern Israeli roller cotton gin with individual motor drives on each gin stand, as located at Ramat-Hasharon, Israel, Courtesy of Mr. Elliot Geffen formerly of Brooklyn, N.Y.

Part II

U.S. D.A. ENGINEERING DETAILS AND DATA

Introduction

The following sections amplify previous references to certain activities of the U. S. Department of Agriculture from 1930 to 1958 during that period of its engineering research and developments in roller cotton ginning. They are intended to afford details and dates not elsewhere available from formal official publications. Some current work also is mentioned. In a few instances research records and studies that have not been previously published are included. Research workers and agencies most active in the work include:

Former Bureau of Plant Industry

James S. Townsend*
Dr. Chalmers J. King*

Former Bureau of Agricultural Economics

F. L. Gerdes
C. S. Shaw
W. J. Martin
A. J. Johnson

Former Bureau of Agricultural Engineering

C. A. Bennett
G. N. Franks
C. L. Kellenberger
R. G. McWhirter
R. Hartley
T. L. Walton
T. L. Baggette*
J. E. Harmond
W. S. Kimbrell
H. T. Montgomery
V. L. Stedronsky
R. C. Young

Agricultural Engineering Research Division, ARS

David M. Alberson
Charles A. Bennett
Victor L. Stedronsky
James M. Williams, Jr.

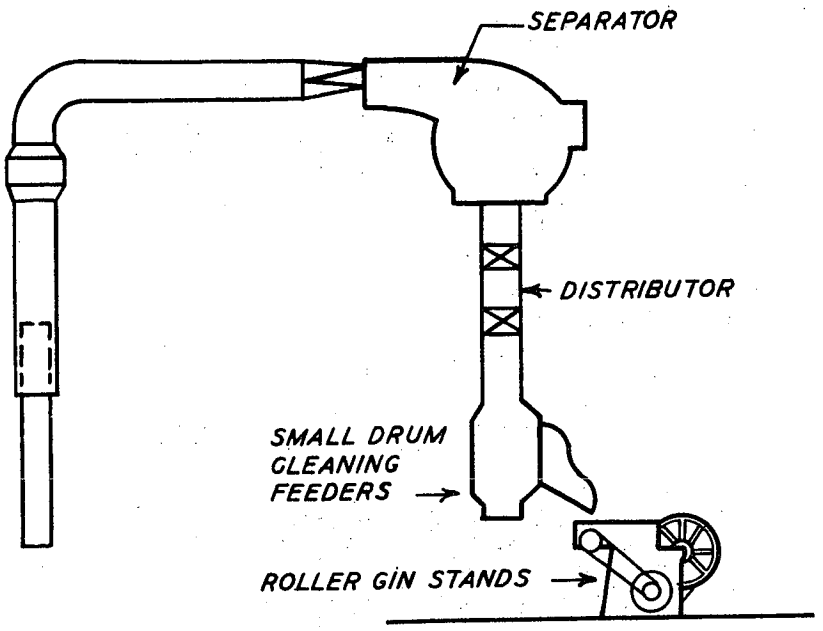
* Deceased

Reference books, bulletins, and catalogs to which acknowledgements are due include James L. Watkins', "KING COTTON", 1908; USDA Bulletin No. 1319, "GINNING PIMA COTTON IN ARIZONA", 1925; J. S. Townsend; and catalogs of Continental, Murray, Platt Bros., Empire Cotton Gin Co., and others as acknowledged in illustrations.

Engineering research on roller ginning started at Stoneville, Miss., in 1932, and expanded in the same year to include the USDA Cotton Field Station, Sacaton, Arizona, where it was concurrently conducted with equipment in part transported from Stoneville. From 1932 to 1945 all of the studies

herein reported were cooperative between the three bureaus previously mentioned. The late Dr. Chalmers J. King, the late Robert H. Peebles, and the late James S. Townsend represented the Bureau of Plant Industry. Mr. Townsend worked both at Stoneville and Sacaton; F. L. Gerdes and staff represented the Bureau of Agricultural Economics; and Charles A. Bennett (this compiler) and staff represented the former Bureau of Agricultural Engineering and its successors.

At the time of the depression, the NRA hearings, about 1932, in Washington included ginner depositions and outlines of ginning systems. The Ginning Laboratory engineers presented fig. 52, a code figure for roller gin establishments, as part of the testimony. It shows that simplicity of many roller ginneries and depicts the saw gin belt distributors that were slowly being adopted by them.



SEPARATOR (MECHANICAL OR PNEUMATIC) – DISTRIBUTOR (OR PNEUMATIC CHUTES) – SMALL DRUM CLEANING FEEDER ROLLER GIN STANDS

Figure 52.

Code figure on roller gins as used in 1932 in Washington hearings.

In 1932, the staff at Stoneville, Mississippi, began experiments with gin flues and brush doffing of the ginned lint from the roller gin stand to condenser and press along the lines shown in figure 53.

Figures 54 through 59 are of passing interest in the work. Legends of these figures are explanatory.

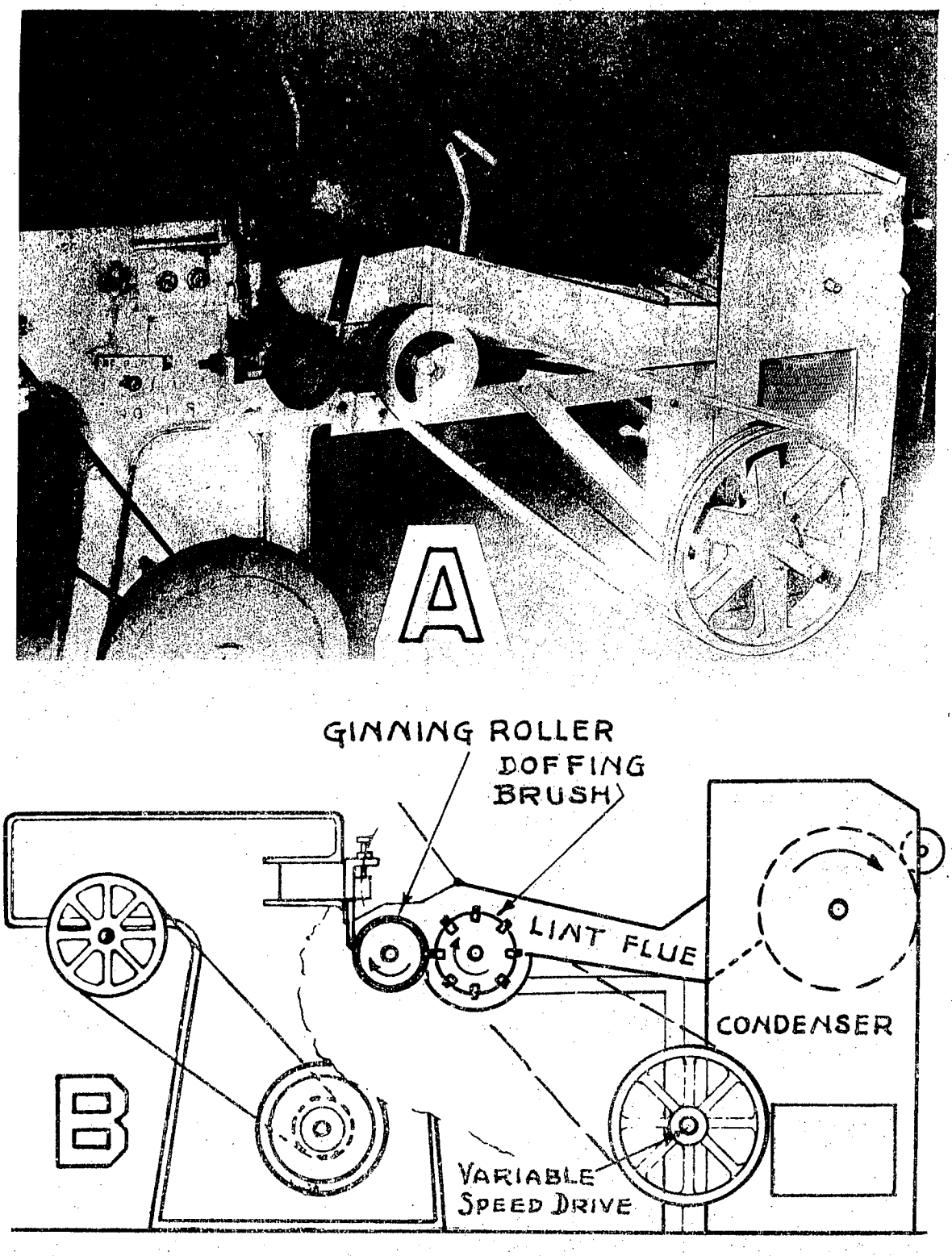


Figure 53.

Rotating brush cylinder doffer and unit condenser attached to experimental roller gin in the tests of 1932; A, photo of the test unit; and B, line diagram of the set-up.

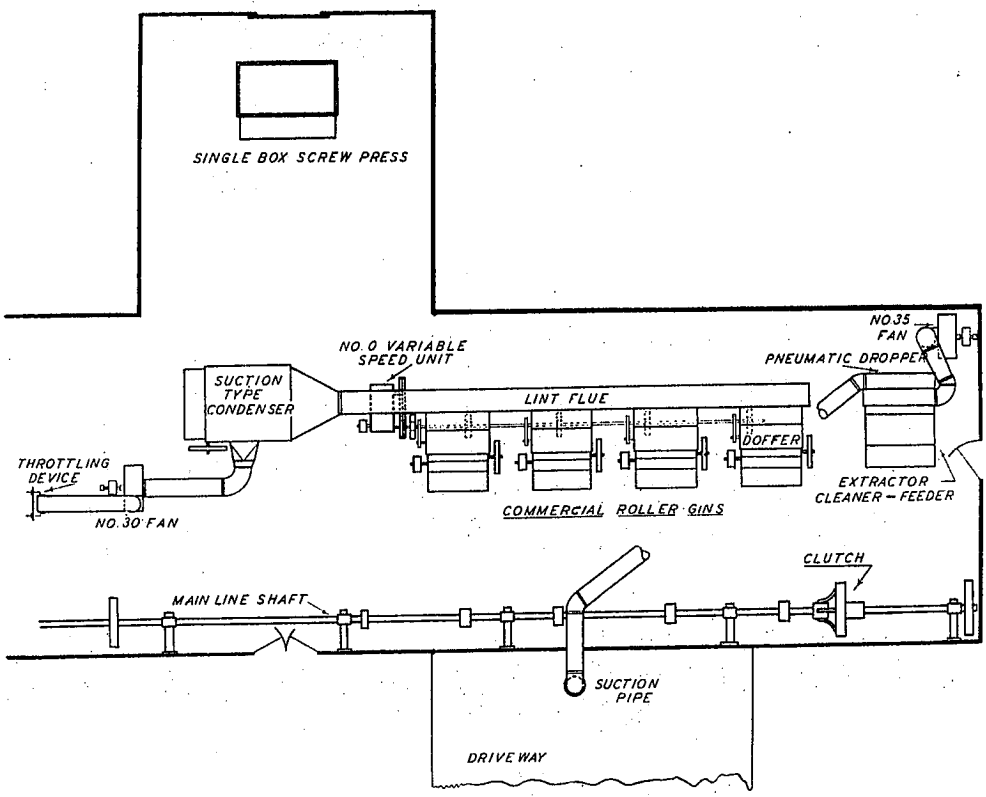
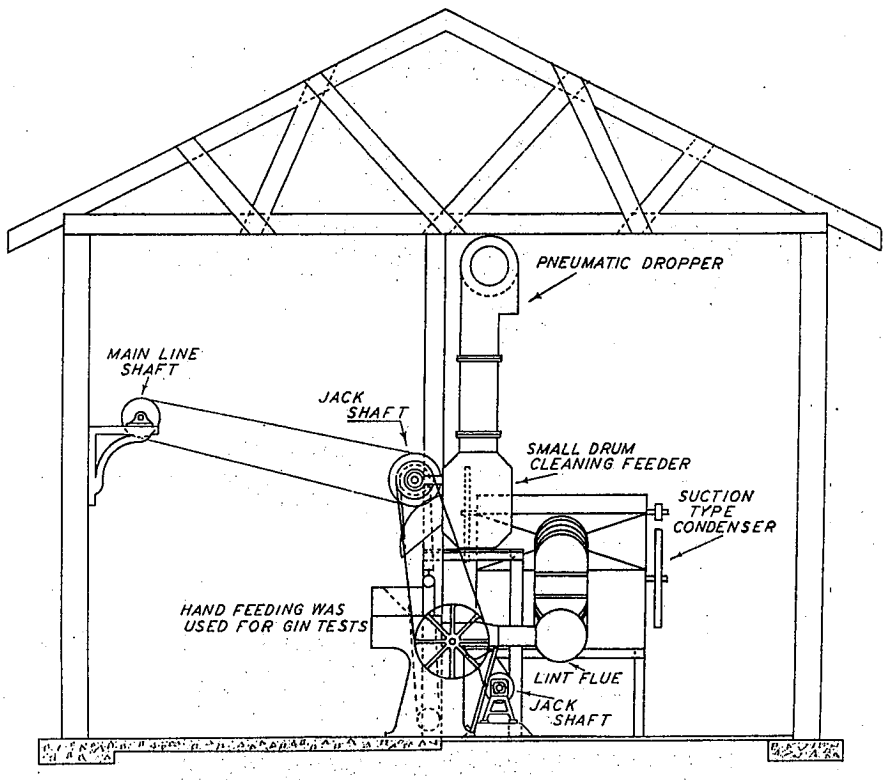


Figure 54.

Floor plan of Pima Indian Agency roller cotton gin, Sacaton, Arizona, showing portion of the roller gin as used by the U. S. Ginning Laboratory in its early tests, 1932-42.

Figure 55.

Sectional elevation of the Pima Indian Agency roller gin, showing general arrangement of the ginning battery and an experimental suction lint flue. (1940-42 tests.)



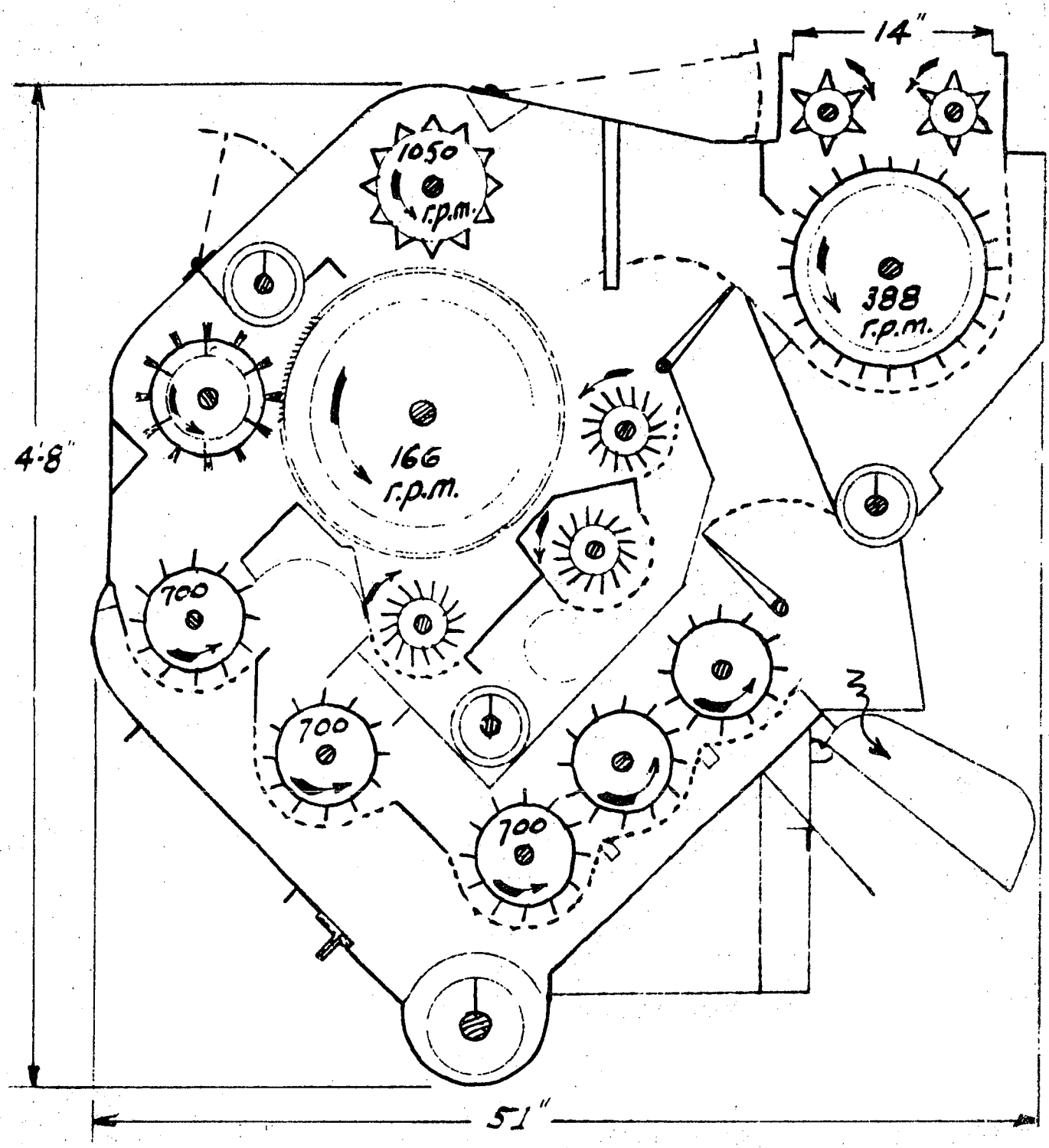


Figure 56.

Section of the M-E-F extractor feeder used on Pima cottons at Sacaton as shown in Figure 54. Courtesy Lummus Cotton Gin Company.

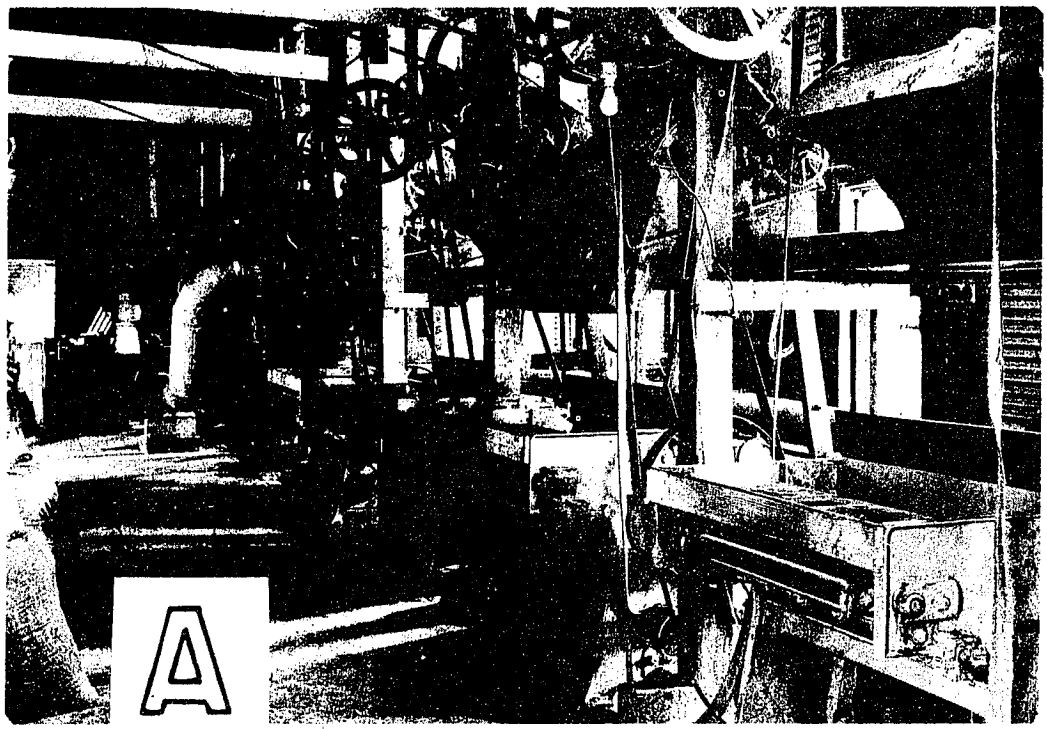
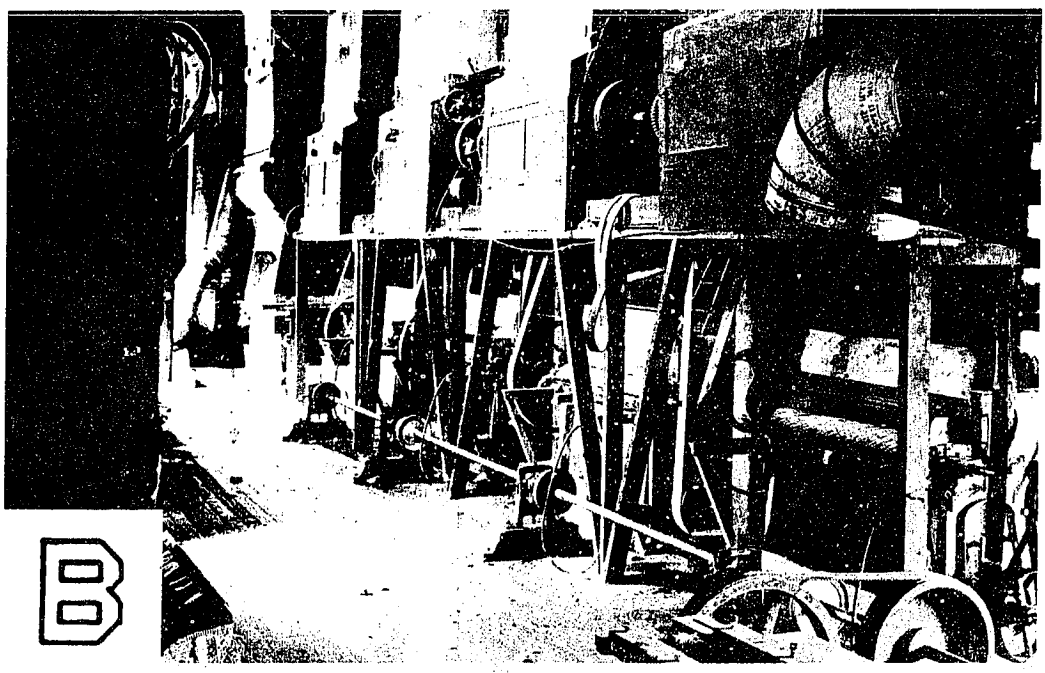


Figure 57.

Portion of the Pima Indian Agency roller gin; A, front of the stands with draper feeders removed; and B, rear view of stands before lint flues and other equipment was installed.



GENERAL RESEARCH AND DEVELOPMENTS

1932-1940

Much preliminary work was accomplished between 1932-35 at Sacaton, Arizona. The ginning engineers and cotton technologists, in fiscal year, 1936 conducted an intensified series of informative roller ginning tests on both cleaned and uncleaned Pima cottons, during which the roller and crank speeds were varied from 110 to 150 and from 650 to 840 respectively, and other elements were investigated. Cleaner feeders, an MEF (Lummus master extractor feeder), and 3 cylinders of cleaning were employed in combinations.

In general, cleaned cotton and higher roller and crank speeds gave the best overall results.

Figure 58.

Interior view of original roller ginning laboratory at Stoneville, Mississippi, taken about 1938 before fire destroyed the building and equipment. Here a staff member, Ronald Hartley, is ginning on a 40-inch roller gin. Other units such as the 60-inch Foss and 16-inch laboratory unit are at the left.

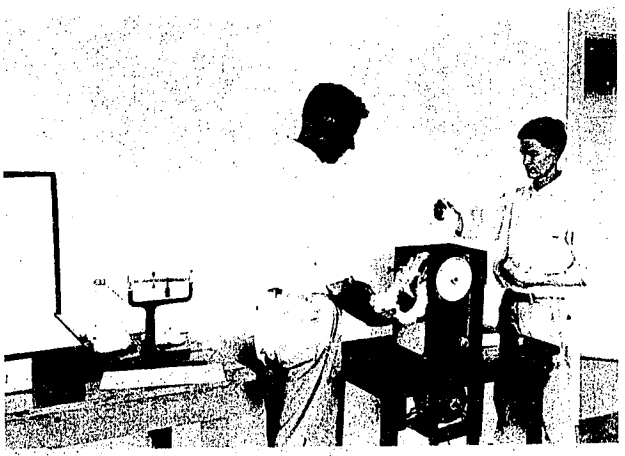


Figure 59.

Experimental 8-inch laboratory roller gin being operated by staff members William S. (Steve) Kimbrell, master ginner, and Henry T. Montgomery mechanic, at Stoneville, Mississippi, 1940.

In the fall of 1939 there was a renewed interest in the Mississippi River regions concerning sea-island cottons. Single stand roller gins were installed at Indianola, Mississippi, and at Tallulah, Louisiana, in order to handle their sea-island crops that were planted by some of their patrons. The Ginning Laboratory engineers assisted in getting the plants under way, and moisture tests were made on typical samples of the sea-island cottons.

The ginning engineers also made a number of tests at the laboratory in roller ginning sea-island cottons from the two states. During November, 13-15, 1939, test lots from approximately 50 bales showed that the sea-island seed cotton moisture content ranged in percent from 7.92 to 10.98; ginned lint from 5.85 to 7.56; and seed from 8.38 to 11.95.

Roller ginning research was renewed that year at Sacaton, Arizona, and a brief summary of some of the comments of research workers follows:

a. Cleaning Tests: Handling with a fan, cleaning and drying lowered bale weights. Grade and staple length were affected but not an appreciable amount. Ginning time was not shortened and power requirements but very slightly reduced by processing. Indications are that on the dry and clean, hand-picked Pimas of the Salt River Valley, drying is undesirable, and that cleaning would not be practicable except on very dirty cotton.

b. Composition Roller: These tests gave promising results. The composition covered roller ginned faster than walrus hide, increased bale weight slightly, and had no harmful effect on grade and staple length. In addition, the composition packing is cheaper than walrus hide, easier to obtain, and easier to put on. However, this roller requires more pressure against the fixed knife, using slightly more hp., and kw.-hours. This increase in pressure necessitates a well constructed roller. Further tests should be made in an effort to discover a better covering and easier method of building rollers.

c. Grid Agitator: This experimental unit did not give favorable results and lowered the grade.

d. The 9-inch composition roller: This roller seemed to be less desirable than the 6-inch roller in all respects except grade which was unaffected. For corresponding roller and knife pressures this larger roller required a larger torque and tighter belt on roller pulley. One purpose of the test was to determine whether a larger roller would require less unit pressure because of a greater area of contact between knife and roller, but just as much pressure had to be carried to accomplish ginning. More tests should be run in an effort to determine what effect differ-

ent roller sizes have on ginning.

e. The Doffer: The use of the rotating doffer improved the lint and had no objectionable features.

During May, 1940, investigations were made at Stoneville on the effects of different pressures per inch of ginning roller as applied by it against the fixed knife blade. This was accomplished on one of the laboratory 40-inch roller gins, using 6 different rollers, 3 different pressures, and 3 cotton moisture conditions. Pressure was attained by a simple rig shown in fig. 60, where in the spring compression was adjusted for each test to obtain the per running inch pressure between covering and blade that was desired.

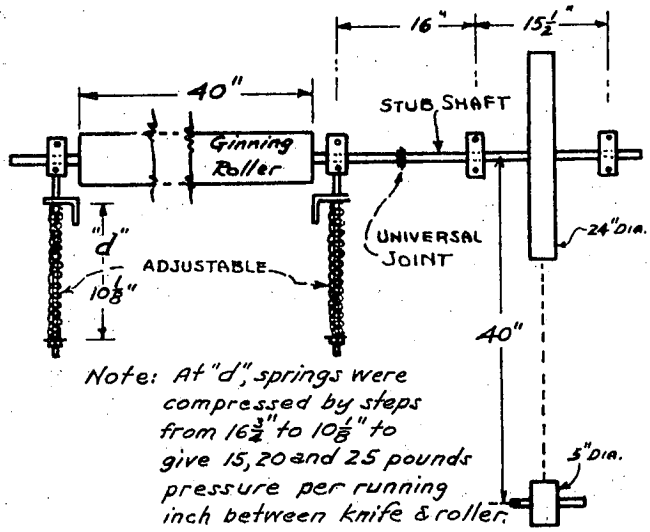


Figure 60.

Engineering diagram of roller gin pressure spring setup to determine effects of pressure between covering and fixed knife, together with the covering and diameter tests on rollers. Stoneville, Miss., May, 1940.

Roller ginning revival was also noted in 1940 in the Southeastern states, especially in Florida which enjoyed a healthy increase in its long staple cottons. A part of a brief report dated August 1941 is here given, based upon work of Jenkins and Gist.

"GINNING OF SEA-ISLAND AND AMERICAN-EGYPTIAN COTTON IN 1940"

"Sea-Island and American-Egyptian cotton production is limited to certain areas in the Cotton Belt. In recent years, the predominating staple length of Sea-Island has been about 1-5/8 inches and that of American-Egyptian 1-1/2 to 1-9/16-inches. During the last five years, there has been a material increase in the production of these two types of cotton. In 1936, 889 bales of Sea-Island and 17,551 bales of American-Egyptian cottons were produced as compared with 4,491 bales of the former and 32,325 bales of the latter produced in 1940.

"The increased plantings of Sea-Island were principally in Georgia and Florida with scattered plantings of small acreages in Texas, Louisiana, Ark-

ansas, Alabama, and the Carolinas. The increase in acreage of American-Egyptian was primarily in Arizona but plantings of several thousand acres as a new venture were made in the valley of Texas around El Paso.

"Of the 4,491 bales of Sea-Island produced in 1940, 1,858 were ginned in Florida and 2,400 in Georgia. The Georgia ginnings included almost 300 bales produced in South Carolina, North Carolina, and Alabama. The remaining bales of Sea-Island produced outside of these Southeastern states were from scattered plantings in Texas, Louisiana, and Arkansas. Arizona produced over 90 percent of the 32,325 bales of American-Egyptian cotton, the remainder being grown in the Texas valley. Although the production of Sea-Island and American-Egyptian cottons was only 0.3 percent of that of American upland cotton in 1940, its estimated value was about 1.0 percent of the estimated value of the American upland crop. The total value of the 1940 crops of Sea-Island and American-Egyptian cotton is estimated at about 5-1/2 million dollars, the former bringing about 2/3 of a million and the latter almost 5 million dollars.

"In 1940 the Sea-Island ginning facilities comprised 13 plants in Florida, 14 in Georgia; 3 in Arkansas; 2 each in Texas and Alabama; and 1 each in Louisiana and Mississippi. 1./ All except one of the 24 American-Egyptian cotton ginning outfits were located in Arizona, the exception being in the El Paso valley of Texas and operating for the first time in 1940. Although there were 36 ginning plants equipped to gin Sea-Island cotton in 1940 as compared to only 24 for American-Egyptian cotton, the total number of gin stands in them was less than one-third of the number of American-Egyptian cotton gin stands. Of the 93 Sea-Island gin stands, 57 were of the double roller type which along with the single roller types made a total of 150 rollers in Sea-Island gins. This compares with the 328 rollers of the 328 single roller gins used universally in American-Egyptian cotton ginning. The average number of gin stands per Sea-Island plant was 2.6 and per American-Egyptian plant was 13.7. The Sea-Island plants ginned an average of about 43 500-pound gross weight bales per stand and 27 similar bales per roller, while the American-Egyptian cotton ginning plants ginned an average of 100 500-pound gross weight bales per stand and 100 per roller.

"Virtually all rollers of the Sea-Island gins operating in 1940 were covered entirely with walrus hide. No all-walrus hide rollers operated in the American-Egyptian cotton gins. Three-fourths of these gins were covered with alternate spiral strips of walrus and composition packing, and the remainder with spool wound all-packing.

1./ The information concerning ginning machinery and production given in this release for Georgia and Florida, is based on data collected by J. G. Jenkins and Mordecai N. Gist, Agents, U. S. Bureau of Plant Industry.

"In 1940 very little cleaning and handling equipment and no extracting machines were used in processing Sea-Island cotton, but all the American-Egyptian cotton gins were equipped for cleaning the cotton, with extractors of the type used as unit extractor-cleaner-feeders in upland cotton ginning plants. These units are essential in the West because much of the cotton is roughly harvested."

In addition to the foregoing data on roller ginning, USDA Agent M. N. Gist forwarded data on the gins that operated in Florida during 1940, which are here given in Table II. (Note large quantity of roller ginned upland.)

TABLE II. GINS OPERATED IN FLORIDA IN 1940

GINS	Sea-Island	Coker-Wilds	Upland
Baker, Sam McCart	7	44	333
Lake City, Buie	50	0	213
Lake City, Parrish	38	6	296
Leesburg, Experimental	147	0	0
Leesburg, R. B. Roberts	295	0	0
Live Oak, Goff Bros.	68	4	623
Mayo, Mayo S. I. Gin Co.	43	17	0
Madison Gin Co.	486	0	0
Marianna, Chipola Gin Co.	4	404	198
Newberry, W. H. Holt	32	0	0
Ocala, Pillans & Smith	681	0	0
Pinetta, R. M. Allen & Son	1	5	105
Sanderson, John Burnett	7	0	0
Lee, J. C. Black Gin	0	1143	0
Totals (Bales)	1859	1623	1768

In 1939-40 in addition to program tests, the Department prepared for an increase in the production of extra long staple cottons and the expansion of roller ginning activities that would ensue in the Southwestern states. Agricultural Engineer Thomas C. Walton made an extensive inspection of roller cotton gins in Texas, New Mexico, and Arizona. He prepared some 22 floor plan drawings of roller gins in the Southwest in addition to special observations during the fall of 1940 and a rather complete roller gin survey in Arkansas. These plans were made on letterhead size sheets, and the original tracings and notes are in the files of the Southwestern Cotton Ginning Research Laboratory, Mesilla Park, New Mexico. They have not been reproduced here but are available for reference.

A copy of Walton's "Office Report", made to the writer when he was Engineer-in-charge of the Cotton Ginning Investigations is given here in part:

ROLLER GIN SURVEY, ARIZONA, FALL 1940
By T. C. Walton, Agricultural Engineer

1. Summary of data from questionnaires.

A. Number of plants and gin stands:

1.	Total number of roller gin establishments	24
2.	Number of 40" single-roller Murray stands	180
3.	Number of 40" single-roller Platt stands	94
4.	Number of 40" single-roller Liberty stands	2
5.	Number of 40" single-roller Dobson-Barlow stands	4
6.	Number of 40" single-roller Armour stands	28
7.	Number of 72" single-roller Coats stands	20
8.	Total number of roller gin stands	328
9.	Average number of gin stands per plant	13.1
10.	Smallest number gin stands per plant	10
11.	Largest number gin stands per plant	32

B. Power:

1.	Number of diesel powered plants	3
2.	Number of 60-cycle electric plants	9
3.	Number of 25-cycle electric plants	12
4.	Total number of electric plants	21

5. H.P. per gin stand:
   a. Plants using 72" Coats stands - 12.00 H.P. per gin stand
   b. Plants using 40" Std. stands - 7.44 H.P. per gin stand
6. H.P. per gin stand (Plants using 40" Std. stands only)

a.	12 stand gins	- 7.86 H.P. per gin stand
b.	16 stand gins	- 7.34 H.P. per gin stand
c.	Diesel powered gins	- 8.30 H.P. per gin stand
d.	Electric powered gins	- 7.28 H.P. per gin stand
e.	Individual motor driven gins	- 7.58 H.P. per gin stand
f.	Central motor driven gins	- 7.25 H.P. per gin stand

C. Gin Rollers:

1. Average speed - 125 r.p.m.

2. Diameter
   a. 40" std. gin - average 6-9/16" diameter
   b. 72" Coats gin - average 8-13/16" diameter
3. Roller Covering -
   a. Number of plants using roller covered with 1/2 walrus and 1/2 packing..... 18
   b. Number of plants using rollers covered with all packing..... 6
   c. Life of Coverings -
      (1) Plants having 72" Coats stand and rollers of 1/2 walrus and 1/2 packing - 280 bales per roller.
      (2) Plants having 40" Std. stands -
      1/2 walrus and 1/2 packing covered rollers -140 bales per roller.
      All packing rollers - 275 bales per roller.

4. Roller Grooves:
   a. Number of plants that do not groove rollers..... 13
   b. Number of plants having grooves in poor condition .. 5
   c. Number of plants having grooves in fair condition... 4
   d. Number of plants having grooves in good condition .. 2
   e. Number having grooved rollers average 17 bales per roller between groovings.

D. Mechanical condition of stands:

1. Moving knife -
   a. Overlap - average 5/8"
   b. Length of stroke (data on 21 plants)
      (1) Number of plants using 1-1/2" stroke..... 12
      (2) Number of plants using 1-5/8" stroke..... 1
      (3) Number of plants using 1-3/4" stroke..... 4
      (4) Number of plants using 1-7/8" stroke..... 2
      (5) Number of plants using 2" stroke..... 1
      (6) Number of plants using 2-1/4" stroke..... 1
      Note: (5) and (6) ginner's statement.
   c. Number of plants using eccentrics..... 6
      Average shaft speed - 726 rpm.
   d. Number of plants using crank..... 18
      Average crank speed - 716 rpm.
      Of these 18 plants using cranks:
      (1) Number of plants using wood crank legs..... 14
      (2) Number of plants using steel crank legs 4
   e. Shaft bearings: (data on 22 plants)
      (1) Number of plants having bronze bearings..... 13
      (2) Number of plants having babbitt bearings 5
      (3) Number of plants having ball bearings..... 4

2. Fixed knife - (data on 22 plants)
   a. Number of plants which hand file fixed knives..... 5
   b. Number of plants which grind fixed knives by hand on emery wheel 1
   c. Number of plants which grind fixed knives on a special machine 16

E. Handling and Cleaning equipment

1. Storage facilities:
   a. Number of plants having no storage facilities 3
   b. Number of plants having storage facilities..... 21
      Storage capacity at these 21 plants averages 97 bales and ranges from 60 to 200 bales.
2. Unloading method in storage: (data on 19 gins)
   a. Number of plants using canvas dropper..... 8
   b. Number of plants using revolving dropper 7
   c. Number of plants using Rembert Fan 3
   d. Number of plants using blow box 1
3. Unloading method to Gin (data on 23 gins)
   a. Number of plants using canvas dropper 19
   b. Number of plants using revolving dropper 4
4. Cleaning equipment:
   a. Number of plants using Super Mitchells 16
   b. Number of plants using Standard Mitchells 6
   c. Number of plants using other extractors 2
   d. Number of plants using cylinder cleaners with extractors..... 15
   e. Number of plants using extractors only 9
   f. Number of plants using equipped with driers..... 3
5. Cleaners to feeders:
   a. Number of plants which have gravity chutes 15
   b. Number of plants which have canvas droppers 8
   c. Number of plants which have screw distributors 1
6. Feeders:
   a. Number of plants which have Big Drum Feeders 1
      Speed - 208 rpm.
   b. Number of plants equipped with simple feeders 22
      Average speed - 174 rpm.
7. Draper Feeders:
   a. Average speed - 23.6 rpm.
   b. Number of plants not equipped with drapers 5
   c. Number of plants equipped with drapers..... 19
      Note: The 32 stand (Santa Cruz) Western Cotton Products Co. Gin south of Eloy had drapers on 16 stands only.

F. Press Equipment

1. Number of plants using steel presses..... 3
2. Number of plants using wood presses..... 21
3. Only one gin has a double box press. The other 23 plants have single box undershot presses.

II. Floor Plans.

A. Types of Buildings:
1. Number of plants having concrete floors..... 24
100 percent
2. Number of buildings of corrugated iron over wood frame . 17
3. Number of all steel buildings..... 5
4. Number of buildings of concrete or concrete masonry.... 2

B. Type of Layout:
1. Number of plants having a single row of gin stands..... 5
2. Number of plants having a double row of gin stands 19

C. Gin room: (Plants having a double row of stands only)
1. Average width of gin room ..... 26.8'
2. Average length of gin room ..... 79.7'
3. Average floor area of gin room..... 2124 sq. ft.
4. Average width of floor space between stands .....9' 7"
5. Average distance between seed augers.....13' 4"

D. Bale Platform:
1. Average floor area of bale platform..... 306 sq. ft.
2. Number of plants having no platform attached to building . 5

E. Center distances on gin stands:
1. Of 22 plants having 40" stands
16 plants have gin stands 6'6" apart.
1 plant has gin stands 5'6" apart.
1 plant has gin stands 5'7" apart.
1 plant has gin stands 6'2" apart.
1 plant has gin stands 6'4" apart.
1 plant has gin stands 6'8" apart.
1 plant has gin stands 7'0" apart.
2. Of 2 plants having 72" stands:
1 plant has stands 10' 0" apart.
1 plant has stands 10' 8" apart.

F. Lineshafting: (data on 23 gins)
1. Number of plants having only one central lineshaft..... 12
2. Number of plants having two main lineshafts 9

3. Number of plants having individual drive motors..... 2
4. Size of lineshafting of 20 plants:
   a. 10 (or 50%) have 2-7/16 diameter shafting
   b. 4 have 2-3/16 diameter shafting
   c. 3 have 2-15/16 diameter
   d. 3 plants have a mixture of 2-7/16 and 2-3/16 shafting
5. Average speed of lineshafting - 339 rpm.
6. Average height above floor of lineshafting - 10' 4"
7. Location of lineshafting:
   a. Number of plants with overhead shafting..... 21
   b. Number of plants with shafting below floor..... 3

G. Jackshafting (data on 23 gins)
1. Number of plants with individual jackshaft over each stand..... 5
   Of these 5 plants, 4 have one central lineshaft and one has two main lineshafts.
2. Average size of jackshafting - 1-7/16 diameter.
3. Average speed of jackshafting - 258 rpm.
4. Average height above floor of jackshafting - 8' 8"

H. Typical roller gin layouts in Arizona: The roller gin plants in Arizzona are characterized by the following:
1. Stands installed on the first floor.
2. Use of single-box undershot presses.
3. Almost exclusive use of 40" single roller stands.

The buildings can be divided into one-story or two story. Several of the old gins are of one-story construction with pneumatic or canvas droppers over each stand. In this case the extractors and cleaning equipment are located in one end of the building. All of the new gins and the majority of the old ones are of two-story construction. In the two-story plant the cleaning equipment is located on the second floor and cotton is conveyed to the stands by gravity chutes."

END OF THE WALTON REPORT

GENERAL RESEARCH AND DEVELOPMENTS, 1941-1945

It is interesting to note, in connection with the long staple cottons of the Southwest, that other varieties in the Southeast were prominent during the crop year 1941-42. The following portions of an official report are here given on that area.

Sea-Island Cotton Report

Some 2,000 acres of sea-island cotton were planted in South Carolina this year but seasons were most unfavorable and it is doubtful if half of this amount will be harvested as so much of the acreage was an absolute or near failure.

The crop is grown mostly in the southern and eastern portions of the state although some scattered acreage is found in the Piedmont. Barnwell County has about a third of the state acreage.

The crop is better in other sections of the belt although the indicated production of 3,292 bales for the 8 states growing sea-island cotton is 18 per cent below production in 1940.

Details by states follow, as tabulated by Frank O. Black, Agricultural Statistician, and released on September 22, 1941, by the Department:

State	Yield, pounds lint per acre		Production in 500-pound gross weight bales	
	Final 1940	Indicated 1941	Final 1940	Indicated 1941
North Carolina	74	50	49	48
South Carolina	61	20	158	42
Georgia	75	50	1,700	1,092
Florida	69	50	1,500	1.622
Mississippi	21	75	51	19
Arkansas	39	75	116	78
Louisiana	15	100	69	79
Texas	72	75	377	312
United States	64	52	4,020	3,292

- End of Sea-Island Cotton Report -

Parallel to the Southeastern activities in long staple cottons, the "SXP" or cross between Egyptian Sakelaridis and American Pima was closely follow-

ed by the Department of Agriculture in the Southwestern States, espcially at the U. S. Cotton Field Station, Sacaton, Arizona. Cooperating with this Station, agricultural engineer Tom C. Walton (Stoneville Staff) made a second survey of roller gins and equipment as of 1941. This survey is set forth in Table III.

TABLE III - SXP ROLLER GINS IN OPERATION IN 1941 1./

NAME-LOCATION	Make or type gin stand	No. of Stands	Type of doffer	Cleaning Equipment	Drier
Producers Gin Co. #2 Solomonville, Arizona	40" Old style Platt 40" Hardwicke-Etter	12 2	Rubber Flapper	Mitchell Extractor	Yes
Producers Gin Co. Thatcher, Arizona	40" Old style Platt	16	Rubber Flapper	Mitchell Extractor	Yes
Western Cotton Products Gilbert, Arizona	40" Old style Platt	12	Brush	Mitchell Extractor	No
Valley Gin Co. Peoria, Arizona	40" Old style Platt	12	Brush	Mitchell Extractor	No
Bennett Bros. Gin Co. Peoria, Arizona	40" Old style Platt	10	Brush	Mitchell Extractor 4-cylinder cleaner	No
Northern Avenue Ginning Co. Glendale, Arizona	40" Old style Platt	12	Brush	Mitchell Extractor 6-cylinder cleaner	No
Arizona Cotton Oil Co. Glendale, Arizona	40" Old style Platt	16	Brush	Mitchell Extractor	No
Peterson Gin Co. Peterson Switch, Arizona	72" Old style Liberty	10	Brush	Mitchell Extractor	No
Miller Gin Company Peterson Switch, Arizona	40" Old style Platt	12	Brush	Mitchell Extractor	No
J.G. Boswell Gin Co. Scottsdale, Arizona	40" Old style Platt	16	Brush	Mitchell Extractor 5-cylinder cleaner	No
Leseurer Gin Co. Mesa, Arizona	72" Old style Liberty	10	Brush	Mitchell Extractor 5-cylinder cleaner	No
Gilbert Ginning Co. Gilbert, Arizona	40" Old style Platt	11	Brush	Mitchell Extractor 6-cylinder cleaner	Yes
Farmers' Mutual Ginning Co. Chandler, Arizona	40" Old style Platt	12	Brush	Lummus Extractor 4-cylinder cleaner	No
Western Cotton Products Co. Eloy, Arizona	40" Old style Platt	16	Brush	Mitchell Extractor 4-cylinder cleaner	No
Picacho Gin Co. Eloy, Arizona	40" Armour	16	Brush	Mitchell Extractor 6-cylinder cleaner	No
Farmers Gin Co. Casa Grande, Arizona	40" Old style Platt	12	Brush	Mitchell Extractor	Yes
J. G. Boswell Gin Co. Coolidge, Arizona	40" Old style Platt 40" Hardwicke-Etter	9 6	Brush Brush	1 Mitchell Extractor 1 H. E. Extractor	No

TABLE III - SXP ROLLER GINS IN OPERATION IN 1941 1./ (Continued)

NAME-LOCATION	Make or type gin stand	No. of Stands	Type of doffer	Cleaning Equipment	Drier
Western Cotton Products Co. Coolidge, Arizona	40" Old style Platt	12	Brush	Mitchell Extractor 6-cylinder cleaner	No
Southwest Cotton Co. Litchfield Park, Arizona	40" Old style Platt	18	Brush	Mitchell Extractor	Yes
Cortaro Farms Marana, Arizona	40" Armour 40" Hardwicke-Etter	12 2	Rubber Flapper	Hardwicke-Etter Extractor	No
Miller Gin Co. Glendale, Arizona	40" Old style Platt	12	Brush	Mitchell Extractor	No
Western Products Co. Santa Cruz, Arizona	40" Old style Platt	32	Brush	Mitchell Extractor 6-cylinder cleaner	No
Western Cotton Products Co. Casa Grande, Arizona	40" Old style Platt	24	12 Brush 12 Rubber Flapper	Mitchell Extractor 3-cylinder cleaner	Yes
Farmers' Mutual Coolidge, Arizona	40" Hardwicke-Etter	8	Rubber Flapper	Hardwicke-Etter Extractor	No
Producers' Gin Safford, Arizona	40" Hardwicke-Etter	14	Rubber Flapper	H.E. Extractor 4-cylinder cleaner	Yes
J. G. Boswell Sahuarita, Arizona	40" Old style Platt	16	Brush	Mitchell Extractor	No
Long Staple Gin Vado, New Mexico	40" Hardwicke-Etter	12	Rubber Flapper	Hardwicke-Etter Extractor	Yes
Las Cruces Staple Gin Las Cruces, N.M.	40" Hardwicke-Etter	12	Rubber Flapper	Hardwicke-Etter Extractor	Yes
SXP Gin Company Carlsbad, New Mex.	40" Hardwicke-Etter	5	Rubber Flapper	Hardwicke-Etter Extractor	No
Farmers' Co-op Gin La Union, New Mex.	54" Murray	5	Brush	Mitchell Extractor 3-cylinder cleaner	Yes
Farmers' Co-op Gin Clint, Texas	40" Hardwicke-Etter	12	Rubber Flapper	Hardwicke-Etter Extractor	Yes
Tornillo Long Staple Gin Canutillo, Texas	40" Hardwicke-Etter	12	Rubber Flapper	Hardwicke-Etter Extractor	Yes
Borderland Gin Canutillo, Texas	40" Hardwicke-Etter	8	Rubber Flapper	Hardwicke-Etter Extractor	No
Mart Adams Esparanza, Texas	40" Hardwicke-Etter	8	Rubber Flapper	Hardwicke-Etter Extractor	No
Long Staple Gin Fabens, Texas	54" Murray	5	Rubber Flapper	Mitchell Extractor	Yes
Henry Tipton Grand Falls, Texas	54" Murray	5	Rubber Flapper	Mitchell Extractor 3-cylinder cleaner	Yes
White Gin Association Canutillo, Texas	40" Old style Platt	16	Rubber Flapper	Mitchell Extractor	Yes

Table III - SXP Roller Gins in Operation in 1941 1./

Footnote: 1./ According to most recent information, additional stands have been or are being installed as follows: 3-54 inch Murray stands in the Long Staple Gin at Fabens, Texas; 3-54 inch Murray stands in Henry Tipton's Gin at Grand Falls, Texas; 8-40 inch Hardwicke-Etter stands to be installed in the three Producers' Gins in the Safford area; and 4-54 inch Murray stands are being installed at the Rittenhouse Growers Saw Gin, Higley, Arizona.

For the crop year 1941-42 Laboratory Research work on roller gins continued and included studies of roller coverings and doffers. The immediate pages that follow give some test results of the effects of roller coverings and crank speeds as conducted at Sacaton during Fiscal Year 1942.

TABLE IV.

Averages of FY 1942 Sacaton Tests on Ginning Time for 50 Pounds of Seed Cotton for Different Speeds of Crank and Roller, and Different Coverings. (108 Tests)

	Crank Speed								
	650			930			1200		
	Roller Speed								
	100	125	150	100	125	150	100	125	150
Semi-self grooving	16.13	14.90	13.71	13.78	12.00	11.37	13.25	11.78	11.46
Half & Half	16.49	15.45	14.48	15.41	13.48	11.05	14.72	12.04	11.56
All-packing	14.72	13.57	12.96	12.97	10.99	10.30	12.44	10.00	9.53

Separate Time Averages for Crank and Roller Speeds and Different Coverings.

	Crank at			Roller at		
	659	930	1200	100	125	150
Semi-self grooving	14.91	12.38	12.16	14.38	12.89	12.18
Half & Half	15.47	13.31	12.77	15.54	13.66	12.36
All-packing	13.75	11.42	10.66	13.37	11.33	10.93

These notes on roller ginning tests conducted in the Southwestern States and at the U. S. Field Station, Sacaton, Arizona, Crop of 1941, as reported December 2, 1941, are as follows:

Four cottons were ginned with each of three crank speeds (650, 930, and 1200 rpm) with each of three 6-inch rollers having different types of roller covering (semi-self-grooving, half walrus and half packing, and spool-wound all-packing) at each of three speeds (100, 125, and 150 rpm) or 27 tests per cotton. Seven and 8-inch spool-wound all-packing rollers were also tested against the 6-inch roller with these cottons at a speed of 125 revolutions per minute and at the same periphery speeds as the 6-inch roller operated at 150 revolutions per minute, or 4 tests per cotton.

The optimum crank speed, as determined in the tests appeared to be between 800 and 900 revolutions per minute, preferably about 900 revolutions per minute if a long life, trouble-proof crank mechanism for high speed could be devised. Further development work involving long time mechanical engineering work was found to be necessary to achieve practicable high speed crank mechanisms.

As compared to a crank speed of 650 and roller speed of 125 revolutions per minute, the tests showed that a crank speed of 930 and a roller speed of 150 revolutions per minute ginned an average of 34 percent more cotton, or increased ginning capacity 34 percent. Increased roller speed was a contributor to increased capacity, but the increased crank speed was the main factor. The grade of the cotton was not affected by these increased speeds, and staple lengths was seldom appreciably or significantly influenced as brought out in classifications made at Phoenix, Arizona.

During 1941 new gins in the El Paso area and Pecos Valley of Texas, in the Mesilla Valley of New Mexico, and in the Gila and Salt River Valleys of Arizona operated successfully at crank speed of 800 to 840 revolutions per minute on a 24-hour day basis, and in some instances at 930 revolutions per minute where the ginning volume was small.

The 7-inch and 8-inch laboratory rollers were found in the tests to be at least a third slower in ginning capacity than the conventional 6-inch roller, even when operated at the same speeds, and therefore, proved to be less satisfactory. Grade and staple length of the cotton was not affected by variations in roller size.

Spool-wound all-packing gave slightly better ginning capacity than the semi-self-grooving roller or the half walrus and half-packing roller, but the grade advantages appeared to be barely in favor of the half walrus and half packing roller. The semi-self-grooving roller appeared to produce fewer neps and naps in the cotton than the other rollers.

Along with testing the rubber flap doffer and lint flue devised at the U. S. Cotton Ginning Laboratory, it was proposed to test various methods of overcoming or killing static, the effects of which, if severe, generally prevent the use of the doffers. A jet to place moist air on the cotton on the seed

grid was tried, but it did not function satisfactorily. All other efforts to devise methods of moistening the roller, except steam jets under the roller, were in vain. The series of tests was therefore reduced to 24 tests (6 cottons x 4 tests) or the following:

1. Brush stick for doffing.
2. Rubber flap doffer for doffing.
3. Rubber flap doffer and lint flue.
4. Wooden roller and gin roller and lint flue.

Some very valuable data and observations resulted from these tests. It was found first that the lint flue will work. The present design should be changed however. The piping should be altered to provide adequate air velocity without excessive fan power. When lumps of lint that hang on the knife are finally drawn through by the roller, the air suction at the nozzle is not strong enough to pull the cotton into the lint flue.

Test observations indicated that with a lint flue, the doffer is not necessary because the air pulls the cotton from the roller and straightens out the fibers in a manner comparable to the effect of the mechanical doffer.

A new engineering design of lint flue nozzle with a large adjustable throat to fit partially over a wooden roller riding on the conventional gin roller and partially over the gin roller has been built by the engineers for shipment to Sacaton for testing.

Very little static occurred at Sacaton during the time that the 1941 crop ginning tests were made, and steam lines were, therefore, not hooked up to the gins in an effort to overcome the static; but a number of observations were made and data were collected at commercial gins on the effects of steam devices in controlling static. It was found that steam made it possible for the ginner to use rubber flap doffers which improved the grade from one-third to one-half over the conventional brush stick doffer. The steam also materially increased ginning capacity. The application of steam in its present form has some objections, namely that the steam rusts the gin stand and makes a messy condition with dirt and trash under it.

For this reason some Arizona ginners discontinued the use of steam, although most of the ginners in the El Paso area still employ it as a static eliminator in order to use the doffers and also to obtain as high grade lint as possible. In the El Paso area the ginners aimed to turn out grades as high as No. 2 in order to command good prices. When the grades drop to No. 3, the value of the cotton is generally $25. per bale less than cotton of No. 2 grade. Ginners are therefore making every effort to keep the grades up, and this method of making the use of the doffer possible is one of the several means employed for improving the grade of the cotton.

The tests at Sacaton showed that on 6 cottons, the average grade was 1.7 with the doffer as compared to 2.3 with the brush stick. When the lint flue was used, the grade was about the same as when the doffer was used alone. Tests at commercial gins showed that the doffer improved the grade on an average of almost one-half grade on six cottons at one gin and one-third grade at another gin on six other cottons. When steam was used in these tests to make the doffer function better, the ginning capacity was increased 10 percent and the moisture of the lint cotton 1 percent.

There were 56 tests made on cleaning, drying, and conditioning which were completed on 7 cottons and involved the following:

1. No cleaning (control).
2. Once through Mitchell.
3. Twice through Mitchell.
4. Once through Mitchell with 160 degrees F.
5. Twice through Mitchell with 160 degrees F. and 120 degrees F. respectively.
6. Once through Mitchell with after cleaning cylinders of Lummus.
7. Twice through Mitchell with after cleaning cylinders of Lummus.
8. Once through Mitchell with moist air.

The result of these tests indicated that when the cotton was passed through a double extractor unit, its grade was improved to an average grade of 1.6 from an average of 2.4 where no cleaning equipment was employed in cleaning the cotton. The cotton on hand was generally too dry to show any further favorable effects of artificial drying. By cleaning the cotton the ginning capacity was increased 12 percent. The average foreign matter content of the cotton was reduced from 2.8 to 0.8 percent by cleaning with a double extractor unit. While the passage of the cotton through two double extractor units and a cylinder cleaner reduced the foreign matter content only 0.2 percent below the average for the cotton after its passage through one double extractor unit, the average grade was improved 0.2 grade.

Tests on the conditioning of cotton in extractor units indicated that it was necessary to clean the cotton thoroughly before conditioning it in such units prior to ginning. When steam was applied to the extractor unit, the staple length of the cotton was increased, but the grade improvements were lessened, and additional tests were made to determine the benefits of conditioning the cotton after cleaning it. The results of these tests are not here reported.

Moisture determinations were made at Sacaton on the seed cotton and ginned lint samples involved in the tests there and in commercial gin tests. Foreign matter determinations were made of the seed cotton sample before and after cleaning, conditioning, and drying by the various methods. Fiber length distribution studies were made on samples selected to represent ex-

treme ginning and handling conditions.

All of the lint samples were classed at Phoenix, and some samples representing important tests were also classed at El Paso to provide a double check on the conclusions to be made based on classification.

The 24 roller gin establishments in operation in the West in 1940 previously mentioned were resurveyed by T. C. Walton in 1941 along with the 13 new gin outfits installed in 1941. The new gins had a total of 143 rollers. The other gins had a total of 346 rollers, bringing the total number in 1941 up to 489 as compared to 328 in 1940. In 1940 the roller gin plants ginned an average of 100 bales per stand; in 1941 approximately 150 bales per stand due to the expansion of SXP production in new areas of growth. Six of the new gins were installed in the El Paso Valley of Texas, 4 in the Mesilla Valley of New Mexico, and 1 in the Gila Valley and 2 in the Salt River Valley of Arizona. All except one of the plants were installed with doffers, but the doffers were used only when steam was successfully used in eliminating static.

While very good progress was made in the American-Egyptian cotton ginning investigations in 1941; there remain three unsolved problems especially in engineering developments. The engineers concluded that efforts should be made (1) to devise suitable crank mechanism for satisfactorily running the gins at high speeds, and better grids for shedding the seed faster; (2) to concentrate on the improvements to the lint flue system for higher efficiency and economy; and (3) to develop acceptable methods for controlling or eliminating static. Unless the latter is accomplished, the lint flue may not be completely successful. Therefore, the main objectives of the program must involve further developmental work by the ginning engineering staff.

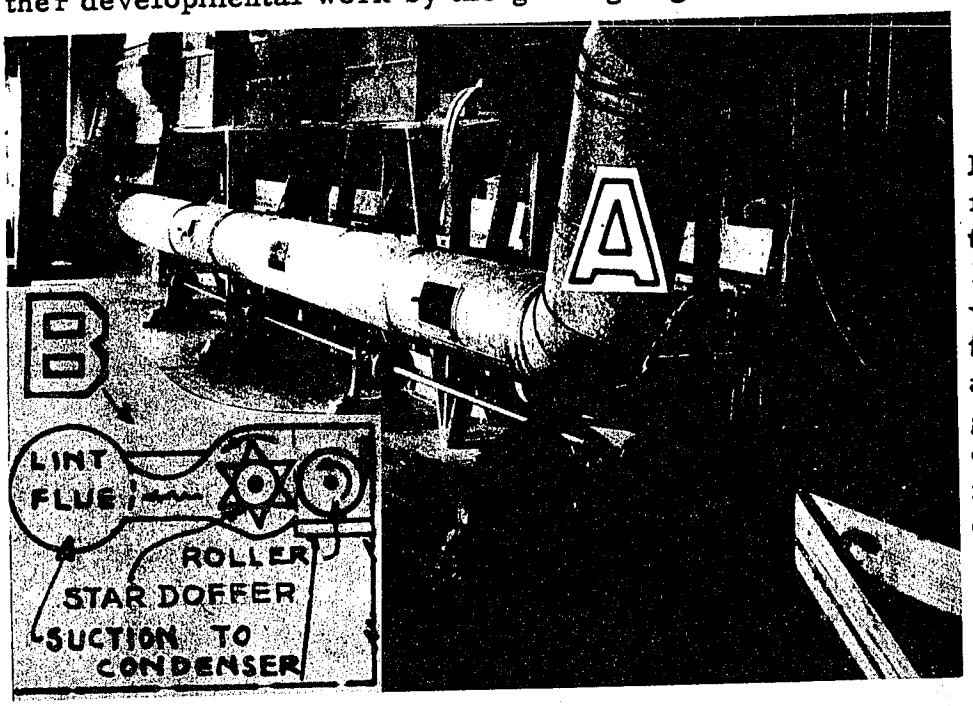


Figure 61. Experimental roller gin suction type lint flue of 1941. A, photo view of lint trunk to the gin stands; and B, line diagram of the take-off gin flue with its star wheel doffer.

Lint Flue Research, 1936-45

Lint flue studies which began in 1936 continued to 1945 and included first, the series A or round lint flue shown in drawing fig. 54 and depicted in photo fig. 61, on page 77.

When roller ginning problems again demanded attention, in 1941 much of the research work was conducted at the Pima Indian Agency roller gins, Sacaton, Arizona, where cooperative work of the Department was then being handled in the production of Pima Cotton. Figure 61 shows one phase of this work.

Figure 62.

Floor-type suction lint flue of 1941 used on the same gin stands as those shown in fig. 61

Other tests followed employing floor-type suction trunks known as series B into which the ginned lint was fed by gravity. These tests are exemplified in fig. 62.

In the second or series B types of suction lint flue studies, a graduated rectangular supplanted the previous round flue as was shown in fig. 62. Several nozzles with 4 x 4-inch take-offs were tested between the gin stands and graduated rectangular lint flue. The best nozzle is shown in fig. 63.

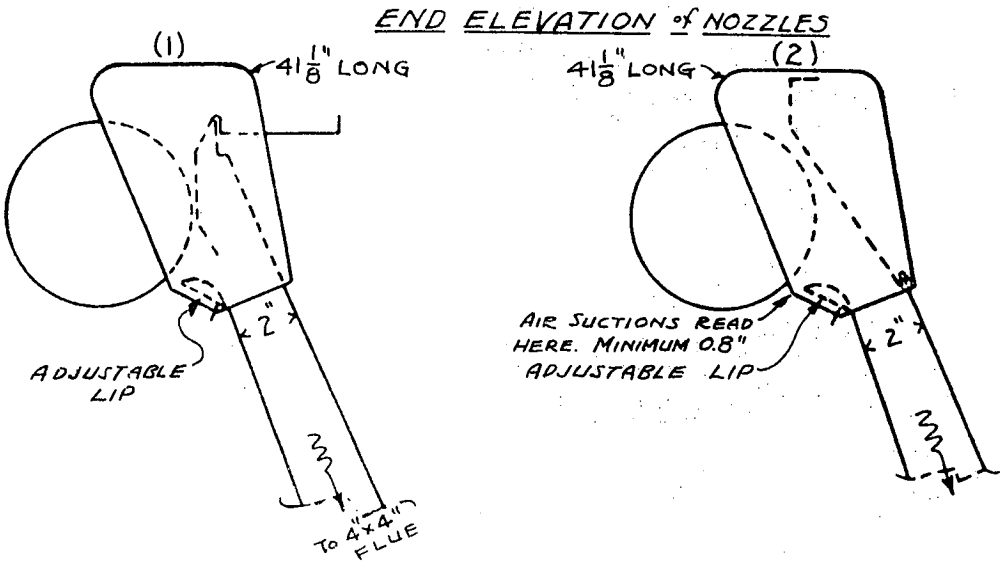
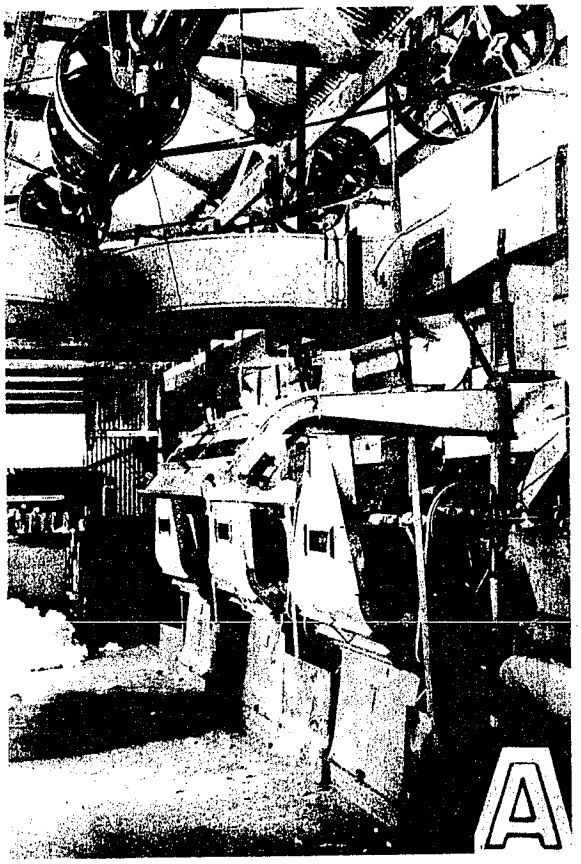


Figure 63.

End Elevation of Nozzles

The series A and B types, illustrated in previous figs. 61 and 62, of lint flues were superseded by the series C overhead systems developed by Agricultural Engineer Gerald N. Franks in 1943. This new system marked a radical departure from previous studies. All trunks were rectangular and graduated in size, each stand take-off being 6 x 6 inches square, with dampered suction regulators, U-tube water gauges, and hinged nozzles. Figure 64a is an interior photo taken at the San Carlos roller gin, Casa Grande, Arizona, (Courtesy Western Cotton Products Co.) and fig. 64b gives nozzle details.



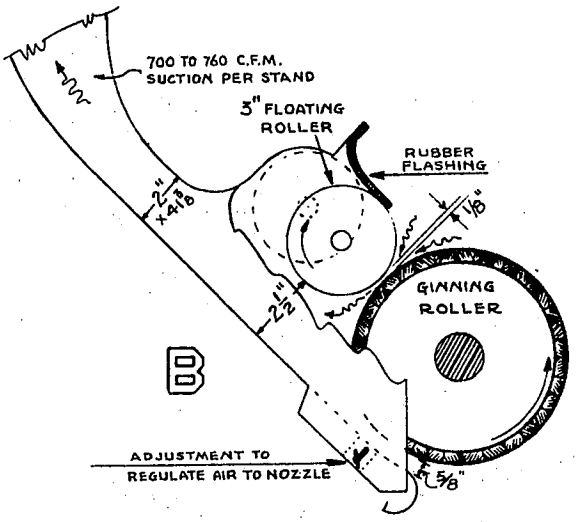


Figure 64.

A, photo of experimental suction lint flue system installed at the cooperating San Carlos roller gin of the Western Cotton Products Co., Casa Grande, Arizona, May 11, 1943. One of the suction nozzles is raised to show accessibility to the ginning roller and stand. B, section of one of the hinged nozzles.

In the tests at the San Carlos gin from 1943 to 1945, 12 McCarthy type 40-inch roller gin stands were employed, grouped in threes per gin flue for delivery to the condenser main intake trunk. Cranks operated at 807, pushers at 165, rollers at 100, line shaft at 360, and counter shaft at 400 revolutions per minute. A type C size 45 fan wheel in a size 50 Boardman fan casing operated at 1614 rpm. This fan drew 8356 cubic feet of air per minute at 6" water gauge static pressure, 2.7" velocity pressure, and 33 horsepower load.

A total of four gin trunks increased in size from 6-5/8 inches square to 9-1/4 inches square to 11-1/2 inches square for each three stands and then delivered into a 46 x 11-1/2 inch rectangular overhead main duct to the suction condenser.

During the operations on August 19, 1943, air volumes of 760 to 700 cfm per gin stand handled the roller delivery satisfactorily. The regulated air nozzles below the rollers showed static pressures on the roller hood ranging from 0.7 inch to 0.3 inch. On September 12, 1945, Western Cotton Products Co. reported ginning 70 bales of SXP cotton for the 1944 season. U-tubes were attached below the hinges of the nozzle hoods, and adjustable dampers enabled the operator to maintain uniform suction on all rollers. This usually averaged 1/2 inch on the individual U-tubes.

The principal value of these developments resided in the fund of practical information obtained by the Ginning Laboratory and the proving that ginned lint from roller gins could be pneumatically conveyed to the press without damage and considerable saving in hand labor. It was found that 700 cubic feet of air per gin stand was desirable for the design here described, but lesser volumes are possible with minor changes in the nozzles. Fan horsepower per gin stand, as shown on special power readings taken August 19, 1943, ranged from 2.75 to 3.17 horsepower per stand, and air volumes ranged as above stated. Full construction details are on file at the Southwestern Cotton Ginning Research Laboratory.

The final conclusions, reached from these extensive experiments with roller ginning suction lint handling systems, were dual. First, the system used at the San Carlos gin proved that roller ginned long staple cottons, such as Pima and sea-island varieties, could be pneumatically handled in lint flues without damage to quality or smoothness of the sample and that minor change of the Franks' design, in the light of information provided by the tests, would make the system feasible for commercial use. Second, that objections to heavy power consumption and first cost of construction involved in the test designs could be largely overcome by using a single larger lint flue, a double box press with improved suction condenser, smaller nozzle areas at the ginning rollers, and careful redesign of dimensions in the major elements.

MECHANICAL ELEMENTS AND STATIC ELECTRICITY, 1942-43

Concurrent with the Laboratory program in lint flue development at Sacaton and Casa Grande, Arizona, other studies were aimed at mechanical improvements in the gin stands. Engineer R. C. Young's report of January 1, 1943, on this work here follows in part:

"Background and Objectives: During Fiscal Year 1941 the roller ginning investigations of the engineers of the USDA Cotton Ginning Laboratory definitely indicated from tests to date that roller gin crank speeds of approximately 900 rpm with accompanying roller speeds of 125 rpm provided the best all-around good ginning results. Higher crank speeds still remained to be more fully investigated, as well as the development of durable replacement cranks for the 348 old gin stands (McCarthy Type that exist in some 40 roller ginneries in Arizona, New Mexico, and Texas); the foregoing work being desirable so that the findings of Fiscal Year 1941 could be applied in commercial gins for verification.

"In Arizona the roller gin operators have had continual troubles with the old-style McCarthy bearings and cranks which require too frequent lubrication and adjustments. Such bearings and cranks have not proved to be satisfactory for speeds greater than 600 rpm. The principal objective of this assignment has been to test and develop new bearings, crank legs, and collateral apparatus, with a view to affording roller ginners better operation and capacity from the existing older types of roller gin stands. Note: For tests in Arizona during the Fall season of 1942, a crankshaft assembly with new bearings and cranks were developed by Young.*

"Cooperative Tests and Results at San Carlos Roller Gin, Casa Grande, Ariz."

Note: The Western Cotton Products Co. (through their Mr. Tom Rollow, Mgr. and L. A. Brewster, Master Mechanic) arranged informally with Young for a series of trial tests of the crank assembly at the San Carlos Gin. Twenty-four stands were in the San Carlos ginnery and the test one with Government crank assembly was operated at 840 crank speed; 110 rpm roller speed, and without doffer.

"After 500 hours of almost continuous operation, the #6 tapered pin shown in photo No. 1910 was sheared. For this, the ginner first substituted a 7/16-inch straight bolt, but within 100 hours of operation a 1/2-inch straight bolt was inserted. After 640 hours, one wooden bearing of a crank leg went out at the top, and the experimental apparatus was removed from the stand. Main bearings, oil housing, felt seals, cross rail all showed O.K. Wear on

* Government file photos #1910 and 1011, not here reproduced.

crankshaft was .0003; on crank legs .0005; on wrist pins .004; on crank leg oil sleeve .007. It was noted that the crank rail should have a center support.

"In the San Carlos Gin at Casa Grande, other roller gin stands were fitted with ball-bearing eccentrics developed by Mr. Brewster, whose estimated costs have never been given to us. These required new steel framing under the stands made of 6" x 3" I-beams. Mr. Brewster's eccentrics have been very good, but they also go out of service from time to time. He has been operating these at 807 to 980 rpm at San Carlos Gin with rollers at 100 and pushers at 165.

"Lubrication of roller gin crankshafts, crank legs, and wrist pin bearings is one of the greatest problems in roller ginning, and especially in the modernization and maintenance of the older McCarthy type gins. Oil-soaked wooden bearings on crank legs have been used in the Southeastern states and in the Southwestern irrigated regions for many years, but the speeds of the cranks have had to be held down to about 600 rpm, and very frequent oiling has been required. Brewster's use of Micarta wedge blocks (a bakelite composition) against steel pins for the upper bearing of the crank legs (wrist pin bearing) has proved satisfactory to the Western Cotton Products Co., and his development of large size ball-bearing eccentrics, sealed in with Zerk fittings for greasing, have been used in many of the company gins.

"Armour of Phoenix produced bronze crank legs with hollowed reservoirs, but these have been rather clumsy and heavy. Hardwicke-Etter Co., and Murray Co., on their newest roller gins have employed both ball and bronze bearings.

"In the 1942 design of crank and crank legs here reported, the main bearings probably required lubrication every 1000 hours of operation. The wrist pins on this equipment required lubrication every 24 hours.

"Feeding oil into the main cranks in an improved design may be a forward step on the part of the Department. In this improvement, oil would be supplied to a hole in the end of the main crank shaft, thence through an oil hole to the pin where centrifugal force would assist in the lubrication. This method would simplify construction of the oil housings and seed guards now needed.

"For lubrication of wrist pins at the top of the crank legs, a real improvement over old unsatisfactory methods could be made by using oil-bearing bronze bearings which go under trade names such as 'Oilite' and 'Compo' to indicate that they are oil retaining. Use of these materials would probably necessitate only minor changes in present designs. The wrist pin design employed by the Laboratory on these FY 1942 tests gave good service and appealed to the operators. It was lubricated with grease, however, and if an oil reservoir could be utilized along with oil retaining bronze pins inserted into

the wrist pin, it should be superior.

"Auxiliary Research Activities: In addition to the assignments on the crank shaft, crank legs, and bearings, several other research assignments were given attention at Sacaton, Arizona, during the period here covered.

"A high-potential static eliminator was installed about 1-1/2 inches above the roller and doffer on one of the stands in the main gin. No difference was observed in its action when placed over either roller or doffer, and when it was positioned between the two, it worked well in any of those positions, and if the commercial cost of such static eliminator is not excessive, they could be installed in the commercial gins with satisfactory results. When the static eliminator was connected to the electric supply, thus giving a 14,000 volt high-potential de-ionizing effect in that area of the main tube or eliminator, the effect upon the cotton fiber was noticeable at once. The fibers did not carry back beneath the knife (backlash), nor did they adhere to the doffer or metal surfaces of the gin. During static conditions, when the eliminator was shut off, the cotton began at once to cling to the roller and to metal surfaces, rendering the doffers ineffective and giving other operating troubles. With this type of static eliminator, the lint flue and doffers seem to be given better chances for successful operation.

"Desert type of air conditioners were installed in the windows of the roller gin by the engineers, and these raised the humidity of the ginning room appreciably. It is possible that since the roller gin rollers heat up during operation, and may hereby increase the static trouble, that the rollers could be cooled by some system which uses moist air. Assistance of the engineering physicist is necessary in such devices.

"Seed grids on roller gins are also needing improvement and development. At Stoneville, three test grids were made up from bar steel and 3/16-inch fingers welded thereto. Spacings of these fingers were 5/16, 3/8, and 7/16-inch apart respectively, giving a smooth rounded discharge port which J.S. Townsend recommends for such work. Several ideas on seed grids have come to mind in this work. First, a seed grid might be made with 3/8-inch spacings and with alternating fingers bent down so that the ends of the seed grid would give more space for the seed to fall through. Such a grid should be placed quite close to the moving knife, and the amount of the depression of alternate fingers found out by testing, bringing the bending to a point where seed cotton leakage through the space was imminent. A horizontal belt with barbs could be placed below the grid so as to return any cotton that had leaked through. Possibly no barbs would be necessary if a vertical lift belt had them and the horizontal belt merely carried the cotton over to it. Several other seed grid ideas could also be tried.

"The tests will show what results were obtained from the desert fans. Since the lint flue withdraws a large volume of air from the ginning room,

this exhaust air would pass through an airwasher and be returned again or be used to condition incoming seed cotton. It is now difficult to meet the extremely dry conditions at these cotton gins, when atmospheric conditions tend to produce static electricity and when conditioned air is not used over again.

"Conclusions and Comments: From the findings and experiences of these FY 1942 tests, the Laboratory can make up better cranks and crank legs. The heavy duty bearings of ring-oiling type appear to be satisfactory. New guards and simpler oiling for the cranks are needed, and are being devised. Better wrist pins and improved lubrication for them is also being worked on. "(End of Report).

In October 1943 at Las Cruces, New Mexico, in cooperative tests at the Las Cruces Roller Gin which has since been dismantled, engineering staff member Ray C. Young began a series of static elimination studies on roller gins, using the two methods of high voltage static eliminator bars and moistening systems.

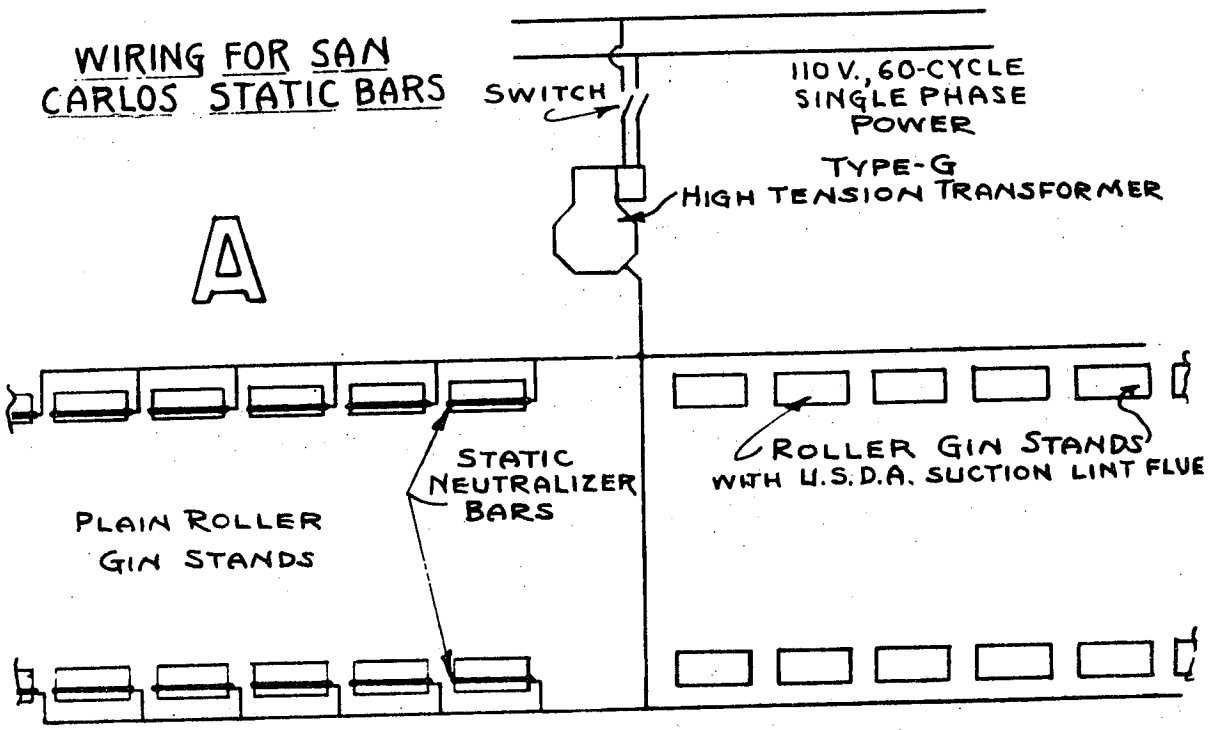


Figure 65a.

Plans of high voltage static eliminator bars as setup by Young and Harmond at San Carlos Roller Gin, Casa Grande, Arizona, and also at Las Cruces, New Mexico, during September and October 1943; A, floor plan at San Carlos Gin.

As an alternative to applying moisture for eliminating static electricity at roller gins, the cotton ginning research engineers resorted to the use of high voltage static neutralizer bars. In the fall of 1943, Messrs. Young and Harmond made tests of these neutralizer bars at Casa Grande, Arizona, and Las Cruces, New Mexico. Figures 65a and 65b respectively show gin building floor plan of stands and wiring at the San Carlos Gin at Casa Grande and partial side elevation of cotton condenser installation at Las Cruces. In the light of more recent tests than those of 1942, it has been found that such installations are not adequate under all ginning conditions.

Several moisture setups were also used in which Hardwicke-Etter Co., assisted with some of their steam and water spray devices as delineated in fig. 43. The Department's steam vaporizer layout for the gin stands is outlined in figure 66.

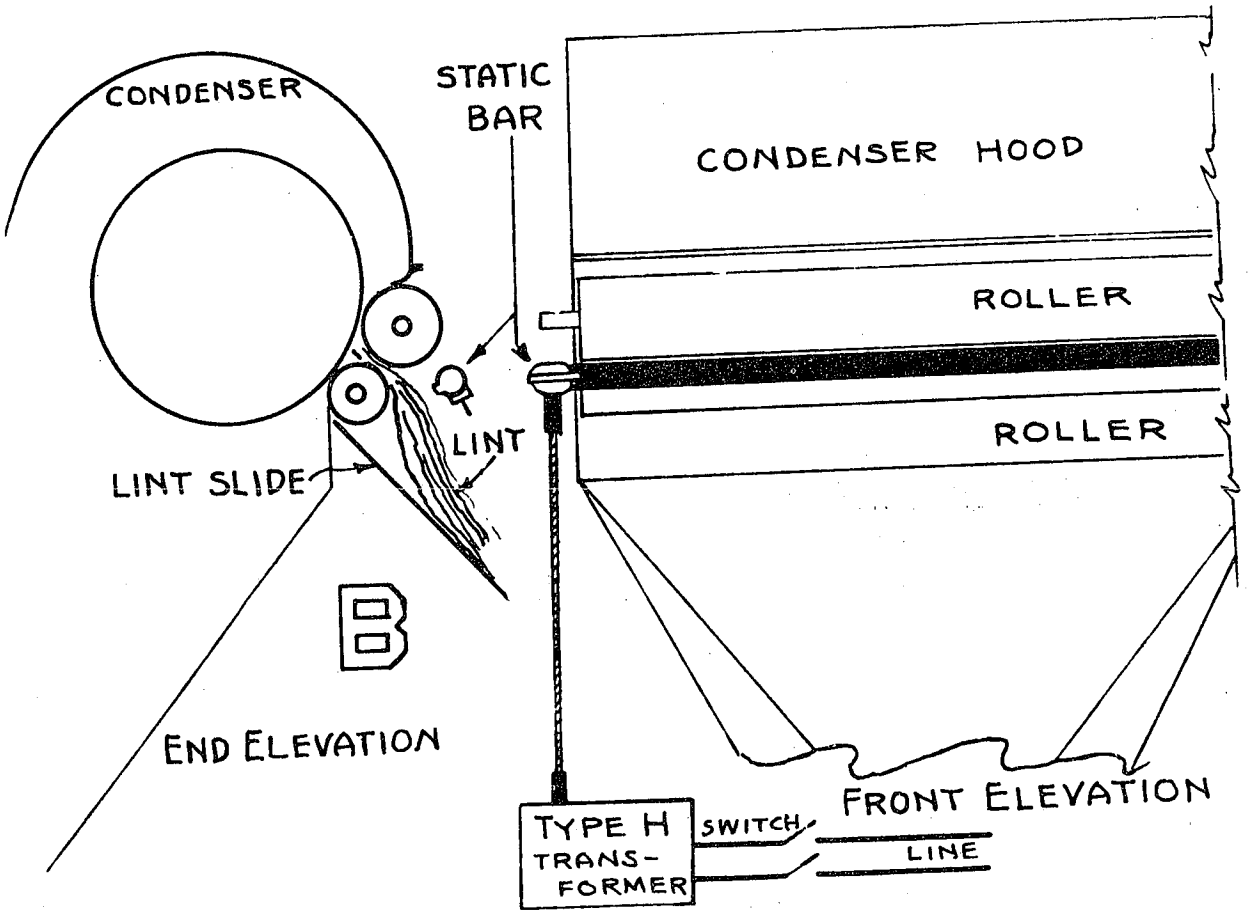


Figure 65b.

Plans for high voltage static eliminator bars as setup by Young and Harmond at San Carlos Roller Gin, Casa Grande, Arizona, and also at Las Cruces, New Mexico, during September and October, 1943; B, condenser wiring where static bars were placed in vicinity of a doffing roller at the discharge.

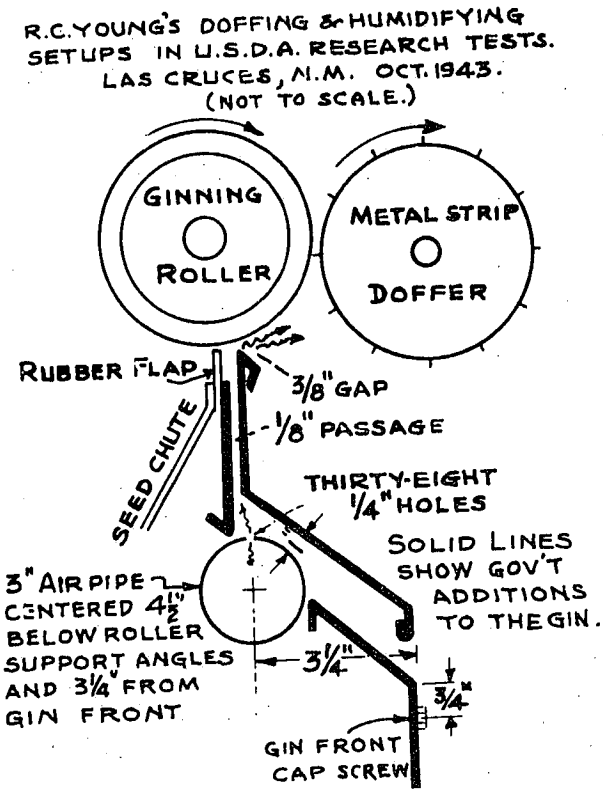


Figure 66.

Diagram of steam vapor humidifying and doffing improvements by Young, as used at Las Cruces tests of October, 1943.

When substitutes for expensive walrus hide and other leathers were being sought in the early '30s, the Department's research engineers and technologists turned to plied packings. The plied canvas - rubber packings at first employed from 11 to 15 alternating layers of heavy canvas and natural black rubber as discussed in connection with figures 39 to 41. Spool windings of this material frequently produced objectionable stains in the lint because heavy knife pressures peeled the rubber from between the canvas layers more readily than was possible with spiral winding. About 1948 white synthetic layers began to replace the black natural rubber.

It may be appropriate at this point to say that during the 1930 - 44 renewal of roller ginning activities in the Southwestern States of this Nation, a number of makes and models of roller gins were employed, among which were the following: Platt Bros. & Co., Ltd.; Dobson and Barlow; Liberty; Sultry; Coats; Talley; Armour; Continental; Murray; Hardwicke-Etter; Foss; and Middleton. Many of these were further improved by the late L. A. Brewster, who installed ball bearing cranks and durable wrist pins for the moving knives. These foregoing gins used rollers from 6 to 8 inches in diameter, operating at 100 to 125 rpm, and principally covered with walrus hide or packing material.

In this same period, crank speeds for the moving knives ranged from 650 to 800 revolutions per minute; and the ginned lint turnout was from 1 to 1-1/2 bales per gin stand per 10 hours. Ginning Laboratory tests in the Southwestern states showed at this time that a crank speed of 930 rpm and a roller speed of 150 rpm on 6-inch diameter rollers turned out 34 percent more ginned lint than did speeds of 650 and 125 respectively. It was also found that spool-wound rollers ginned somewhat faster than did spiral wound, but 7- and 8-inch diameter rollers were almost 1/3 slower than 6-inch rollers when operated at the same roller and crank speeds. In other words, the smaller diameter rollers appeared to have greater capacity.

OTHER ROLLER GINNING DEVELOPMENTS, 1930-58

Several roller gin designs of promise have been tendered to the Government Ginning Research Laboratories for study. Among these have been the Cox cone-type roller gin, the Pettit roller gin, and several others. Each has had features of merit, but the trade in general at that time did not see its way clear to pay for higher priced units because of the uncertainties of long staple cotton crops.

Double box presses at roller gins have been slowly replacing the older single box presses. With these have come lint cleaners as well as pneumatic and belt lint handling systems previously mentioned. So far as is known, the U. S. Department of Agriculture's ginning engineers were the first to use lint cleaners on a roller ginning setup, and this was accomplished very successfully in 1952 at Mesilla Park, New Mexico.

Seed handling improvements, common to saw gins, have also gradually found their place in modern roller gins, so that small-pipe pneumatic seed handling may be cheaply and effectively employed.

From 1955 to 1957, the USDA Cotton Ginning Research Laboratories did much experimental work on swastika type revolving moving knives for roller gins, both at Mesilla Park and at Stoneville. Cooperative runs were made also by the White Gin Association at Canutillo, Texas on this type of moving knife. Figure 67 shows the principal features of this idea in which the speed of the rotary or swastika knives ranged from 230 to 500 rpm in the tests.

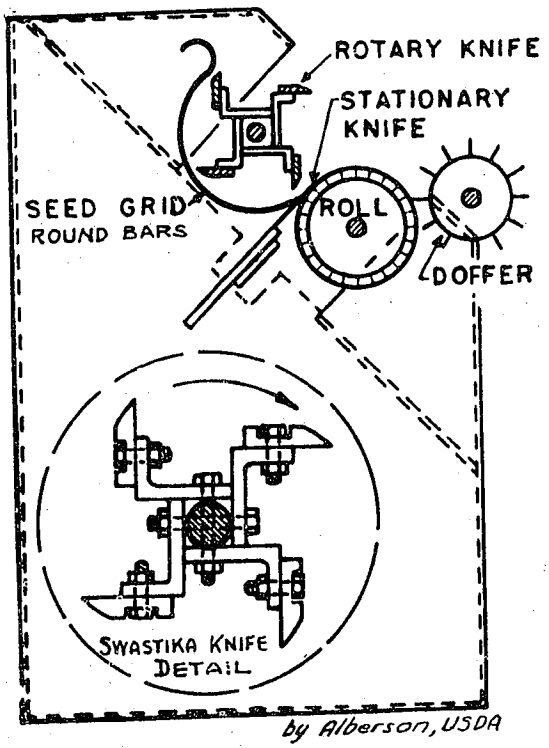


Figure 67.

Swastika type rotary moving knives for roller gins as invented and developed in the USDA Southwestern Cotton Ginning Research Laboratory. Below the main section is an enlarged detail of the knife construction as an inset.

Reports in detail have been issued by the Laboratory and are not repeated here. Suffice to say, however, that while this design had several good features in an increased capacity and simplicity of construction there was a constant hazard of seed cracking and a wide variability of samples from very good to poor.

Other investigations toward improved roller ginning are constantly in progress, and the Government Laboratories have been trying out a series of new ideas advanced by staff members. Among these ideas is a public patent-applied-for invention by Agricultural Engineer James M. Williams, Jr., and associates, which is of interest because of its extremely high capacity, namely up to 20 pounds of ginned lint per hour per inch of roller length, or over 400 pounds per hour on a 20-inch roller gin. Figure 68 affords a simple line diagram of the Williams' idea, wherein an endless chain of bar moving knives, having suitable gaps, travels at high speed over the upper surface of the ginning roller and fixed knife. Ginned seed and some unginned locks travel beyond the end of the fixed knife to one point of disposal and reclamation, while the ginned lint travels from the ginning roller downwards in conventional style. Williams has increased the ginning roller size to approximately 12 inches diameter and has worked on other elements toward perfection of the unit. A more detailed description of the Williams' flight-bar gin is to be found in the Cotton Gin and Oil Mill Press issue of August 9, 1958.

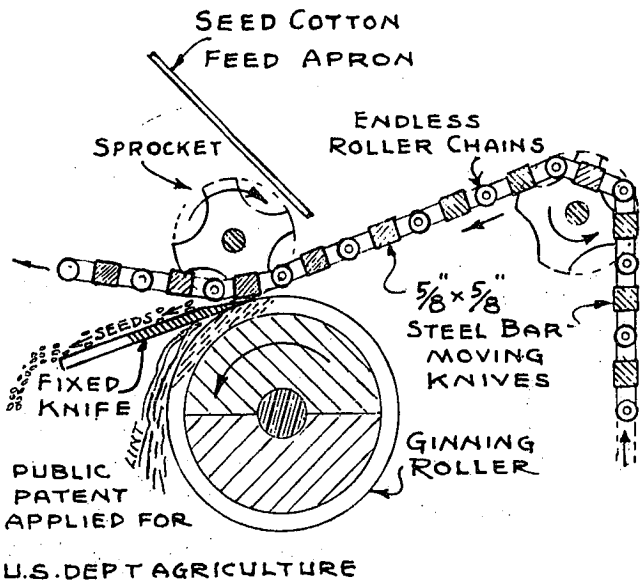


Figure 68.

Diagram of the salient elements of the 1958 model "flight-bar" type of high capacity roller gin invented and developed by Agricultural Engineer James M. Williams, Jr., Southwestern Cotton Ginning Research Laboratory, Mesilla Park, New Mexico.

CONCLUSION

The compiler here desires to acknowledge the helpful assistance, suggestions, and reviews of manuscripts that were tendered to him by Messrs. Edward H. Bush and John C. McDonald of Dallas, Texas and Wilbur M. Hurst of Beltsville, Maryland.

Photographs of the three Cotton Ginning Research Laboratories of the United States Department of Agriculture are here given because of their continuing contributions to all phases of cotton ginning, figures 69, 70 and 71.

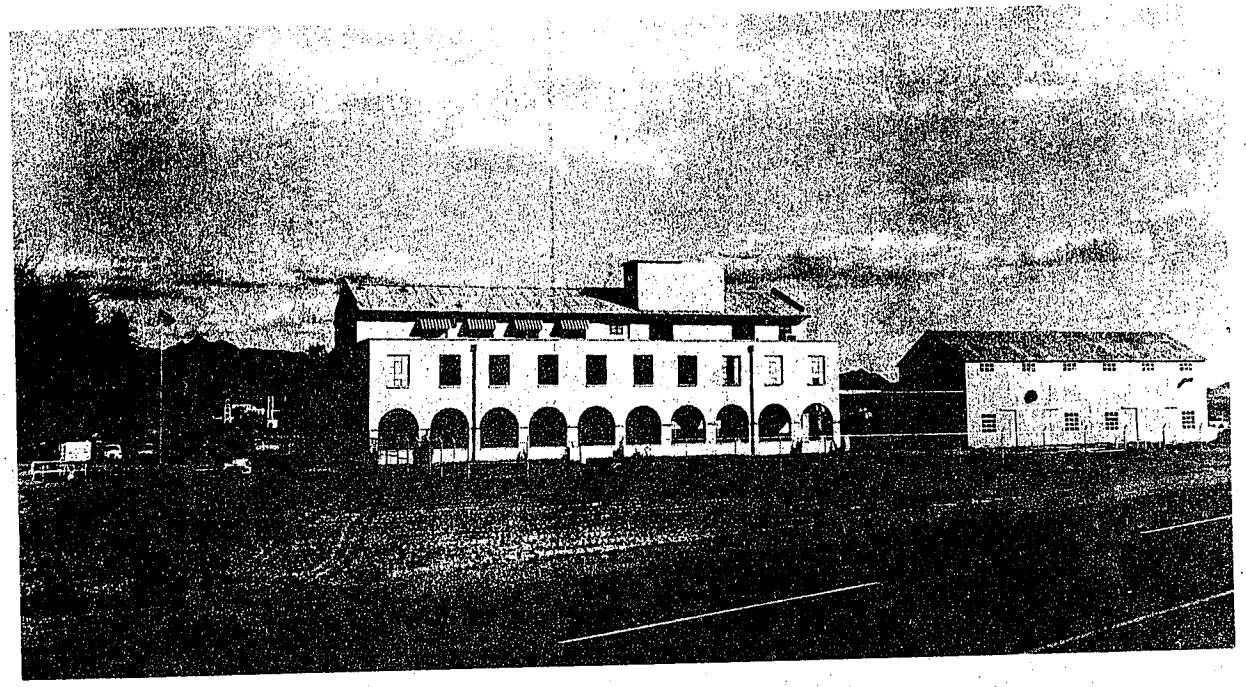
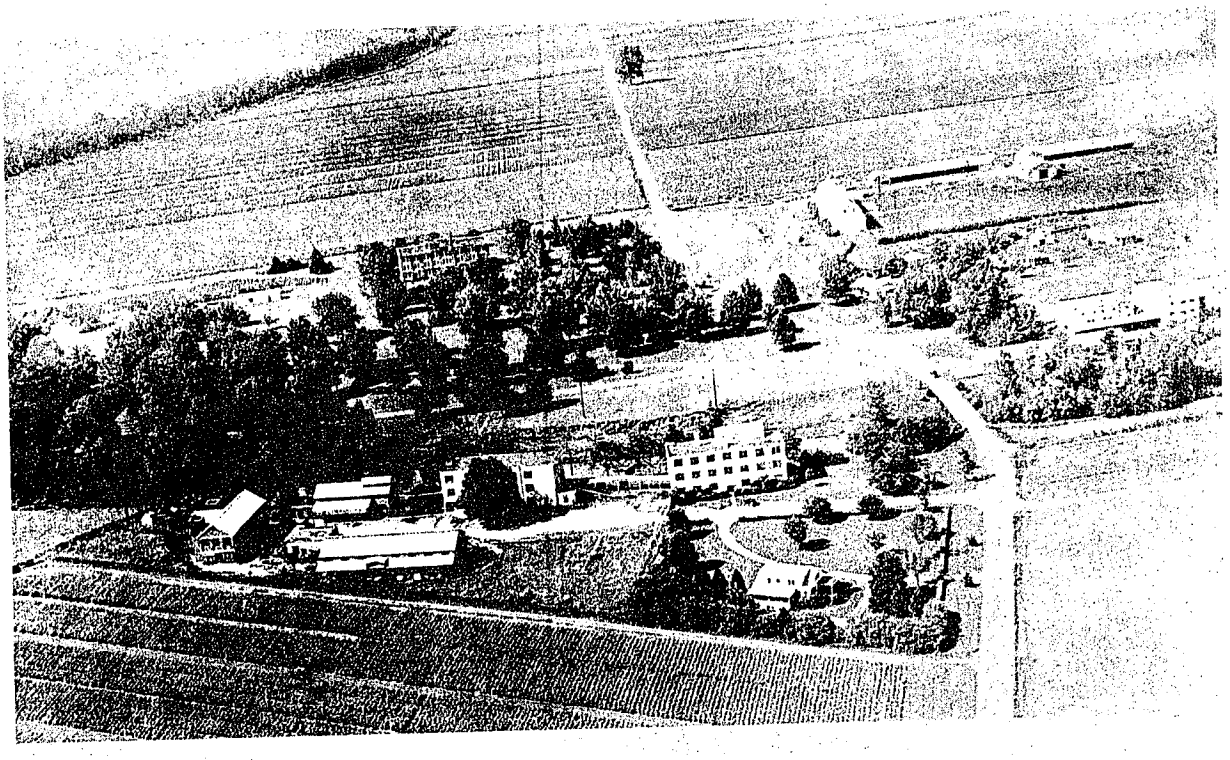


Figure 69.

Southwestern Cotton Ginning Research Laboratory, Mesilla Park, New Mexico

Figure 70.

U. S. Cotton Ginning Research Laboratory, Stoneville, Mississippi



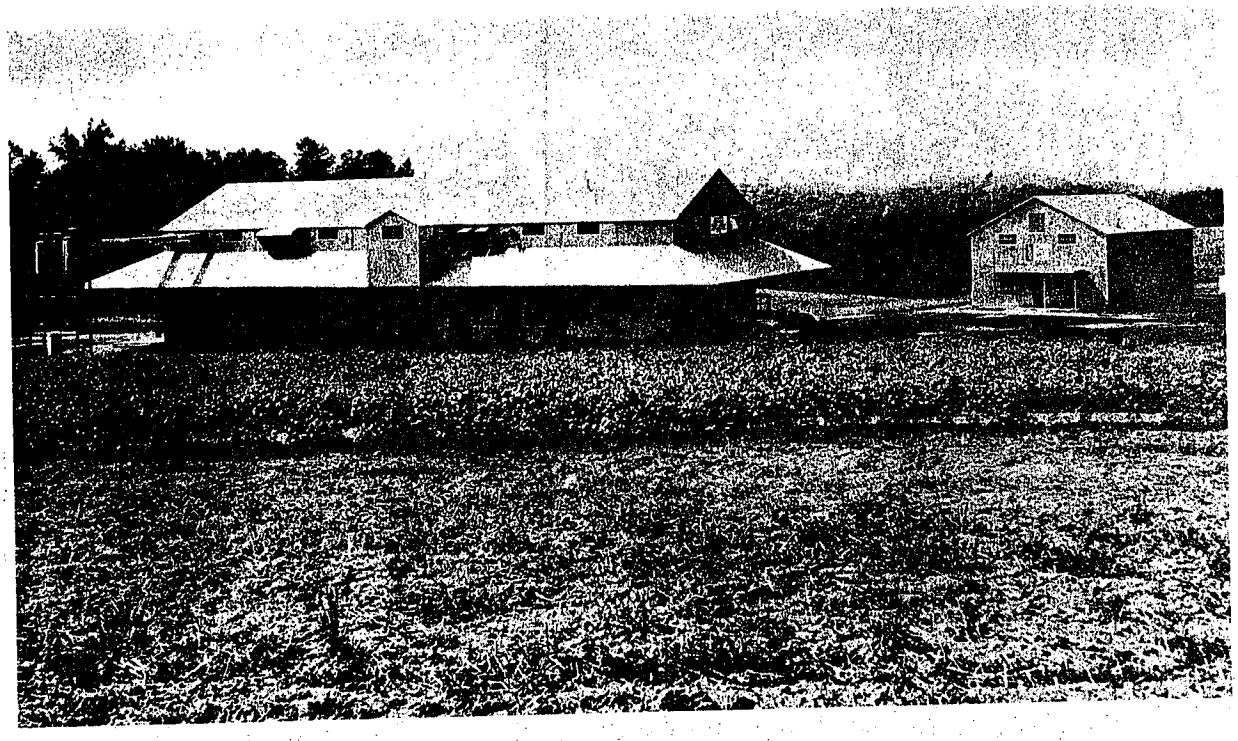


Figure 71.

Southeastern Cotton Ginning Research Laboratory, Clemson, South Carolina

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