Saw and Toothed Cotton Ginning Developments

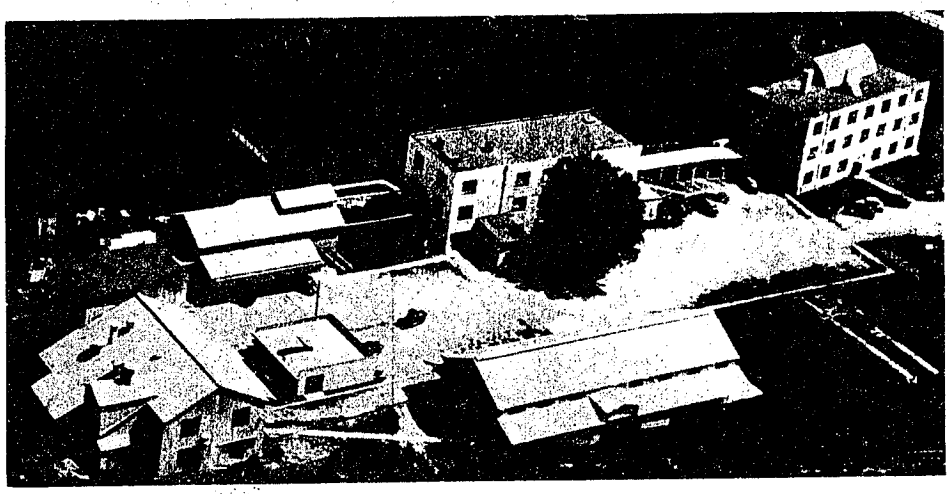

Photo of the World's First Ginning Research Laboratory
Established 1930 Stoneville, Miss.

by

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Agricultural Research Service
United States Department of Agriculture

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The Cotton Ginners' Journal
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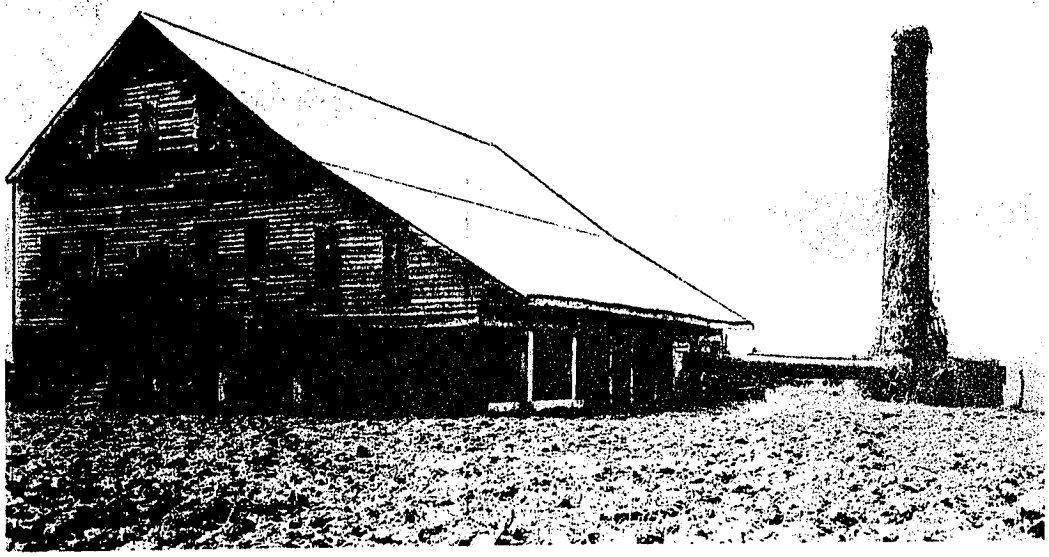

Historic old cotton gin building and vine-covered chimney at Blake Plantation (Blakely, Mississippi), North of Vicksburg, Built about 1841; used to 1901.

Old Mule Gin, McLaurin Plantation, Franklin, Ala. (Courtesy of Library of Congress, E. W. Russell, HABS, photographer.

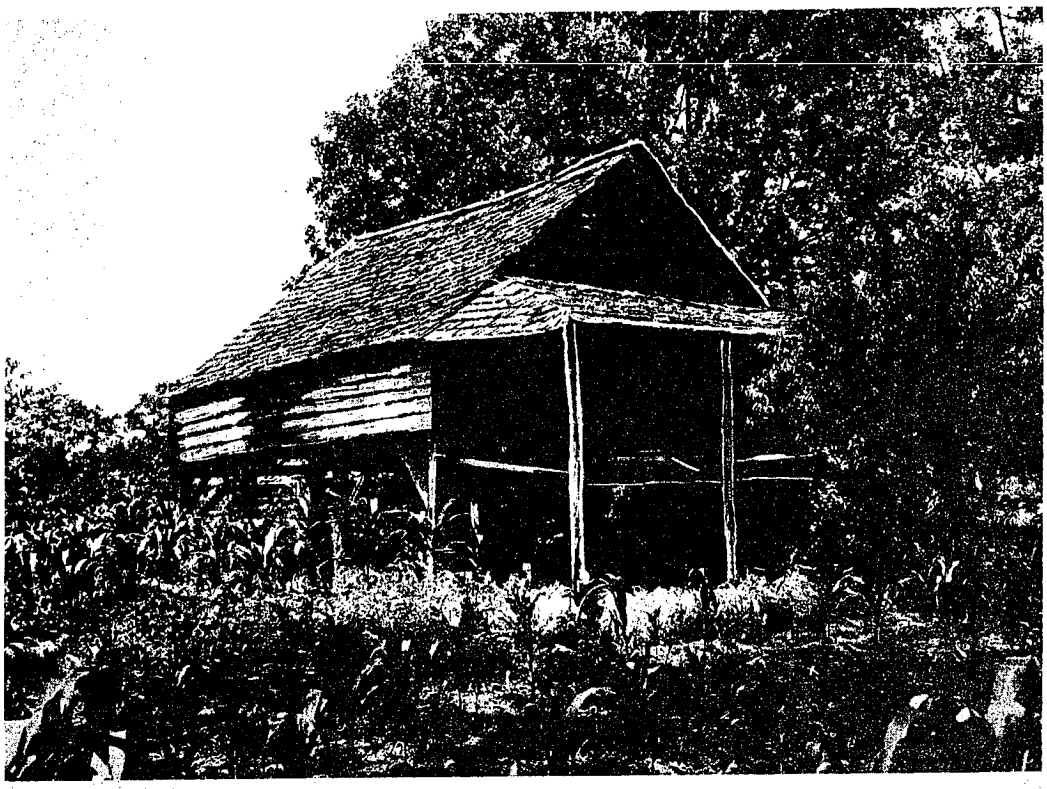

Table of Contents

Acknowledgements

Acknowledgement is hereby made to all who have assisted in the preparation and assembling of this material. An appendix list of special acknowlegements 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 and quotations made available from various sources.

The author is especially grateful to Messrs. Edward H. Bush, Jack Rohr, Walter Moore, Wilbur M. Hurst, W. M. Bruce, and their staffs for assistance in making this publication possible.

After some 30 years of experiments and experiences with toothed and saw gins, he rejoices in the broad range of service effected by colleagues in his and associated branches of the U. S. Government. The Smithsonian Institution, the National Museum, the Department of Commerce, and other Agencies have been most generous to the author. The manufacturers of cotton ginning machinery and research scientists with the cotton mills have also rendered much assistance and information.

With this background, the author takes pride in the leadership of the United States of America in the field of saw and toothed ginning.

Foreword

To present a moderately limited review of the development of the tooth type cotton gin, we have confined discussion to the gin stand itself. This has made it necessary to omit other associated processes, even though they are important and comprise rather extensive and expensive machinery installations.

Most of the United States cotton crop is now ginned at saw ginning establishments. (Saw ginning, as distinguished from roller ginning, is fundamentally the same basic process of removing the lint from cotton seed as in the original tooth type gins.) During the 170 years since the Whitney and Holmes inventions, the ginning establishment has expanded from the plantation single gin unit to complex, multi-battery groups of gin stands and associated apparatus.

To portray this tremendous advance in ginning, the first chapter provides a prologue which summarizes the difference between the first and the latest ginning developments.

It is hoped that the publication will serve as a useful reference and tool for students, historians, and others interested in this major contribution to our agriculture and economic progress.

Charles Abel Bennett

CHAPTER I.

Prologue, giving a brief review of saw and toothed ginning expansion from 1789 to 1900; and Sea-Island cotton ginning from 1800 to 1850.

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SAW AND TOOTHED GINNING

Upland short-staple cottons were grown limitedly in the Atlantic and Gulf coastal areas of the North American colonies and settlements before the Revolution, but Sea-Island cotton varieties predominated in quantity and quality for several decades thereafter. Both kinds of cotton were then ginned by hand or by means of primitive roller gins built on the "churka" principle.

Following the two inventions of toothed cotton gins by Whitney and Holmes, 1795 and 1796, respectively, production of the upland cottons increased rapidly, but the ginning establishments were largely confined to single gin stands on the plantations, somewhat as depicted in Figure 1.

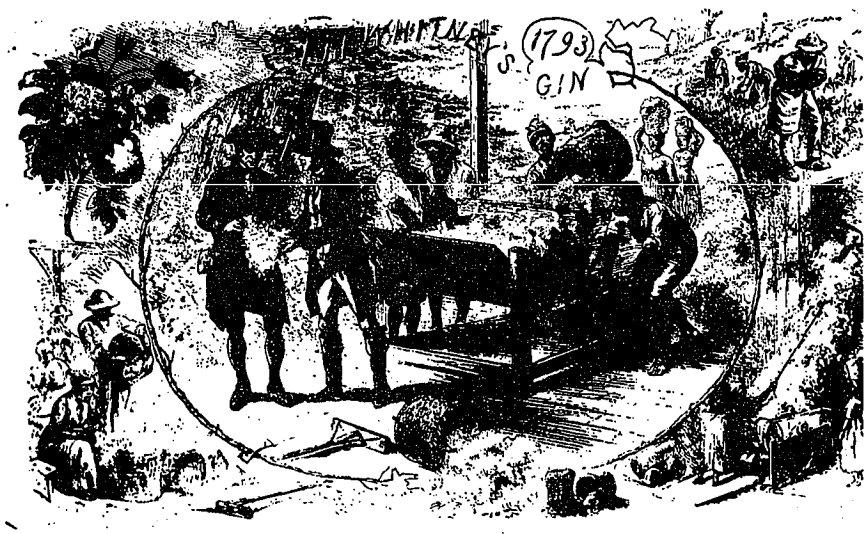


Figure 1.

An old sketch of the Whitney Cotton Gin on a plantation. A border detail shows that the seedcotton was stored in bins above the gin stand, or brought to it direct from the field.

The larger plantations used several methods to house their gin stands and harvests. Some of the gin houses were of 3-story construction providing storage bins on the top floor, ginning operations on the second floor, and

power drives by mule-driven sweeps and gears on the ground level. Other gin houses of 2-story construction depended upon seedcotton main storage elsewhere. Harvested seedcotton was often stored by the plantation families on the cabin galleries (porches) or in storage bins assigned to them. Each family was responsible for sorting and cleaning its harvest, culling defective locks, sticks, stems, burrs, and other foreign matter before the ginning.

The ginned lint was usually discharged into a blow-room, located behind or below the gin stand with outside access so that the lint could be carried to the cotton press without interfering with the operation of the gin. As the size of the annual crop increased, animal power was gradually superseded by water power wheels, tractors of the old steam type, improved steam engines, electric motors, and internal combustion engines.

Figures 2, 3, 4, and 5 from Library of Congress photographs, manufacturers' catalogs, and other sources, show some aspects of the early plantation gins. Figure 2 shows the interior of an old-time, 3-story Mississippi gin, such as portrayed on the introductory page; while Figure 4 shows a Carolina 2-story gin.

Figure 2.

Ginning cotton on the second floor of a 3-story ginnery, such as at Blakely Plantation (Mississippi). Reproduced from the Collection of The Library of Congress. E. W. Russell, photographer, HABS.

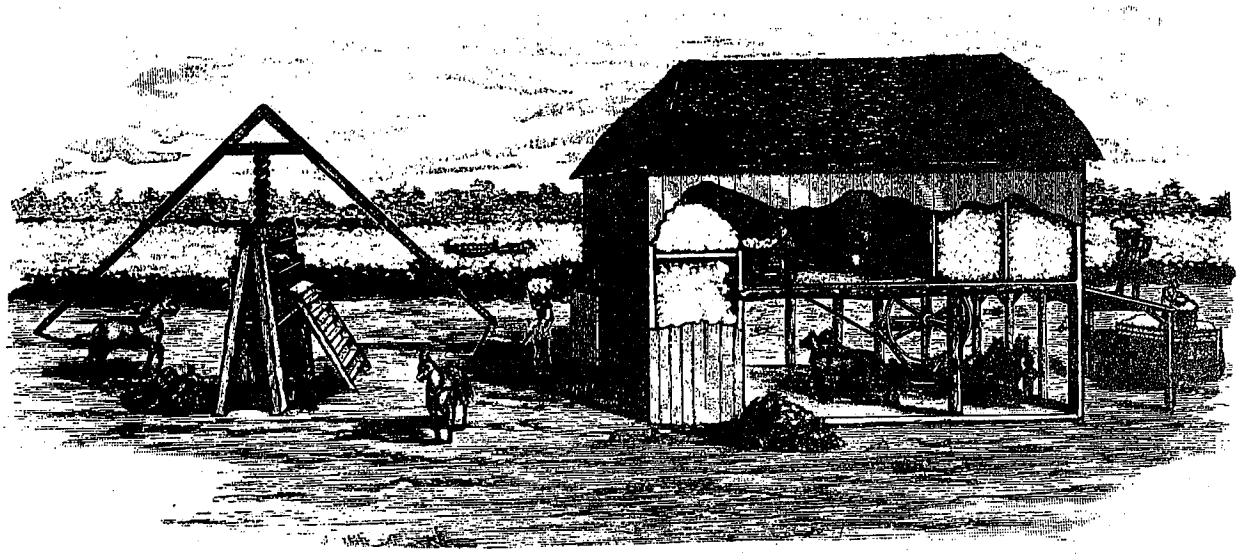


Figure 3.

An early American Cotton Ginning installation, using 2-story building, temporary storage and gin stand on the 2d floor, power drives at ground level, and press in the gin yard. From the 1899 catalog of Munger Improved Cotton Machine Mfg. Co.

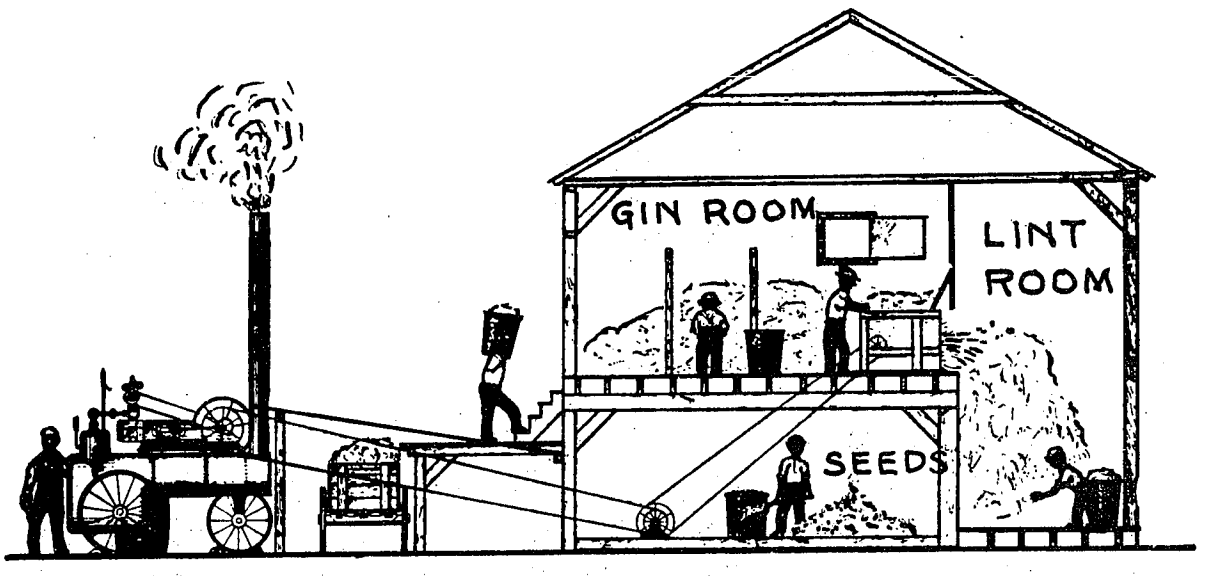


Figure 4.

A Carolina single-stand cotton gin about 1890. Note the temporary stalls for seedcotton storage on the second floor, along with the gin stand. The lint blow room is two stories high. Press is not shown, hence was probably a yard press. Drawn by Prof. D. A. Tompkins.

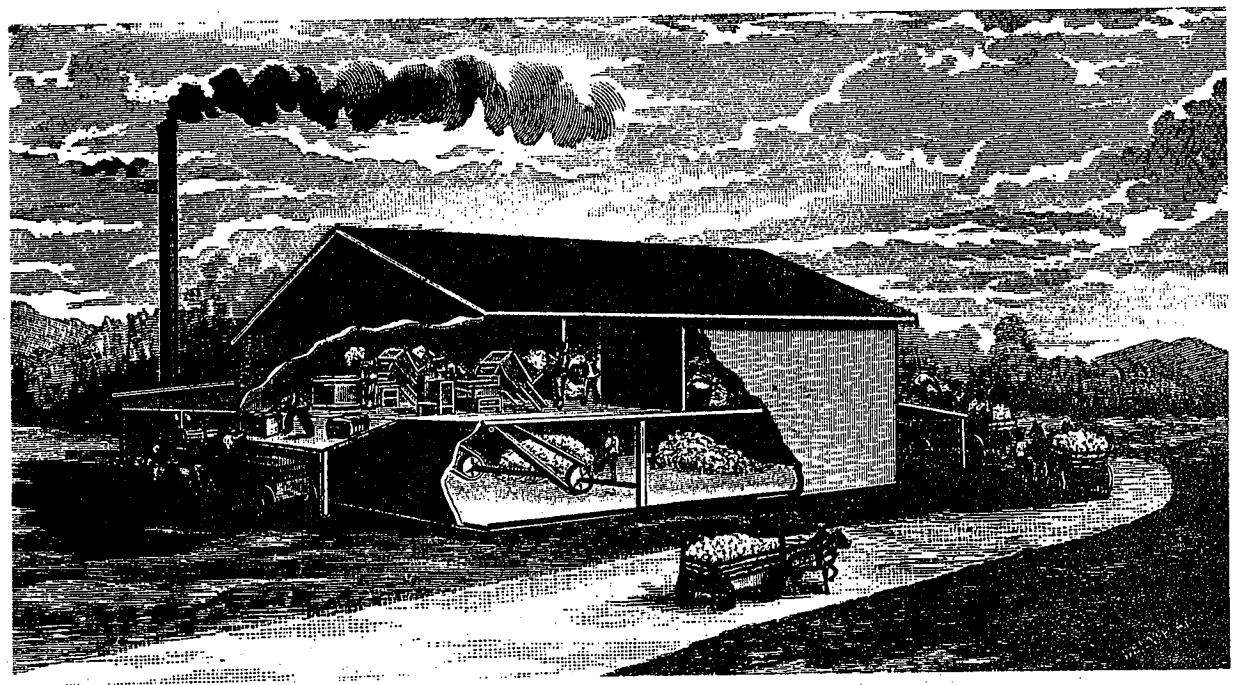


Figure 5.

An 1880 multi-stand ginnery, just prior to the advant of pneumatic handling, showing two gin stands, bale press, etc., in the gin building. Courtesy of Continental Gin Co.

Prior to 1840, ginned lint from both upland and Sea-Island cottons was packed in sacks, as illustrated later in the roller gin section of this chapter. After the development of the screw press, which used post-oak wooden screws first, and iron or steel ones later, the baling underwent many improvements. Earliest presses were those used in the yard adjacent to the gin building (Figure 3.), but later units were placed inside the building (Figure 5.).

Handling of both the seedcotton to the gin stand, and the lint to the press depended upon human labor for almost a century after the Holmes and Whitney inventions. During the 1880's, as described later, the pneumatic conveyance of seedcotton and ginned lint came into use.

A limited amount of cleaning was performed within the gin stand because of centrifugal sling-off of motes and fine trash by the gin teeth, but the turn of the century (1900) witnessed radical advances in seedcotton cleaning by machinery.

Figures 6 and 7, from the Library of Congress and Texas, respectively show two excellent examples of old-time post-oak wooden screw presses for cotton baling.

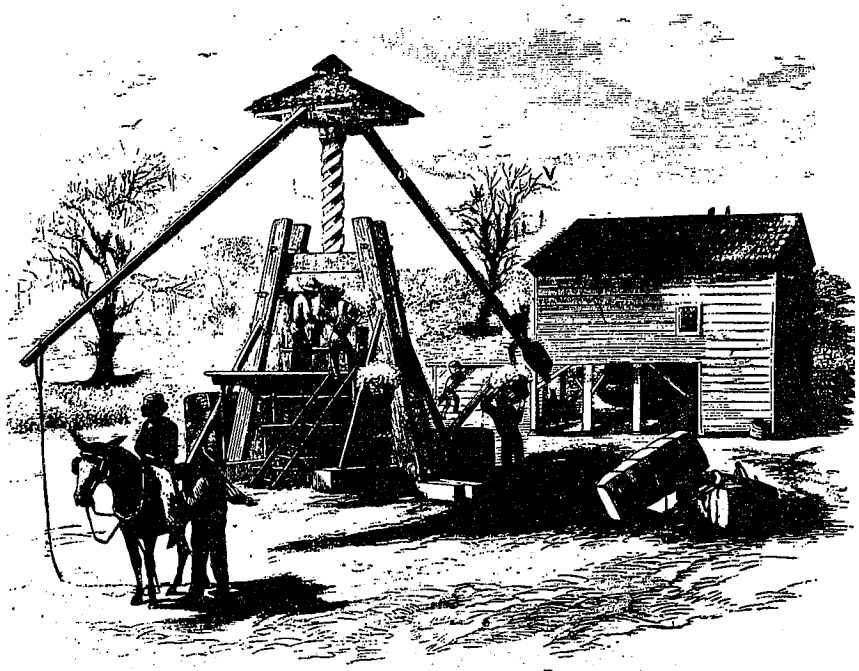


Figure 6.

An illustration used in Frank Leslie's Newspaper, Vol. 33, 1871. Cotton Press and Gin House. E. W. Russell, photographer, HABS, Library of Congress.

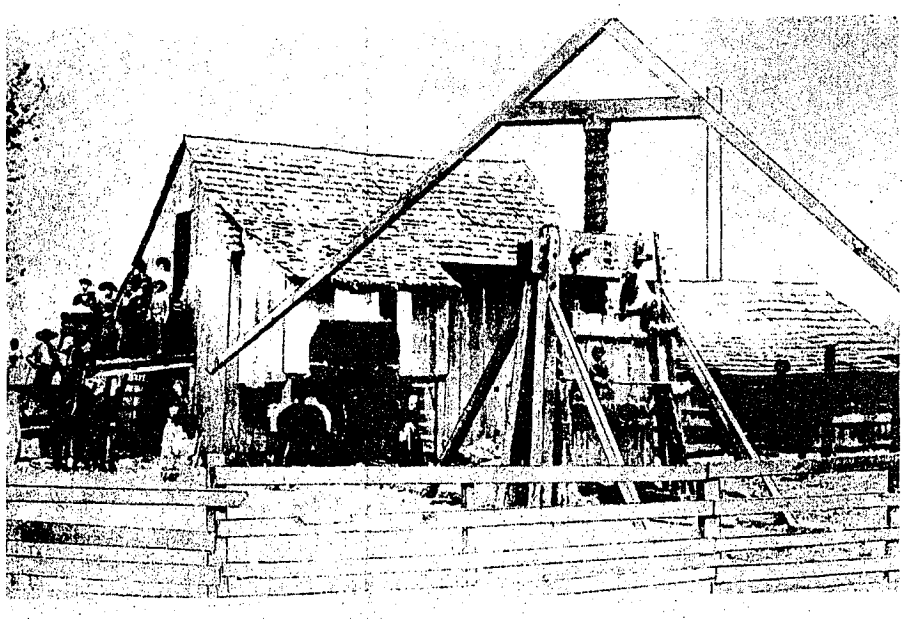


Figure 7.

An old Texas Gin and Yard Press. Photo furnished the author by Mr. Brown Hayes. Origin of photo not known.

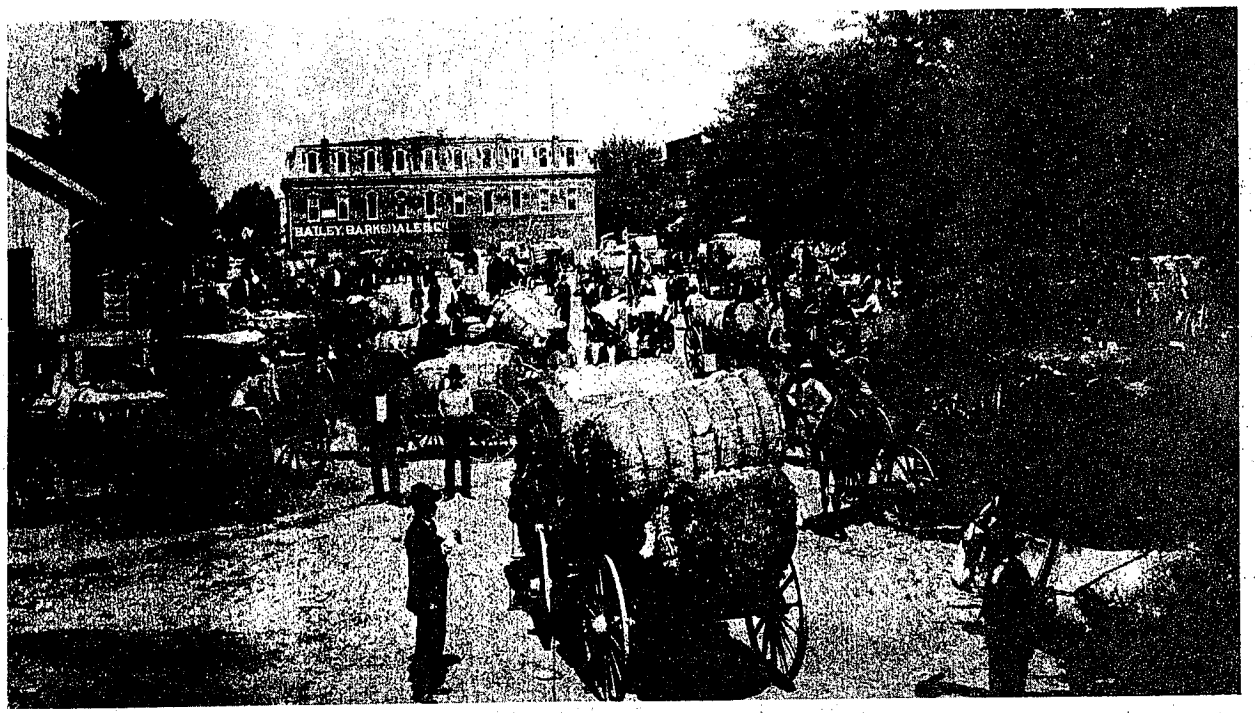


Figure 8.

Greenwood, S. C. Cotton Market, 1896. E. W. Russell, photographer, HABS, Library of Congress.

Marketing was largely localized on town squares or gin yards from 1840 to 1900, as shown in Figures 8. and 9.

Figure 9.

Hauling cotton by ox team. From Frank Leslie's Newspaper, Vol. 33, 1871. E.W. Russell, photographer, HABS, Library of Congress.

Although small plantation ginneries continued to operate with single stands until about 1845, the close of the 19th century saw the establishment of many custom gins in local communities similar to that shown in Figure 10.

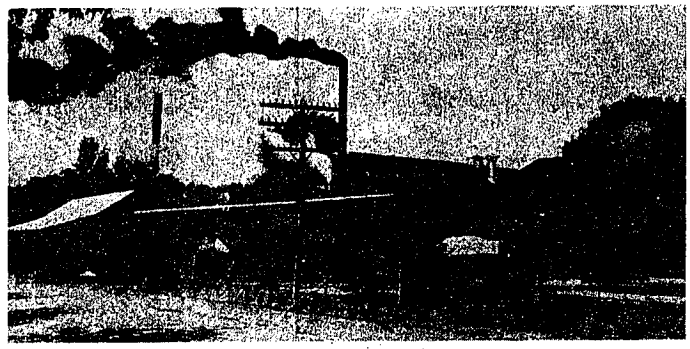


Figure 10.

A Southeastern custom ginning outfit of 1900. Library of Congress Collection. File 6013.

By that time also, animal-powered gins had given way to steam gins and other powered gins, and straws were in the wind that betokened for the American ginner many important changes as the end of World War II neared. One of these omens of great change was the machine cotton picker, shown in Figure 11, a steam tractor type of cotton picker which was operating in 1896 in Texas fields.

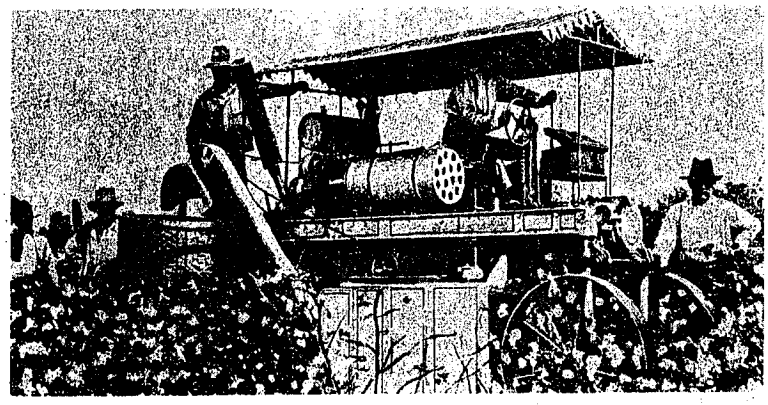


Figure 11.

From Collection of the Library of Congress. A photo taken March 6, 1896.

A number of the cotton ginning machinery manufacturers that were organized as early as the 1830's later issued cuts and comments along with their sales bulletins that have been of excellent reference value. The single-stand hand-powered gins were in use in the United States and in foreign countries and they are still in use. The record is not clear as to when rotary lint condenser attachments were made to such hand gins, but it appears from contemporary patent records that prior to 1860 the rotary screen drum condenser

was unknown. Various old gin buildings and equipment that were personally inspected by the author and members of the United States Department of Agriculture Ginning Research Staff indicate that the lint blow rooms were used extensively until the end of the War between the States. This feature is discussed in Chapter III.

A good example of the hand-powered gin stand, as taken from 1896 and 1913 catalogs of manufacturers, is illustrated in Figure 12. Such brands as Eagle, Lummus, Continental, and others had saw cylinders ranging from 10 to 20 saws, with detachable condensers so that the stands could be backed against a blow room or other screened receptacle.

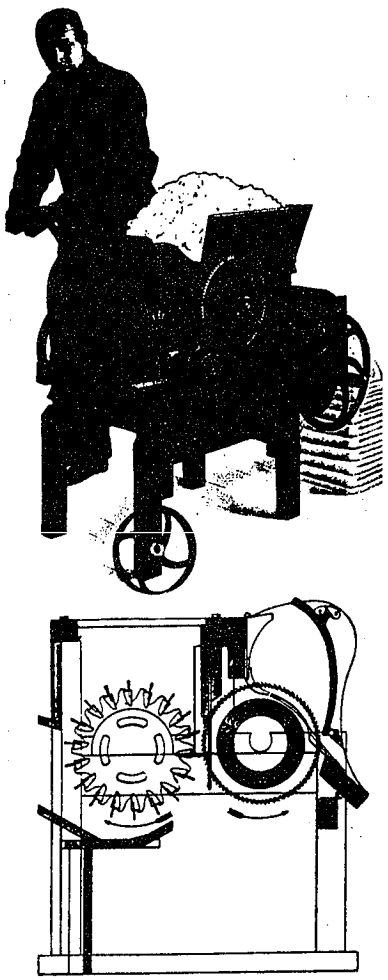


Figure 12.

Hand powered gin stand of 1890 to date. Made in 10, 16, and 20 saw units.

The saw spacings of the 10 to 20 saw small hand-powered gins for export purposes seem to have approximated 5/8 inch from center to center of saws, while those of American gins have in most cases increased to about 3/4 inch spacings.

The 1880 decade gave impulse to a series of ginning developments, some of which had been suggested years before. Single and double rib huller gins came into prominence; automatic or mechanical forms of feeders were developed to replace hand-feeding of seedcotton into the roll box of the stand; pneumatic handling from wagon and bin to overhead distribution of two main types appeared; and increase in the number of gin stands per ginnery became popular.

Figure 13, retouched from an 1890 Munger catalog, shows the cross section of the mechanized ginning systems that marked the end of the decade.

The inset shows improved construction of this flat feeder that was popular between 1890 and 1920. Figure 14, adapted from other catalogs, depicts an inclined type of mechanical feeder that was tipped into operating position, or put back on its legs when out of use.

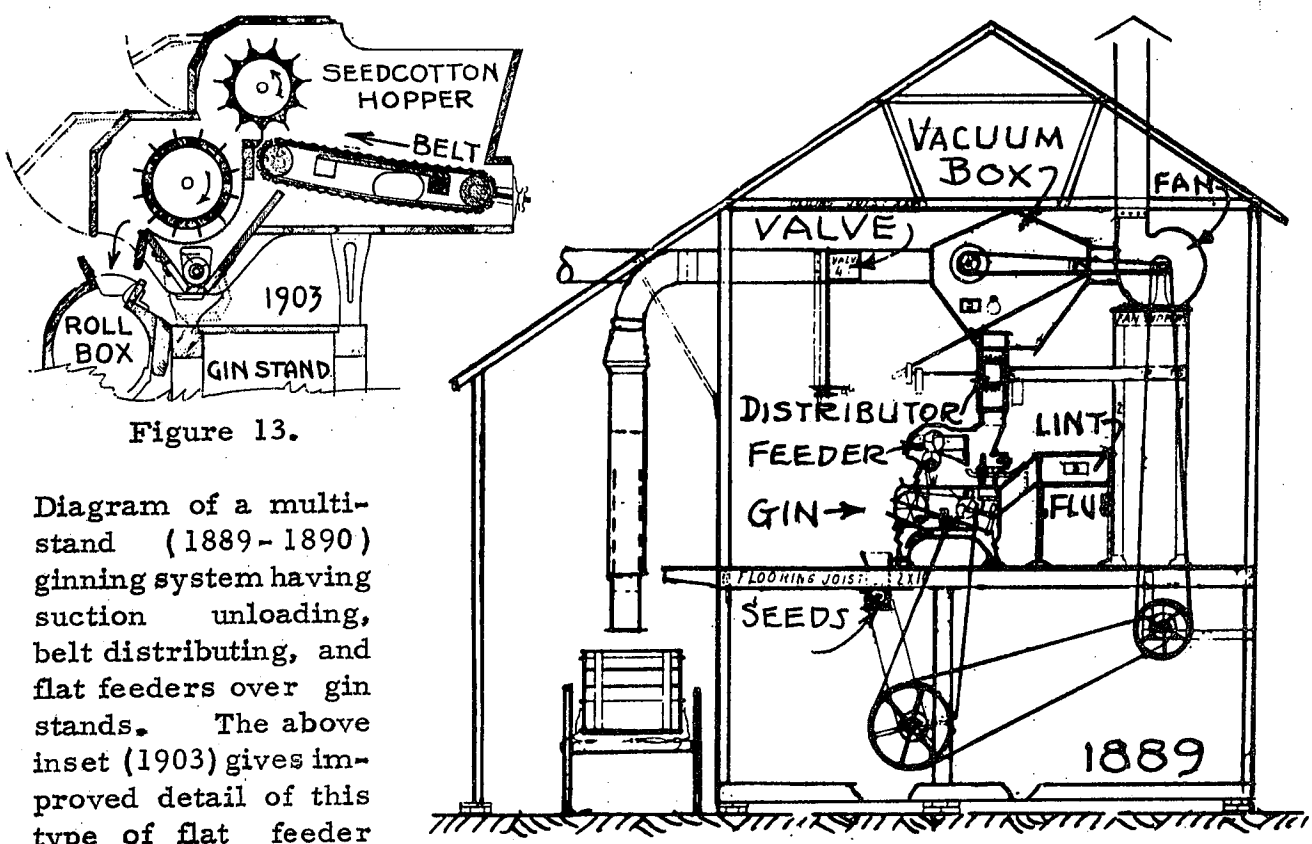


Figure 13.

Diagram of a multi-stand (1889-1890) ginning system having suction unloading, belt distributing, and flat feeders over gin stands. The above inset (1903) gives improved detail of this type of flat feeder construction. Note also the rectangular lint flue, and seed disposal system at front of gin stands.

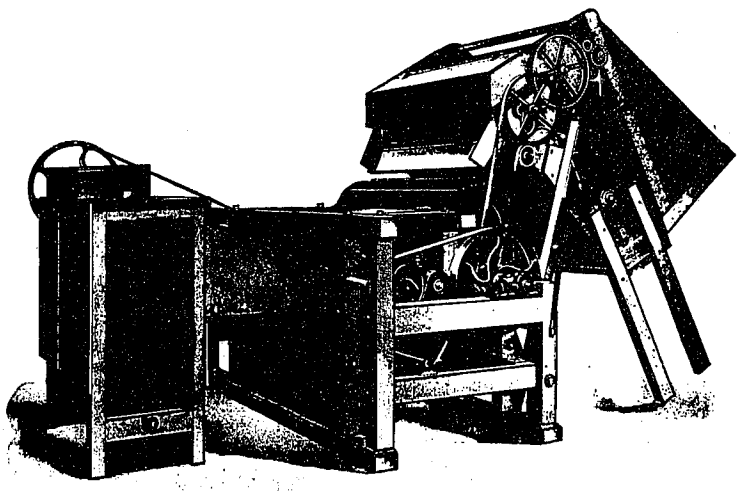


Figure 14.

An 1899 model front feeder and wooden-frame brush gin.

When handling of seedcotton by air from wagon to ginning equipment was achieved in the 1880's, two distinct forms of distribution to the feeders came into use. One was that of David Saylor of Arkansas and comprised a fully pneumatic system from point of suction to point of delivery, by means of the suction pipe and a so-called pneumatic elevator, which was an intermittently acting dropper. The suction fan was provided with a mechanically operated gate which broke the suction at intervals and permitted the cotton in the elevator body to drop to the feeder. The second type, known as the Munger system, employed the cotton suction pipe as far as a screened box, called a separator (See Figure 13 in which the separator is designated as a vacuum box). From the separator cotton outlet, the seedcotton was conveyed by a spiked belt to the feeder hoppers, and the suction fan operated continuously by drawing air through a separating screen at the rear of the vacuum box.

Figure 15 depicts the Saylor pneumatic distribution and the Munger separator and mechanical distribution system for double stand outfits.

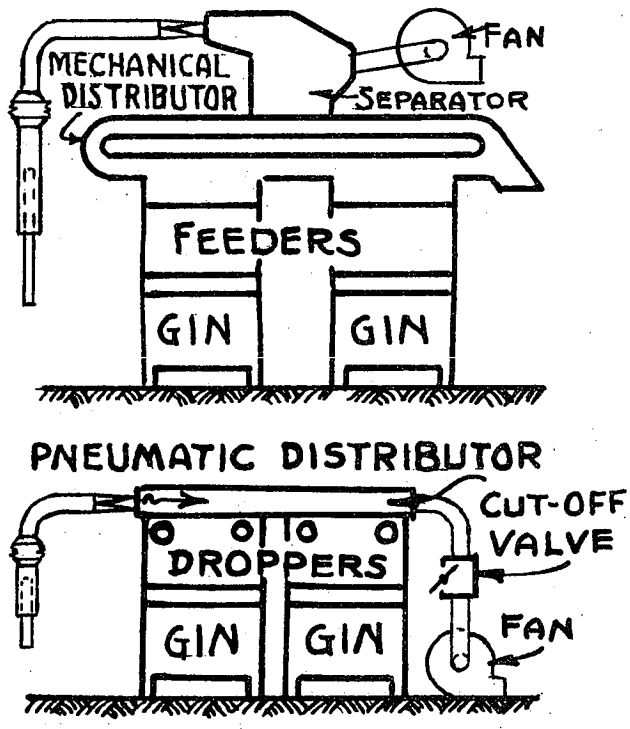


Figure 15.

(Top) - Mechanical Distributor and vacuum separator invented by Munger, 1884.

(Bottom) - Pneumatic suction distributor and dropper invented by Saylor, 1888.

It should be noted that during the turn of the century, 1895 to 1905, there was a marked trend toward the use of special cleaning feeders in order to improve the older methods that relied upon "whippers" or preliminary beaters operated by hand, and upon the huller front and moting action of the gin stands to complete the cleaning. At the same time, the handling of the freshly ginned lint was improved by the use of master condensers that replaced small, upright, or farm units previously used.

Figure 16, reproduced from another old catalog of 1896 vintage, shows another interior of an 1893 brush ginning system having (1) an overhead pneumatic suction system of the Saylor type; (2) seedcotton chutes or dropper down to the flat feeders; (3) and (4) brush gin stands with individual rectangular gin flues for conveying the lint to a master condenser (5). In addition

to those items, it will be noted that there is a seed disposal system beneath the gin floor and a steam-driven packer or tramper over the cotton box of the press.

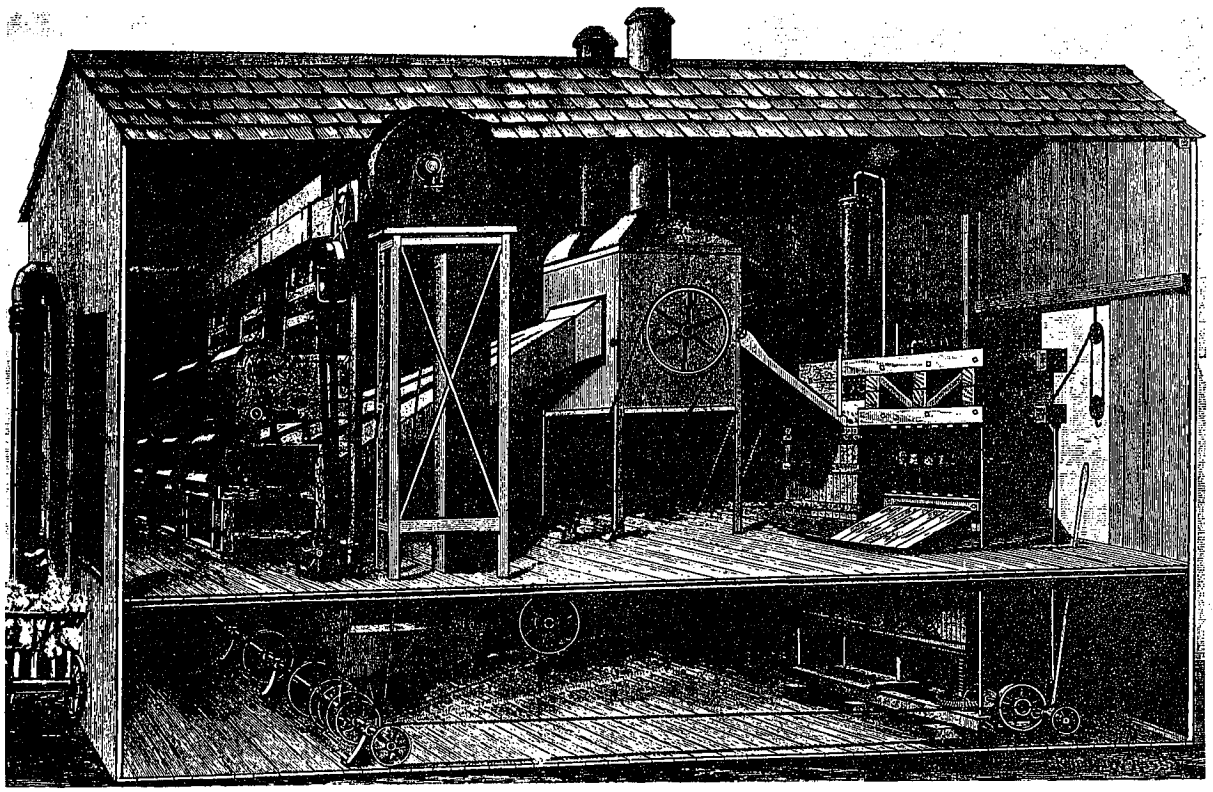


Figure 16.

Dallas Exposition and Texas State Fair first prize for complete gin system from wagon to press, Oct., 1893. Courtesy Eagle Cotton Gin Co. (formerly Bates, Hyde, & Co.)

Figure 17 comes from a catalog cut (Continental, 1903) showing a gin yard scene at Mexia, Texas. The photograph was taken during the season 1895-96. Within the gin house were three batteries of five 70 saw stands upon which were flat feeders (see Figure 13.) which were supplied from overhead mechanical belt distributors. The circular brick building in the right foreground was the cotton house, upon which later rested a water storage tank.

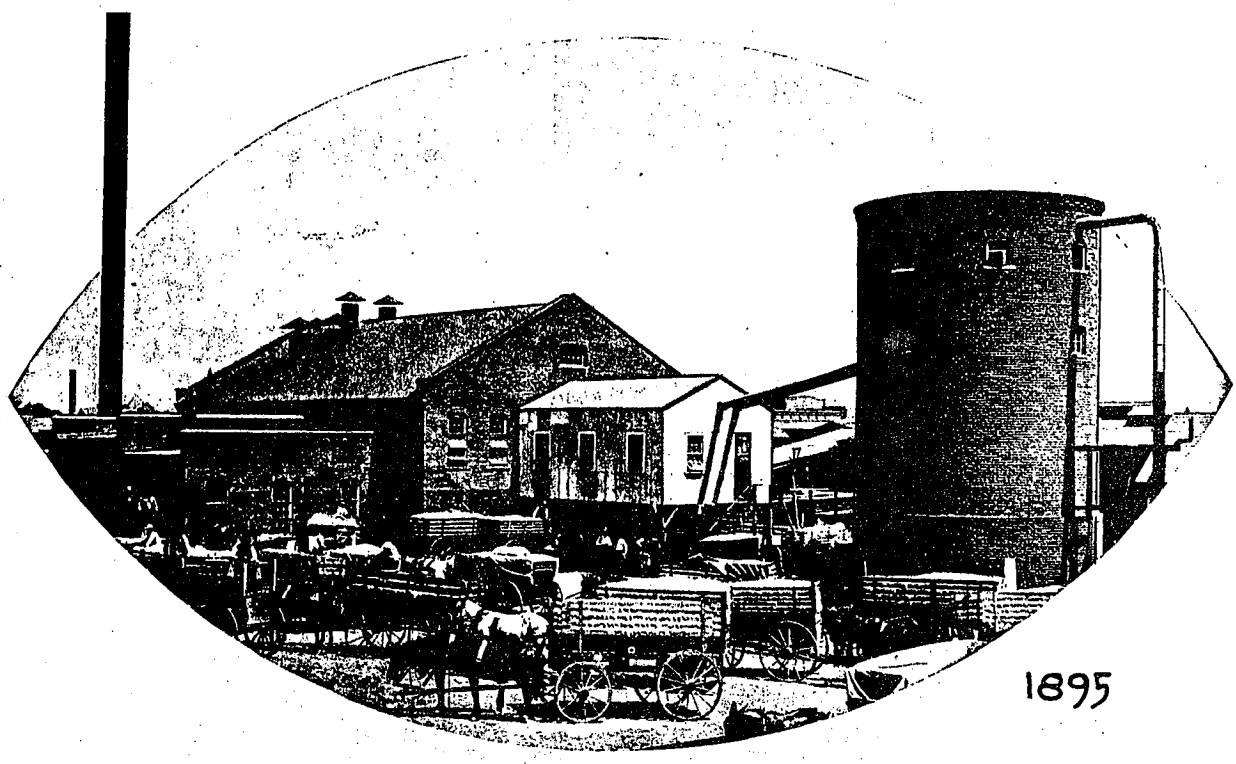


Figure 17.

Exterior view of an 1895-96 cotton gin yard at Mexia, Texas. In this ginnery were three batteries of five 70 saw stands each. (Courtesy of Continental Gin Co.).

SEA-ISLAND COTTON GINNING

It has been deemed necessary to refer, at this point, to Sea-Island cotton ginning in the United States, because that type of long-staple cotton is not usually ginned on saw gins. Statements have been made that certain forms of needle-tooth gins described later, were able to gin Sea-Island cottons satisfactorily. However, since roller gins will handle both upland and long-staple cottons and are in worldwide use, brief notes upon this type of ginning may interest saw ginners.

Beginning with the McCarthy roller gin patent of 1840, the United States of America took the inventive lead in that type of ginning as well as in saw ginning. A few scenes of the Sea-Island cotton industry are given here for historical interest. The illustrations were made available to the United States Department of Agriculture through the courtesy of the Library of Congress. Mr. E. W. Russell, photographer, HABS, Library of Congress, made the prints or photographs, reproduced here. For more detailed information on roller ginning see "Roller Ginning Developments," Charles A. Bennett, 90 pp., 1959, Cotton Gin and Oil Mill Press and Texas Cotton Ginners' Association.

Although the cotton tenants usually cleaned their harvests of seed-cotton by hand prior to ginning, the ginning was performed on some type of roller gin which operated on the same principle as did the ancient "churka" or jerky gin which pinched the seeds from their fibers by means of very small rollers. Hand gins were sold at about $10 each, were all wooden, and were made on the Island of Jamaica. Others, invented by Georgians and Carolinians, used gun-barrels and other small diameter rollers, operating in pairs to provide larger capacity, power-driven stands (Figure 18.).

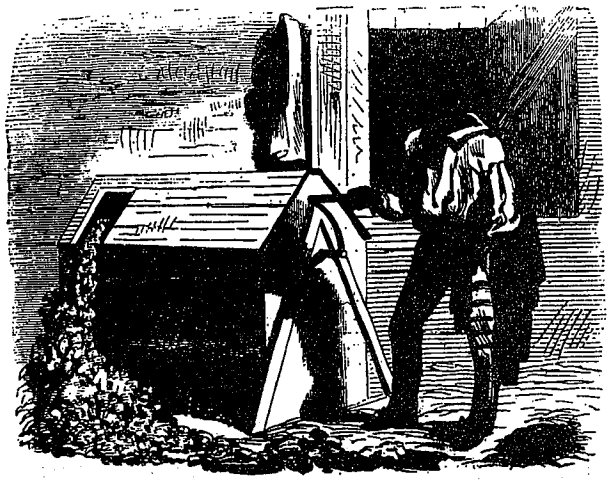


Figure 18.

A power-driven roller gin, portrayed by Mr. James E. Taylor in the April 17, 1869, issue of Frank Leslie's Illustrated Newspaper.

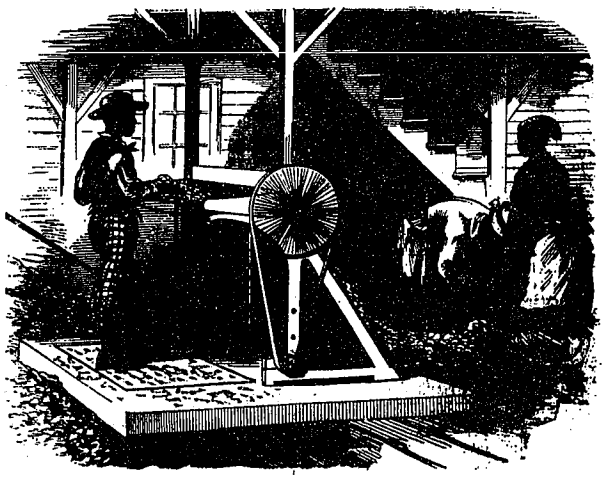


Figure 19.

"Whipping," or cleaning seedcotton in a horizontal device having slats running lengthwise of the unit, and a center shaft of long paddles placed diagonally in helical rows to cork-screw the cotton to the outlet.

According to Mr. T. B. Thorpe, for whom Mr. Taylor made the sketches here shown, the price per pound for Sea-Island cotton in 1806 ranged from 18 to 50 cents. Mr. Kinsey Burden, of Burden's Island, S. C., undertook about that time to improve both his varieties and his ginning. According to Mr. Thorpe, the highest price that Sea-Island cotton ever achieved up to 1869 was $2 per pound. That price was paid Mr. Kinsey Burden in 1828 on ten bags that he had produced under his secret methods, for which secret a Mr. Seabrook of Edisto is said to have offered him $50,000. (All as related

in Library of Congress files of the Frank Leslie Illustrated Newspaper from which these pictures came.)

Figure 20.

The ginned fiber of Sea-Island variety was packed into bags weighing from 150 to 250 pounds in the manner shown here.

Figure 21.

A drawing of a bag of Sea-Island cotton ready for export shipment.

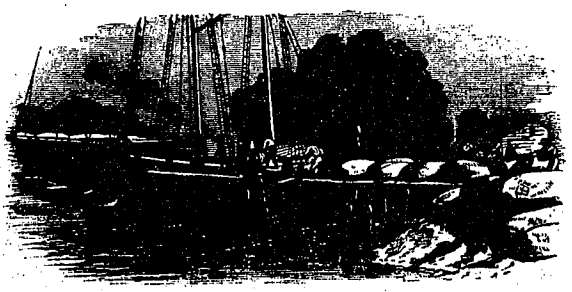


Figure 22.

Loading the bags of Sea-Island cotton for shipment to British mills.

In concluding this chapter, since roller ginning developments are covered in the companion brochure to this one on toothed ginning, it was not thought necessary to illustrate familiar American roller ginneries.

CHAPTER II.

THE TOOTHED GIN INVENTIONS OF ELI WHITNEY AND HODGEN HOLMES WITH BRIEF REVIEWS AND COMMENTS.

All staple lengths of cotton may be ginned on roller type cotton gins, as described in the companion brochure on the development of roller gins. When the Government of the United States of America came into being at the end of the American Revolution, the roller gins were the only kind available and were not only rather crude but low in capacity.

Necessity, generally referred to as the mother of invention, led to the devising of toothed types of gin stands that could more rapidly and efficiently gin out the "bread-and-butter" short-staple upland cottons that promised so much to the agriculture of the Western Hemisphere.

Vague ideas for toothed ginning are reported to have been extant in 1787, before the United States Patent Office was formed. At that time, Caveats of Invention, having a duration of 5 years privilege for the inventor, were issued by the War Office. In numerous instances, ideas of inventors have been ahead of their time because materials or manufacturing facilities were not available for their effectuation. Even when excellent facilities of shops, tools, and materials are at hand, as has been the case since the establishment of the Cotton Ginning Research Laboratories in 1930 by the United States Department of Agriculture, it is nevertheless somewhat time-consuming and tedious to develop practical machines for seemingly simple ideas. Years may pass rapidly under such circumstances before satisfactory results are achieved.

It is not improbable that periodic waves of inventive ideas impinge simultaneously upon several persons who are broadly separated by localities, training, vocations, and facilities. Such probably was the case in the birth of toothed cotton gin stands, affording two valuable inventions by Holmes and Whitney that were virtually simultaneous.

The general form of these two inventions, which are discussed later in more detail are shown in Figures 23 and 24.

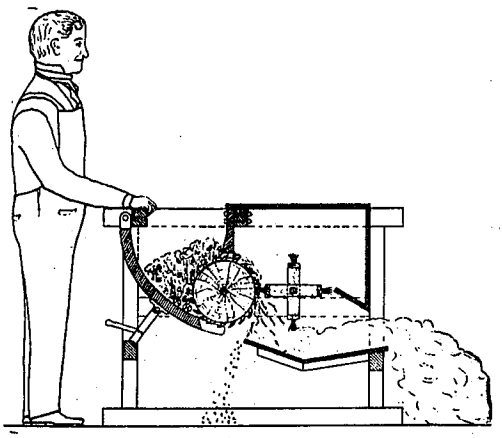
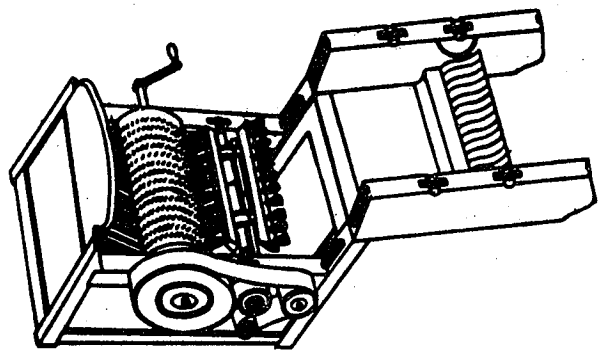


Figure 23a.

Line drawing of Eli Whitney's 1794 patent spike gin, as made by Prof. D. A. Tomkins, 1890. This model is at Clemson College, South Carolina.

Figure 23b.

Line drawing of Eli Whitney's 1794 patent spike gin, as made by Prof. D. A. Tompkins, 1890. This model was portable.



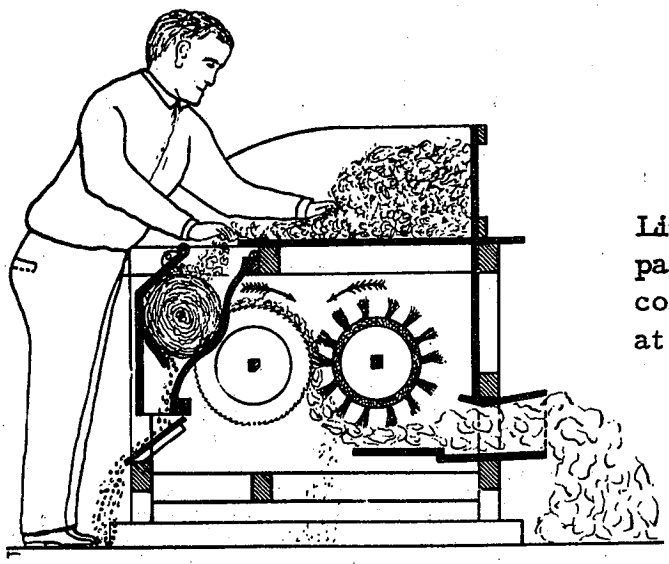


Figure 24.

Line drawings of Hodgen Holmes' 1796 patent saw gin. This working unit, as constructed by Prof. Tompkins is also at Clemson College, S.C.

The plain cotton gin of the present time, for comparison to the foregoing toothed gins, is depicted in Figure 25.

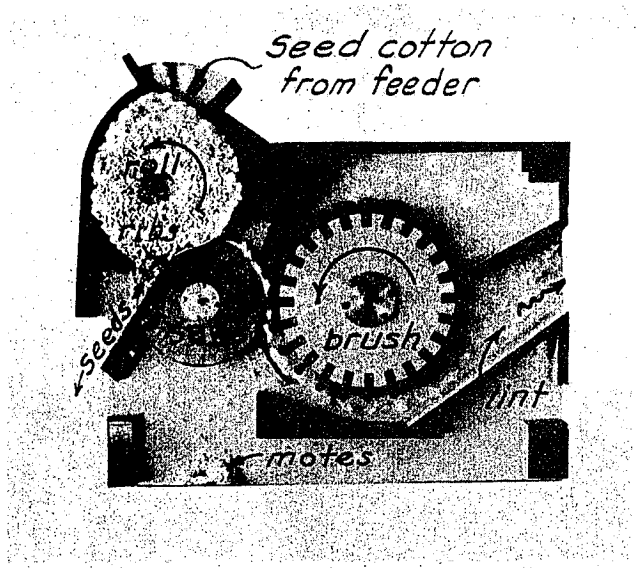


Figure 25.

U.S.D.A. Cotton Ginning Research Laboratories' cross-section of today's plain gin, (as portrayed in the model by Messrs. McWhirter, Martin and Baggette at Stoneville, Miss.).

It is convincingly claimed on the one hand, that ideas for saw toothed cotton ginning began in 1787 with work at the Kinkaid Plantation in Craven (now Fairfield) County, S.C., by Henry Ogden Holmes, now generally known as H. Ogden or Hodgen Holmes, who obtained a "Caveat" thereon in 1789.

On the other hand, beginning with Mrs. Nathaniel Greene's problems in cotton at her Mulberry Grove Plantation in the area of Savannah, Ga., it is recorded that she urged Eli Whitney to work out a cotton gin, and that he developed the needle-tooth or spike-toothed cotton gin stand on her plantation.

In an effort to find out "who was who" and what they actually did at the inception of these toothed gin ideas, Professor D.A. Tompkins followed many historical trails during his researches between 1880 and 1900. Tompkins was a trained engineer and writer, residing at Charlotte, N. C.; and was also renowned for his work as Instructor of Textiles at Clemson College, S. C. He fortunately was in the locale where Holmes and Whitney had been, and we are greatly indebted to him for his efforts and contributions. 1/

Professor Tompkins was fair and impartial. His investigations exploded numerous weird myths and wild stories about Whitney and Holmes that had been prevalent. He clearly outlined the salient features and respective differences of each invention. At Clemson College, where they may be seen today, he constructed full-sized working models of the Whitney and Holmes gin stands and faithfully reproduced their details from authentic sources.

This author is indebted to Thomas Ancrum, Camden, S. C., for a manuscript containing interesting comments about Hodgen Holmes, some of whose descendants (Ruffs, Leitners, and others) are understood to reside in South Carolina at the present time.

From this manuscript by Claude C. Leitner (2), it appears that Capt. James Kinkaid of New York City and Charleston, S.C., was both a cotton planter and a ship owner. His advocacy to move the State Capitol to Columbia is said to have incurred the displeasures of Charleston residents to such an extent that his friends and employees (among them Hodgen Holmes) were unwelcome there. It is an established fact that Holmes was a general mechanic and farm leader for Kinkaid at the grist mill and plantation in Craven County; and it is claimed that with Kinkaid's help, Holmes obtained his Caveat of Invention from the War Office under date of March 14, 1789, covering a saw-toothed type of cotton gin.

The Caveat for 5 years thus expired on March 14, 1794 -- the date that a patent was granted to Eli Whitney for his spike or needle-toothed gin, although Whitney's application had been filed in 1793. Holmes' descendants

1/ See end of Chapter, references.

further claim that Holmes' Caveat was displayed in 1881 at the Cotton States Exposition at New Orleans and later at the Charleston Public Library until it disappeared. The first power-driven saw-toothed gin was demonstrated in 1795, and this brought forth a law suit by Whitney against one Edward Lyons.

Eli Whitney was a Yale graduate in Law. Hodgen Holmes evidently had little formal education. Each man appears to have been a genius in his own way, a skilled designer, and a clear thinker.

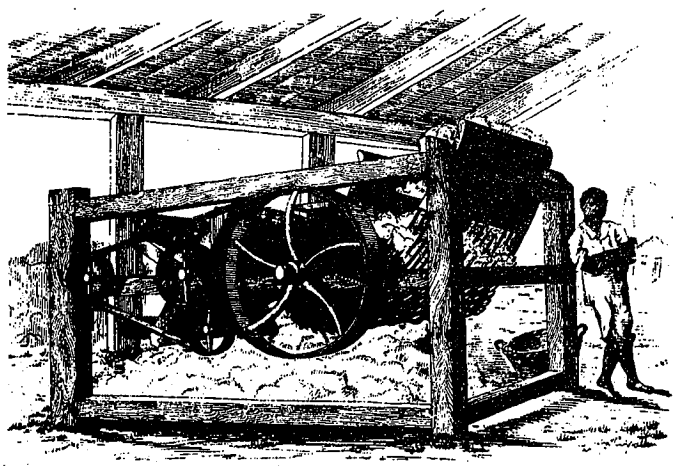
The Whitney original patent sketches and descriptions (see Appendix) not only show the needle or spike tooth exclusively, but also indicate that the ginning unit was intermittent in its action and required dumping the seed roll at intervals. The difficulties attendant to making uniform needle teeth and properly securing them upon the surface of the cylinder were such that they would deter many farm mechanics from attempting to fabricate the original Whitney cotton gin. These may be noted in Figure 24.

Holmes' cotton gin was down-to-earth and practical, using circular saws and flat ribs that farm mechanics could produce and the unit was continuous in action. Basically, it continues to be the cotton gin stand now in use. An inspection of the two drawings by Prof. Tompkins indicates how widely the two gins differ in their principal elements. They are more widely discussed in the literature references that are cited at the conclusion of this chapter (3).

Another interesting illustration of the Whitney needle-tooth gin is shown in Figure 26, which was published in "The Growth of Industrial Art," (4), arranged, and compiled under the supervision of Hon. Benjamin Butterworth, Commissioner of Patents. It was reproduced and printed in pursuance of an Act of Congress, March 3, 1886, and Acts supplementary thereto.

Figure 26.

As quoted from the reference - "U. S. Patent Saw Gin - A. D. 1794." Text further says, "Until the invention of Whitney the separation of the fiber from the seed was entirely performed by hand....."



Although no saws are shown in the official picture, it may be said in fairness to Whitney that his needle teeth were probably as successful as were those of gin saws in handling long-staple cottons, and it is known that Whitney

turned to the use of saws in his last models.

During research trips to the Southeastern states in 1940-41, old residents told the author that needle-toothed gins, made by a Mr. Scattergood, had ginned Sea-Island cotton in their communities, with excellent results.

One of the few authentic Whitney gin models is in the U. S. National Museum at Washington, D. C. It was made by Eli Whitney prior to 1800, and was deposited in the Museum by Eli Whitney, Jr., in 1884. In it are 15 rows of ginning teeth, ten rows being needle teeth, and five being saw discs. The center distance of the rows were 1/2-inch, between which there were two curved wires, or a total of 28 wires, that formed the front breast. The actual metal grates or ribs and rib rail were assembled almost centrally above the rows of teeth. Outside diameters of the saws and needle-teeth tip circles approximated 3-1/2 inches, according to the author's notes, and the overall width of both the saw and brush cylinders measured 8 inches. Figure 27, made from a combination of the author's sketch and the photograph of the model that was generously afforded us by the Textile Curator of the Smithsonian Institution, may make the design of the Whitney teeth more easily understood.

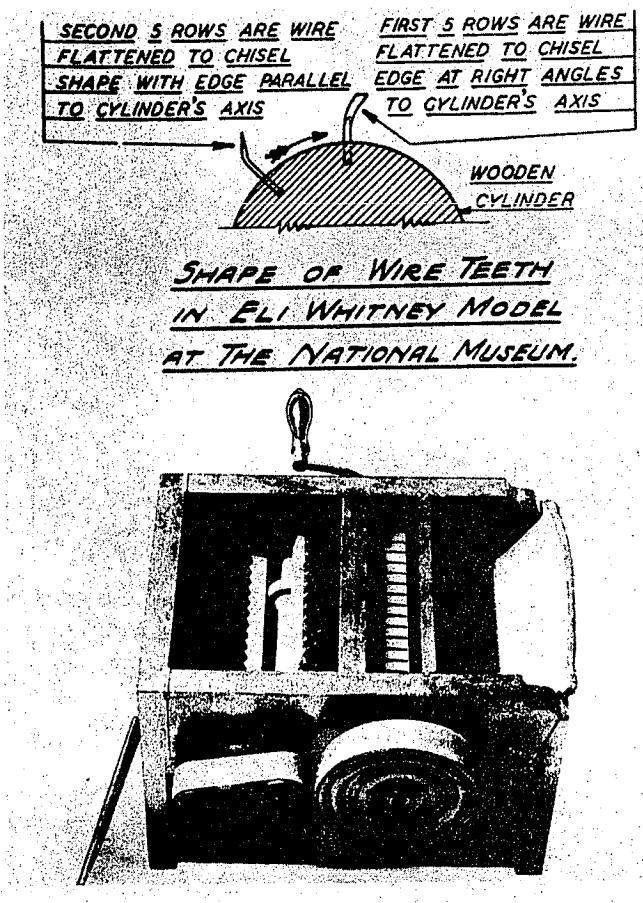


Figure 27.

(Top) - Sketch and information regarding the peculiar shape of the Whitney wire teeth.

(Bottom) - Photo of the Eli Whitney Model with lid removed, as now on display in the U. S. National Museum, Washington, D. C.

At the Cotton Ginning Research Laboratory (Stoneville, Miss.) the

Whitney tooth forms of the first five rows in his model, shown in Figure 27, were duplicated on gin saw discs of 10-inch diameter. These teeth gave good results in ginning but were lower in ginning capacity than the conventional saw teeth.

For ready reference, Table I gives comparisons of the major elements of the Whitney and Holmes' gins, as constructed about the year 1800. These were not models but actual gins that worked on the plantations.

TABLE I.

A COMPARISON OF THE MAJOR ELEMENTS OF THE EARLY WORKING UNITS OF ELI WHITNEY AND HODGEN HOLMES GINS AS EMPLOYED FOR REGULAR SERVICE.

Whitney's Gin	Element	Holmes' Gin
#12 to #14 steel wire needles or spikes, driven into wooden cylinder in plane rows about 1/2-inch apart. Estimated at not more than 260 for 12-inch diameter. Flat on the sides.	Ginning Teeth	Saw teeth cut on rim of 6 or 8-inch diameter metal circular discs, or segments of circles. Estimated at about 300 per 12-inch diameter.
Wooden, 3-1/2 to 7 inches diameter, by about 26 inches long. Wire teeth driven in and bent to pitch.	Cylinder or "Cylender"	Shaft plus saw was about 48 inches long at most. Saw spacings were about 1-inch apart, with wood disc separators.
Usually about 6 to 9 inches.	Tip Diameter of Teeth	Usually about 6 to 9 inches.
Same as modern gins, being about 48 degrees.	Pitch of Leading Edge of Tooth to Tangent	Same as modern gins about 48 to 53 degrees.
Overhead slots above center of cylinder, later models having a forward extended lip.	Grates or Ribs	Sloping flat ribs, reversible, with saw slots between ribs.
Slow and intermittent requiring seed hopper dumping at intervals.	Operation	Rapid and continuous shedding the seed as fast as ginned.

The certified copies of Whitney's original patent as published by Tompkins from the Federal Court Records in Savannah, Ga., and his restored patent drawing, are given for reference in the Appendix.

Unfortunately, the original patent papers and models at Washington, D. C. were destroyed in the U. S. Patent Office fire of December 15, 1836. Holmes' patent was not restored, but a long-hand restoration for Whitney was made with some errors and differences between it and the Savannah documents.

Tompkins summarized the whole matter relative to the Holmes and Whitney invention in what we consider to be a just and brief manner, as follows;

"The real facts about the cotton gin are:

1. Eli Whitney, of Mass., a graduate of Yale College, invented a cotton gin, consisting of spikes driven in a wooden cylinder, and having a slotted bar through which these spiked teeth passed, and having a brush to clear the spikes. He obtained a patent March 14, 1794, signed by George Washington, President, Edmund Randolph, Secretary of State, and Wm. Bradford, Attorney General.

2. Hodgen Holmes, of Georgia, a resourceful and practical mechanic, invented an improved gin, using circular saws properly spaced, passing through spaces between ribs. For this invention he obtained a patent May 12, 1796, signed by George Washington, President, Timothy Pickering, Secretary of State, and Chas. Lee, Attorney General.

3. Whitney's invention, consisting of a wooden cylinder, carrying annular rows of wire spikes, with a slotted bar and clearing brush was fundamental.

4. The practical application of the fundamental idea was Holmes' invention of the saw gin, which consisted of a mandrel or shaft carrying collars separating circular saws which pass through narrow spaces between ribs.

5. Whitney went South without money, business experience or mechanical training. He received from the Southern States the following amounts:

From South Carolina.....	$50,000
From North Carolina (at least).....	$30,000
From Tennessee (about).....	$10,000
Royalties from Southern States (about)...	$90,000

6. In Georgia, his firm (Miller & Whitney) attempted to monopolize the ginning business. This brought on long and vexatious litigation, and the object was never successfully accomplished."

The Smithsonian Institution publication No. 3478, (5), by Dr. F. L. Lewton, deserves the reader's attention because it gives an illustrated series of notes and historical facts not given here. Plate I of this Smithsonian publication displays a short description and drawings sent from the United States Patent Office by Wm. Thornton, Esq., for publication by the American Farmer, Feb. 21, 1823, (p.380) two years before the death of Eli Whitney. It shows only spike or wire teeth and closely follows the patent descriptions filed at Savannah, Ga.

However, as previously mentioned, Whitney had long since seen the value of the Holmes gin saw because he was a pioneer in mass production

methods, and hence adopted the saw teeth, as indicated by the model which is now at the Ford Edison Institute, Dearborn, Mich. This was probably the last model made by Eli Whitney, being also dated 1823.

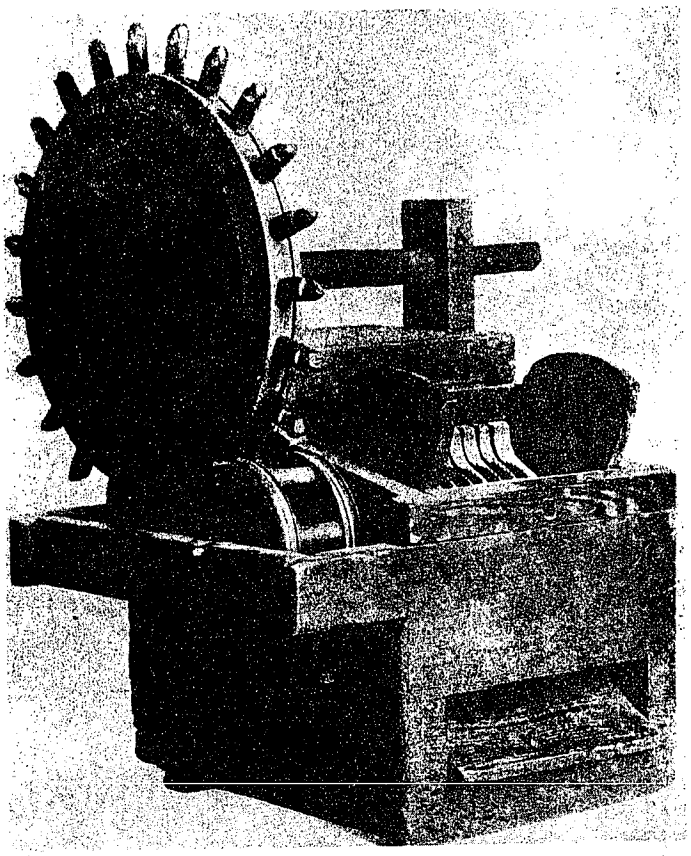


Figure 28.

Photo of the Eli Whitney model cotton gin, using only saws, as made by Whitney about 2 years before his death. Courtesy of the Ford Edison Institute, Dearborn, Michigan.

In view of the foregoing, it is evident that both Whitney and Holmes deserve credit for their two great inventions, from which our modern toothed cotton gins have emanated.

Until Whitney's partner, Phineas Miller, wrote to him on Feb. 15, 1797, concerning the use of saw teeth, it is doubtful that Whitney contemplated their use because he displayed only wire teeth in his many lawsuits. The courts recognized Holmes' right to saw teeth but did not appear to note their real significance and suitability for mass production methods.

Whitney made no financial gain to speak of, in the final accounting, nor did Hodgen Holmes -- but both should be placed in the Hall of Immortals because the world has been blessed by the best features of each invention.

-----Literature cited in Chapter II.-----

(1) Tompkins, D. A., "Cotton and Cotton Oil," 2 vols., 1901.
(2) Leitner, Claude C., "Unknown Makers of America, Henry Ogden Holmes, the Real Inventor of the Cotton Gin," Christian Advocate, 1932.
(3) Bennett, Charles Abel, "Early Years of the Cotton Gin," Cotton Gin and Cotton Oil News, 1933.
(4) Butterworth, Benjamin, "Growth of Industrial Art," 1886.
(5) Lewton, Frederick L., "Historical Notes on the Cotton Gin," Smithsonian Institution #3478, 1937.

CHAPTER III.

THE DEVELOPMENT OF TOOTHED GIN STAND ASSEMBLIES; THEIR SPECIAL IMPROVEMENTS AND REFINEMENTS THAT FOLLOWED THE BASIC INVENTIONS OF WHITNEY AND HOLMES, 1801 to 1899.

The first two decades of the toothed gin stand (1794 to 1814) seem to have been devoted to much litigation, although the rapid increase in production of upland cotton kept the manufacturers of early model gin stands at fever heat.

On August 8, 1805, a patent was issued to J. McBride of Nashville, Tennessee, for a "Cotton Ginning, Carding and Spinning Machine," which shortly became known as a "Gin-spinner" and was widely used on plantations for producing cotton yarns necessary to home weaving.

This gin-spinner adopted the Holmes saws and ribs for its ginning section, and such units have from time to time been mistaken for gin stands. Some confusion arose from lack of knowledge concerning the McBride gin-spinner, and many persons assumed that they were made by Whitney and were his early models. This was untrue. One of the McBride machines was found near Washington, Ga., in the 1940's by a neighbor of Mr. J. Luke Burdette. Mr. Burdette mistakenly assumed that it was made by Whitney because there had been an early power gin of Whitney and Miller's located where Mr. Burdette lived.

The Burdette discovery, incorrectly called Whitney's first power gin, is now understood to be on display somewhere in Savannah, Ga. It was examined carefully by us and photographed, and its details were reported to the Smithsonian Institution. It was an early type of the McBride gin-spinner.

The McBride gin-spinner used from 15 to 20 gin saws of about an 8-inch diameter, together with reversible ribs, brush, condenser box and carding cylinders, etc., all in orderly sequence. Excellent specimens of these machines may be seen at the U.S. National Museum, Washington, D.C., and also at the residence of Mr. Andre A. Oliver, 429 East Bridge St., St. Martinville, Louisiana.

In order to comprehend more clearly the large number of suggested improvements that followed the introduction of the Whitney and Holmes gin stands, Table II was prepared to summarize the wide variety of inventions that were brought forth.

This table is given at this point to indicate that many complications are involved in attempting to present a relatively brief but comprehensive review of the development of the toothed cotton gin. Since the main subjects and detailed series may be divided into a large number of individual discussions, only a few of the major items can be handled here.

A year prior to the invention of the McBride gin-spinner, there is listed in the U. S. Patent Office a "System of Cleaning after Ginning" patent that was issued in 1804 to Messrs. Simmons and McJames, but this writer has no detailed information about it.

TABLE II.

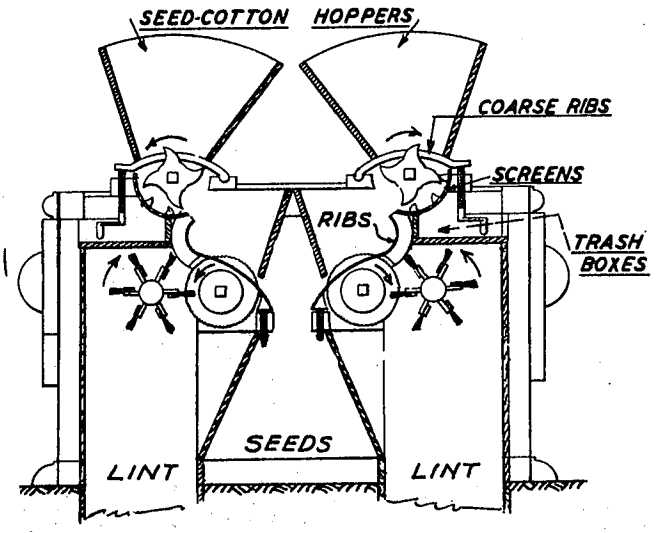
(ITEMIZED DETAILS) DOWNPOUR OF INVENTIONS AND IMPROVEMENTS FROM TOOTHED GIN CONCEPTS OF WHITNEY AND HOLMES.

Major Class	Items
Kinds of teeth for ginning	Wires, spikes, needles, card-clothing belts, bristles, saws, likerin wires with teeth, wobble saws, trained saws, non-circular saws, teeth punched from cylindrical surfaces, special leading and trailing edges, teeth formed on discs to copy Whitney's spikes.
Ginning ribs	Flat bars, curved bars, fluted, ribbed, split, chilled, patched, metal plates in sections, revolving disc ribs, knurled disc revolving ribs, special offset heads and throats, special side profiles. Special cross sections.
Seedcotton roll box or hopper	Cross-sections of round, oval, hexagonal, and other shapes. Seedcotton roll drives, revolving front belts, central cores and tubes. Various seedboard designs, seed fingers, linings for roll boxes, axis positions relative to saws.
Saw cylinder assemblies	Singles, duplex, multiples, taper shafts, horizontal and vertical axes, kinds of spacers and saw spacings, assemblies of vari-diameter saws, tip diameters of saws, coarseness of teeth on saws, saw speeds. Number of saws per cylinder.
Lint doffing systems	Brush cylinder airblast fan jets, suction or centrifugal doffing, single and multiple airjets, transfersaws.
Backside of ribs	Stripping brushes, moting bars, bristle sticks, deflectors, combers, recipro-cleaners, special flanges on backs of ribs, single and flat nozzle jets, metal blade brushes and fans.
Moting methods	Special sling-offs, flue lips, gravity and centrifuge belts, splitter vanes pointing toward saws, brushing cylinders.
Rib assemblies	On wooden rails, on metal rails, adjustability, angles of slope, guage settings for interchangeability, special designs.
Conditioning in the gin stand	Hot roll box heaters, central tubes, grids, conditioned airblasts, moisteners, oilers, soapstone & talc appliers.

In 1831 a Mr. Lester patented a cast-iron gin frame. In 1834 Alex Jones designed and patented a double-cylinder cotton gin, as diagrammed in Figure 29.

Figure 29.

Alex Jones 1834 patent duplex or double-cylinder cotton gin. Note that it has a mechanical feeding device, screens for a moderate precleaning, and flat gin ribs.



A notable improvement to the original Holmes and Whitney stands was the invention in 1837 by Perkins, who provided a sliding seedboard that could be wedged into any position desired for optimum ginning. (see Figure 30.).

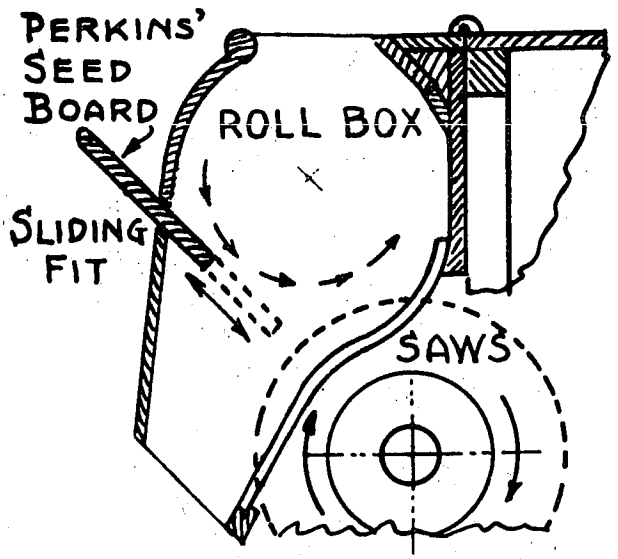


Figure 30.

The adjustable seedboard invention of Perkins in 1837. This was used on many brands of gins for half a century or longer.

An excellent example of the Perkins' adjustable seedboard is shown in the photograph (Figure 31.) of the 1844 Pratt gin, which is on display at Stoneville, Miss. This stand was the property of the Bash Barnes family of Hot Coffee, Miss., and was loaned to the United States Department of Agriculture by Mr. Harris Barnes of Clarksdale, Miss. At a saw speed of 200 r.p.m., it turned out a very good sample.

In 1841, A. Washburn patented a practical invention for taking up the wear on gin ribs (see Figure 32.). Prior to his invention, reversible ribs had been common. Evidently the use of chilled ribs had not then been developed. This writer is uncertain as to when the chill idea evolved.

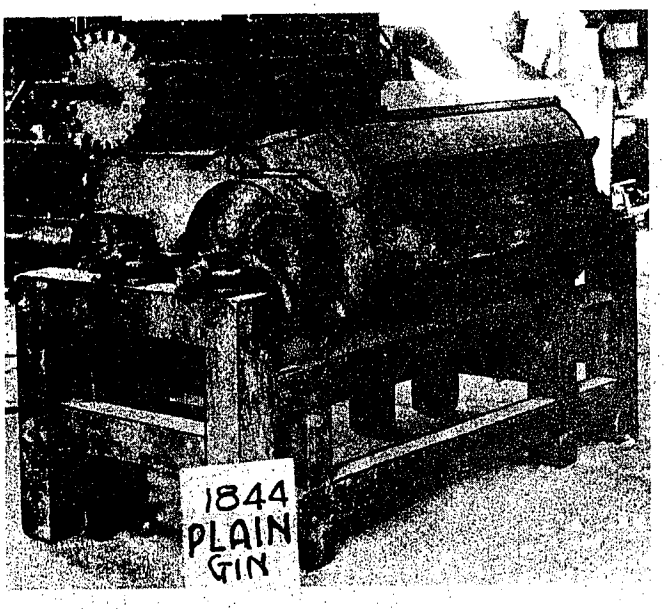


Figure 31.

An 1844 model brush gin, with over head box for hand-feeding, and with Perkins' adjustable seedboard. This gin stand and its working duplicate are at Stoneville, Miss., in the Ginning Research Laboratory.

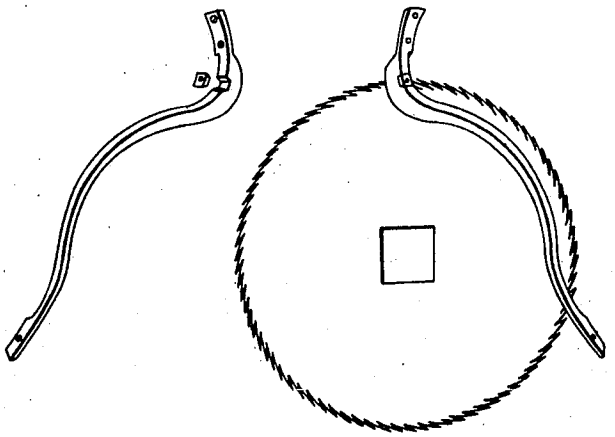


Figure 32.

The 1841 invention of A. Washburn to cure rib wear in cotton gin stands.

At Shirt Tail Bend, Washington County, Miss., in 1842, Theodorick James invented an improved cotton gin that introduced several novel ideas. The James family operated an extensive cotton plantation a few miles south of Greenville, Miss., on the Mississippi River. James Landing was adjacent to Shirt Tail Bend, but the village later became known as Avon. In the James' invention (see Figure 33.), he used a stripper brush above the saws and just behind the ribs, so as to give a combing and brushing action upon the lint while the fibers were held by the saw teeth. This was to remove pin and pepper trash and also to straighten the fibers. Two stationary sticks of bristles somewhat longer than the ones used in regular brush sticks came next; followed by a pair of vertical mote ribs between each pair of saws. Also, the brush chamber curved closely to the brush sticks as they swept downward for doffing the fibers. In that manner, the sticks acted as fan blades and were aided by the controlled air current to cast motes downward from the fiber.

It is probable that this patent led to several modifications in the moting improvements that followed, but the mote bars as shown here appear to be the first ones in the field.

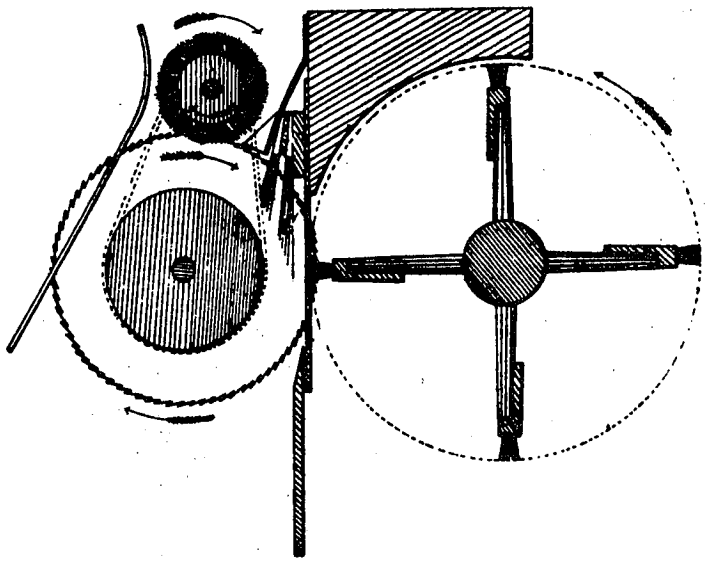


Figure 33.

The 1842 invention of Theodorick James that included lint cleaning and special moting and doffing features.

At the time when the news of the Whitney and Holmes gin inventions had been broadcast far and wide (about 1800-1810), it might be said that there was almost a "gin rush," later paralleled by the "gold rush," in which many inventors and cotton growers travelled to Georgia and the Carolinas to see the new gins. One of these, Mr. Eleazer Carver, then of Washington, Miss., travelled to Savannah to observe the gins at work. Some years later, in Massachusetts, the Carver Cotton Gin Factory got underway, and Eleazer Carver obtained a series of patents covering his roller and saw gin inventions. In 1844 he produced special moting bars behind the gin ribs and in front of the brush cylinder, so that motes and trash would be deflected downward and avoid contaminating the freshly ginned lint. This invention was used for many years in such brands as the Carver and Eagle, and is still well known to ginners. Its features are shown in Figure 34.

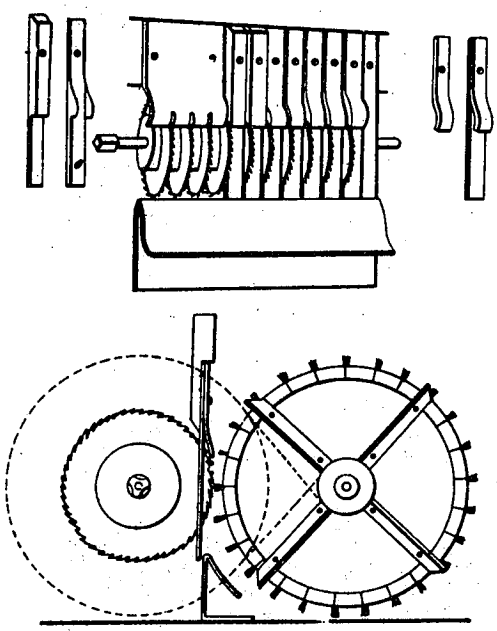


Figure 34.

Carver's invention (1844) of a guard and mote bar assembly placed between the gin saws and the gin brush. The lower element was an adjustable "splitter."

Although dividing boards or deflectors above the junction between the saws and brush bristles are used to this day, there are only a few modifications of the Carver type moting bar that worked out successfully. One of these was the 1854 Gullett combination of bristle brushes in lieu of flat mote bars, plus a revolving stripper brush on the underside of the saw (Figure 35.).

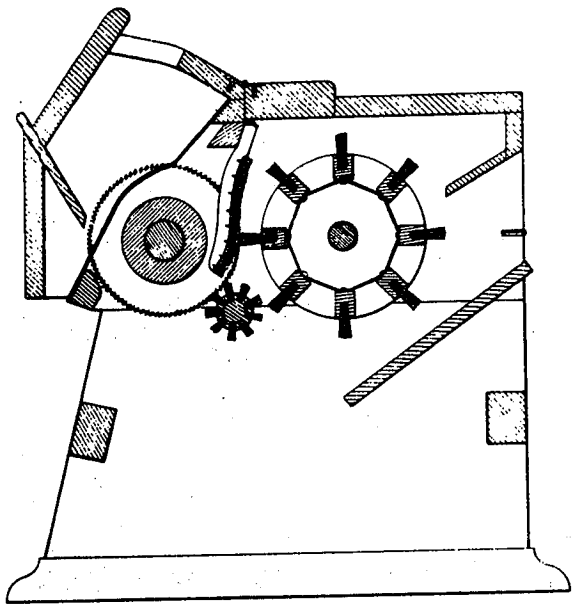
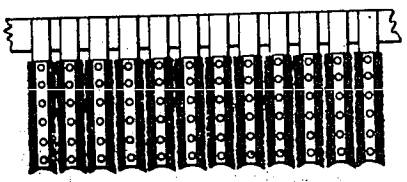


Figure 35.

Benjamin Gullett's invention of stationary and revolving mote bars and lower stripper. 1854.



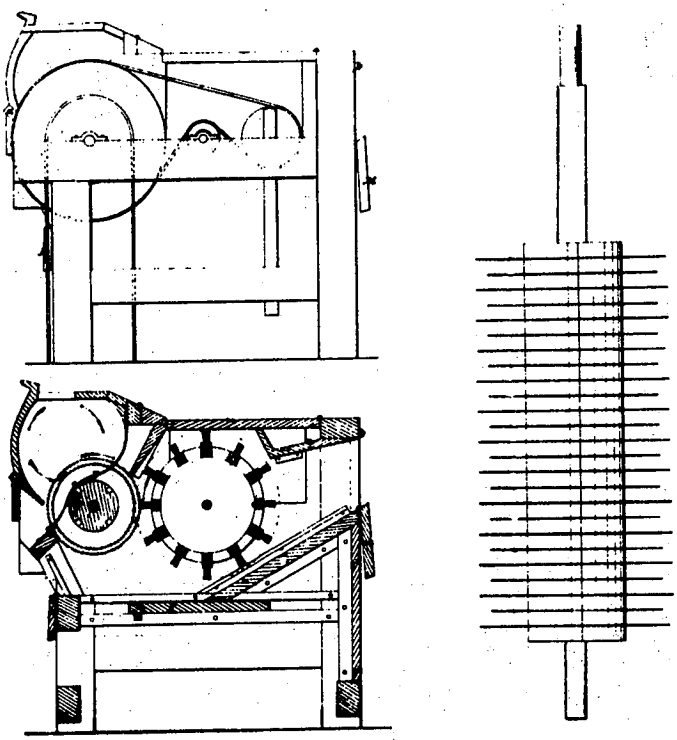


Figure 36.

J. Simpson's improvement in cotton gin stands, having two sizes of saws and a horizontal sliding mote board.

Three startling improvements in cotton ginning were submitted by inventors during the last two years of the decade: 1858 -- Withers', and Wilson and Payne's; and 1859 -- Olmsted's.

A. Q. Withers of Tunica, Miss., in 1858 obtained a patent on a ginning arrangement and method that was clearly the first transfer-saw lint cleaning gin. He employed four cylinders in a horizontal series; the first, the saw ginning cylinder at about 350 r.p.m.; the second, a transfer brush to act as a relay runner at slightly greater tip speed than that of the saw, to carry the ginned fiber downward in an arc over a fixed concave screen to discharge pin, pepper, and leaf trash from the fibers; the third, a second saw cylinder stepped up in speed to about 700 r.p.m. to doff the fibers from transfer cylinder number 2, thereby re-ginning the fibers; and the fourth, the final doffing by brush cylinder number 2, which completed the moting and discharge of the cleaned lint. In his testimony, Mr. Withers stated that he had obtained as much as 4 cents more per pound for his cottons than similar cottons that were ginned on the orthodox single-saw-cylinder gins. This invention is shown in Figure 37.

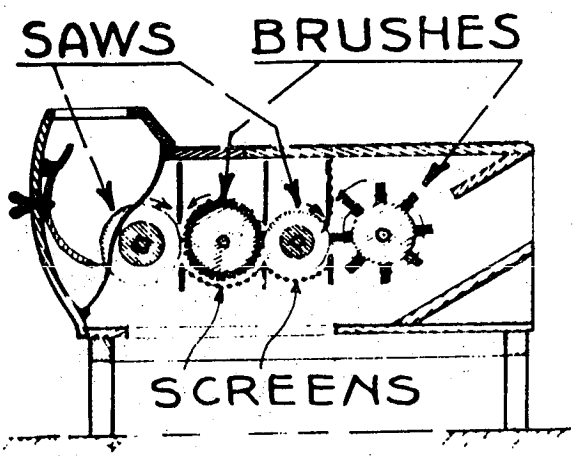


Figure 37.

The 1858 invention of A. Q. Withers which is the first lint-cleaning gin stand the author can find. Note the cleaning screens under the second and third cylinders.

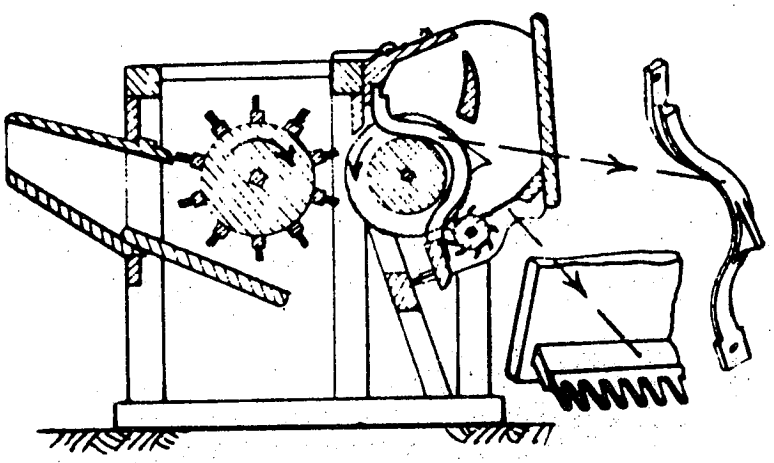


Figure 38.

Wilson and Payne's single rib huller gin, with outer breast, picker roller and inner roll box. Note also the seedboard fingers of this invention.

The staff of the Department of Agriculture Cotton Ginning Research Laboratory at Stoneville, Miss., made a thorough series of tests in transfer types of re-ginning. The Wither's system gave very good results.

The cotton gin patented by Wilson and Payne in 1858 was probably the first gin stand with huller ribs. As shown in Figure 38, this stand had a single rib huller assembly, and an outer breast for the introduction of the seedcotton into the roll box by way of the lower picker roller and through the huller ribs. The entire front was a significant improvement.

The closing month of 1859 noted the issue of patent to D. G. Olmsted of Vicksburg, Miss., that brought several new features into the gin stand construction. Olmsted, like Wilson and Payne, fed his seedcotton into the outer breast that was equipped with a picker roller. The shape of the outer breast and roll box differed greatly from that of Wilson and Payne, however. Olmsted's roll box was a vertical oval, in which was centered a rotating cylinder. One form of this was a solid cylinder with pins or spiral rearranged to augur the seedcotton to each end of the box, along with the ginned seed. Another form was in the shape of an internal solid core and external grid which would permit ginned seed to be discharged at the ends of the roll box without loss of seedcotton. Olmsted's brush cylinder had nonclog wiper blades at the ends, and brush sticks that protruded enough to act as fan blades. Figure 39 gives the general detail of this stand.

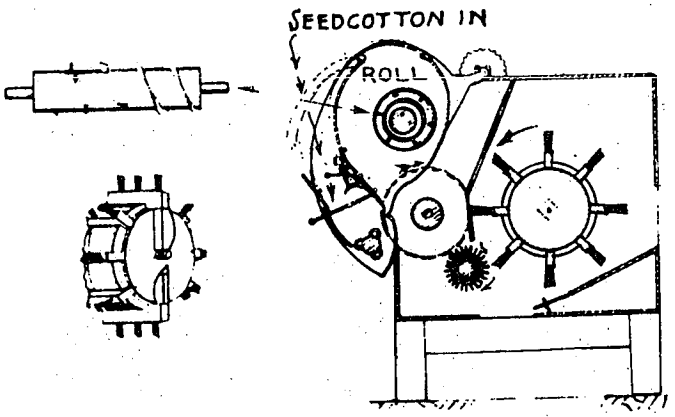


Figure 39.

D. G. Olmsted's gin of 1859, with roll box drive, etc.

In 1861 Israel F. Brown obtained a patent on a gin using one single brush and two horizontal saw cylinders working together in a single roll box. This invention might be called a double duplex, because it had not only double saw sizes, alternating large and small along the lines of J. Simpson, but also duplex cylinders for which the single brush cylinder and roll box served. Figure 40 gives a cross section of the Brown invention.

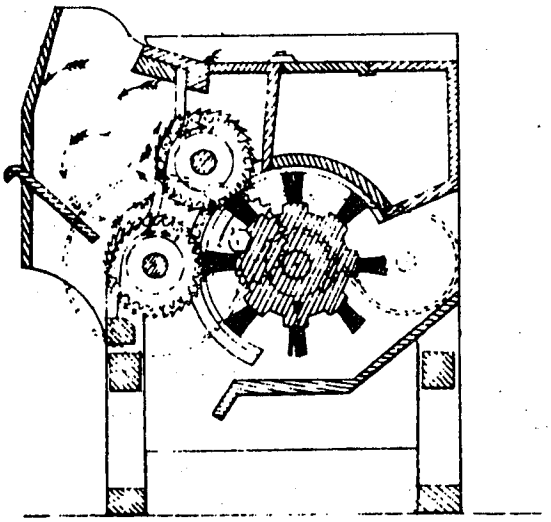


Figure 40.

Israel F. Brown's double duplex cotton gins. We have no record of its capacity or the size of saws in the final models.

The War between the States, from 1861 to 1865, blocked the inventors to a large extent, insofar as cotton gin stand improvements were concerned. In 1864, however, a patent was issued to Thomas C. Craven on a very novel design of gin stand that he proposed to develop and use. We have shown it in Figure 41, referring to it as a "Cat's Claw Gin," because its wire teeth claw into the roll box and then sheath into a suction air stream in order to doff the fiber. The ginning cylinder was set eccentrically with regard to its outer casing. The ginning teeth protruded through the casing while taking fibers from the cottonseeds, and then sheathed as described. This invention was probably the first gin stand to employ a built-in condenser and suction fan. It also had a lint cleaning brush to remove the batt from the condenser drum.

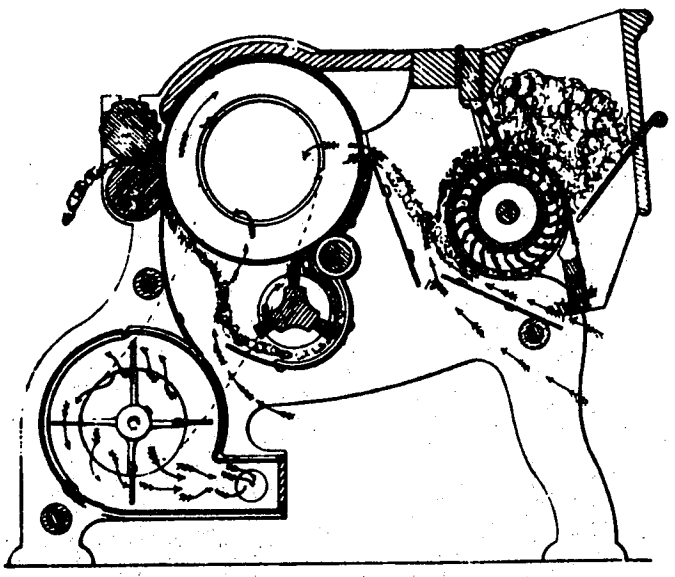


Figure 41.

Craven's cotton gin with sheathing teeth, suction doffing, suction condenser, and fan. It is not known whether this unit was successfully operated for a season.

The general features of the Craven gin appear to have been difficult for many shops to produce, but the suction condenser marks a definite step forward, although it later gave way to blow type units.

According to old catalogs and numerous printed publications, several of the present day ginning machinery manufacturers had become well established as early as 1850. In this century, a number of them merged into the Continental Gin Company, while others continued with their original name to this day.

This writer is greatly indebted to the present ginning manufacturers for the use of their old catalogs and historical information. It should be understood, of course, that in keeping with Governmental policy, the mention here of brands or firm names, with their illustrations, does not comprise either an endorsement or criticism. For over 30 years, the author has enjoyed an inspiring friendship and helpful relations with the cotton ginning machinery manufacturers, and he acknowledges the use of their histories and illustrations.

Beginning 1880, broad changes were introduced into the construction features of cotton gin stands and ginning establishments. Patents were obtained by the staffs of such firms as Munger, Winship, Pratt, Eagle, Gullett, Lummus, Murray and others for establishing pneumatic handling of seed-cotton, mechanized feeding to the gin stands, adequate dispositions of the products from the ginning, and many important construction features. The large number of single stand ginneries at plantations rapidly gave way to custom gins at the crossroads of the communities, and marketing facilities expanded to produce cash markets and standardized classification of grades. Chapter I indicated this broad change.

In 1881, the invention of Ellis (Figure 42.) produced the split-rib huller gin of modern type; and in 1884 a mechanical belt drive for the front of the roll box was invented by Smith and Adams (Figure 43.). These figures are sufficiently self-explanatory to require no detailed description.

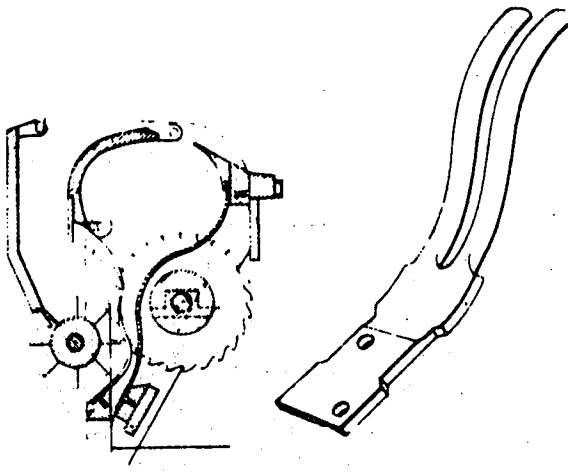


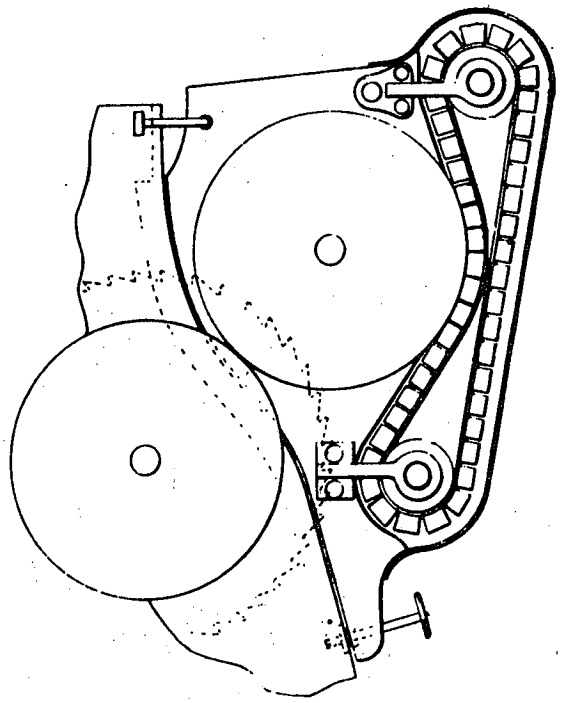
Figure 42.

The split-rib huller cotton gin invented by Ellis in 1881.

Figure 43.

Smith and Adams' seed roll driving belt for cotton gins.

Some of the older ginners remember the Gardner patent cotton gin of 1886, which Figure 44 shows in cross section. While this cotton gin was a single rib unit, it combined stationary and revolving rib rollers around the roll box. Its users were strong in their praise for its performance.



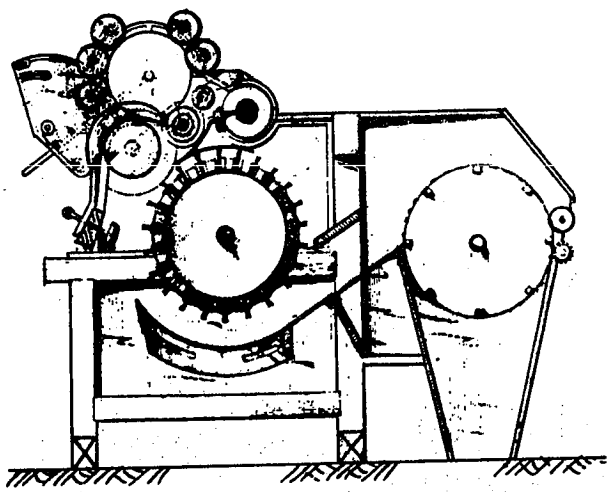


Figure 44.

The J. M. Gardner gin stand with unit condenser and special roll box features.

The 1881 invention of W. L. Ellis (Figure 42.) was followed in 1889 by his invention of an improved double-rib huller gin (Figure 45.). This form of gin stand has become a general standard in the United States.

Since the single-rib plain and huller gins were also used in the United States for a long period (1880 - 1950) and are still used in foreign countries, it is worthwhile to indicate some of their stages of construction (Figure 46). These diagrams have been assembled from several old catalogs and figures have been numbered according to the year of their original illustrations.

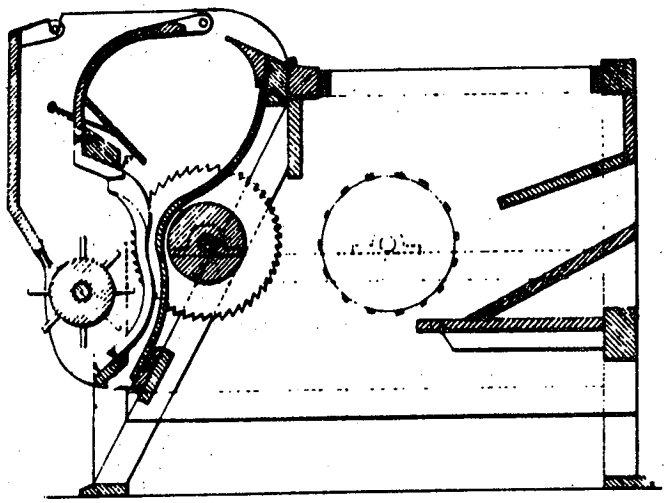
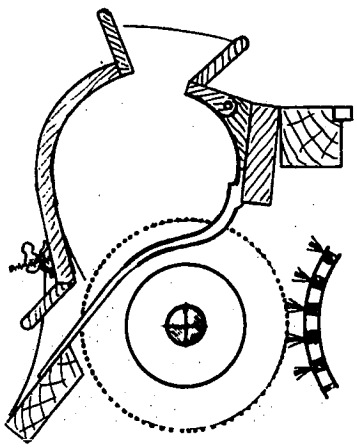
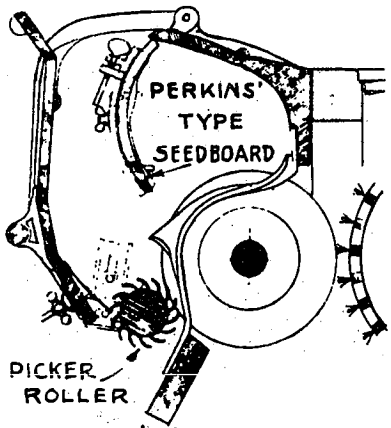


Figure 45.

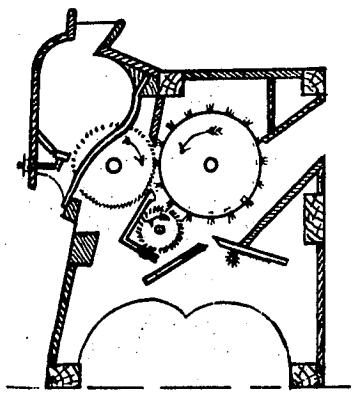
Double rib huller gin invented by W. L. Ellis of Prattville, Ala., 1889.



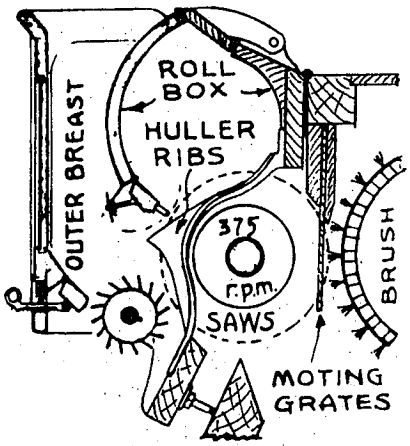
1. PLAIN 1888 GIN.



2. D'BL BREAST 1888 HULLER GIN.



3. PLAIN GIN 1900



4. 1903 HULLER GIN

Figure 46.

Stages of developments in the single-rib gins from plain rib of 1888 to single-rib huller gin of 1903.

The use of various forms of rotating brush cylinders, for doffing the ginned lint from the ginning teeth, from early models to the present gins, are illustrated throughout this brochure. Table III is a copy of the author's reference list of brush inventions, as taken from class 19 sub-class 60 of the United States Patent Office.

TABLE III.

REFERENCE LIST OF COTTON GIN BRUSH INVENTIONS, 1845 to 1930, CLASS 19, SUB-CLASS 60, UNITED STATES PATENT OFFICE.

Patent No.	Inventor and Residence	Author's unofficial description of the salient features involved.
3,875 Jan. 4, 1845	Eleazer Carver Bridgewater, Mass.	4 air wings at each end of brush cylinder to avoid eddies.
4,196 Sept. 19, 1845	E. Keith Bridgewater, Mass.	Combination brush and internal fan blades, open ends. Brush plus air. Note: 3 other patents by Keith along same lines: 1855, 1857, and 1857.
4,817 Oct. 17, 1846	P. Von Schmidt Washington, D. C.	Idea parallel to Keith's above, but with disc fans at each end of cylinder.
19,417 Feb. 23, 1858	B. D. Gullett Aberdeen, Miss.	A "stripping" brush; a lower "carding" brush; and a doffing cylinder of steel blades to make horizontal fan. Solid core. Blades 3/4" high with 5/8" long teeth @ 6 to the inch.
169,584 Nov. 2, 1875	W. S. Reeder St. Louis, Mo.	Diagonal grids placed below brush cylinder to form mote chutes.
201,724 Mar. 26, 1878	H. A. Walker Ranaleburg, N.C.	Notched steel plates or wipers in lieu of bristles, to straddle saws.
220,957 Oct. 28, 1879	W. W. Brigg Charlotte, N.C.	8 or more leather wings in lieu of brush strips. Holes punched 5/8" in from edge for teeth to pass and leather split to each hole with taper to wipe saw edges.

Patent No.	Inventor and Residence	Author's unofficial description of the salient features involved.
239,716 Apr. 5, 1881	I. F. Brown New London, Conn.	Bases of brush sticks teed out to hold sticks in cylinder heads.
258,618 May 20, 1882	E. Van Winkle Atlanta, Ga.	Bases of brush sticks wider than top to be held in reverse "v" slots.
266,972 Nov. 7, 1882	Wm. O. Coleman Memphis, Tenn.	Doffing cylinder of open grid or squirrel cage design in lieu of brush sticks. Each flat bar notched to mesh with saws, same as 1878 Walker.
296,659 Apr. 4, 1884	S. D. Webb Washington, D. C.	Bristles twisted in wires to make spiral brushes. These attached to cylinder so as to wipe each side of a saw.
360,486 Apr. 6, 1887	R.F. Spangenburg New Orleans, La.	Brush bristles slanted in sticks, and sticks alternately reversed, giving slopes to right, then left.
351,401 Oct. 26, 1886	J. Ralston Brenham, Texas	Iron backing strip placed behind brush bristles; and revolving rib used at top of ribs to eliminate rib wear.
401,124 Apr. 9, 1889	I. F. Brown New London, Conn.	Brush sticks made to provide wooden backing strip behind bristles.
403,973 May 28, 1889	W. M. OrtSwann Dallas, Texas	Brush sticks made round in cross-section held in holes of the end plates of cylinder. Sticks could move laterally but not radially.
429,119 Jun. 3, 1890	J. S. Edgcomb Mystic River, Conn.	Combination fan and brush cylinder; fan blades tipped with bristles and air inlets through holes at cylinder heads.
482,478 Sept. 13, 1892	Susie B. Hall Little Rock, Ark.	Brush cylinder with clumps of bristles held by fingers to wipe each side of the saws. Fingers fastened to brush sticks.

Patent No.	Inventor and Residence	Author's unofficial description of the salient features involved.
644,155 Feb. 27, 1900	A. D. Thomas Pulaski, Ark.	Hollow brush cylinder, squirrel cage type, with air into cage from special fan. Combined brush and blow system.
660,960 Oct. 30, 1900	J. H. Jenkins Hubbard City, Tex.	Metal blades, notched in lieu of bristles, and base of blades bent to 90° for anchorage.
732,999 Jul. 7, 1903	T. Brantley Albany, Ga.	Brush cylinder built up with short sticks of bristles, staggered.
887,780 May 19, 1908	T.C. Eberhardt Fort Valley, Ga.	Improved construction features of strapping brush strips to cylinder.
922,525 May 25, 1909	Arthur A. Vardell Dallas, Texas	Steel plate blades in lieu of bristles, having V-shaped scoop depressions formed opposite saws to direct doffing blasts.
991,876 May 9, 1911	Stephen D. Murray Dallas, Texas	Bristles grouped in strips with cylindrical base, to slide into special slots or clamps.
1,018,327 Feb. 20, 1912	S. F. Krupp Memphis, Tenn.	Shape of gin sticks at base and U-clamps to hold same on cylinder.
1,175,664 Mar. 4, 1916	J. T. Shute Monroe, N. C.	Composite brush cylinder using brush sticks interspersed with notched plates. Two plates between brush strips. Solid ends and core of cylinder.
1,231,032 Jun. 26, 1917	S. F. Krupp Atlanta, Ga.	Multiblade fan in lieu of brush cylinder, with fan tips extending between gin saws. 16 long blades and 54 short blades, forward pitched.
1,344,843 Jun. 29, 1920	J. Wooldridge Temple, Texas	Brush cylinder has fingers in rows, holding bristles sideways to wipe saw edges. (See Susie Hall, No. 482,478, 1892.)

Patent No.	Inventor and Residence	Author's unofficial description of the salient features involved.
1,426,689 Aug. 22, 1922	Arthur A. Vardell Dallas, Texas	Bristles set in circumferential rows around cylinder, like a polishing wheel. One row per saw.
1,682,950 Sept. 4, 1928	Homer Beaver Chickasha, Okla.	Wood strips on T bases, in lieu of bristles. Set close to tooth tips to fan off the lint.
1,709,021 Apr. 16, 1929	Ina H. Jenkins Altus, Okla.	Aluminum wings or blades, outer ends folded with base bent to angle and held by strips.
1,769,869 Jul. 1, 1930	W. C. Torbett Dallas, Texas	Star shaped brush cylinder with 8 or more wings to fan lint from saws.

CHAPTER IV.

Part I.

GINNING TOOTH DESIGNS, WIRE AND SAW, DURING THE 19TH AND 20TH CENTURIES.

The Whitney model, deposited by Eli Whitney, Jr., at the Textile Section of the Smithsonian Institution was described in Chapter 2. Of the two types of wire teeth in that model, the one with flattened sides appears to have been most practical to manufacture and maintain because the flats were easily formed after the wires were driven into place and the sides could be dressed by files. Some examples of this shape of Whitney ginning tooth were adopted by J. M. Clough in 1870 and D. W. Haselton in 1884, as shown in Figure 47.

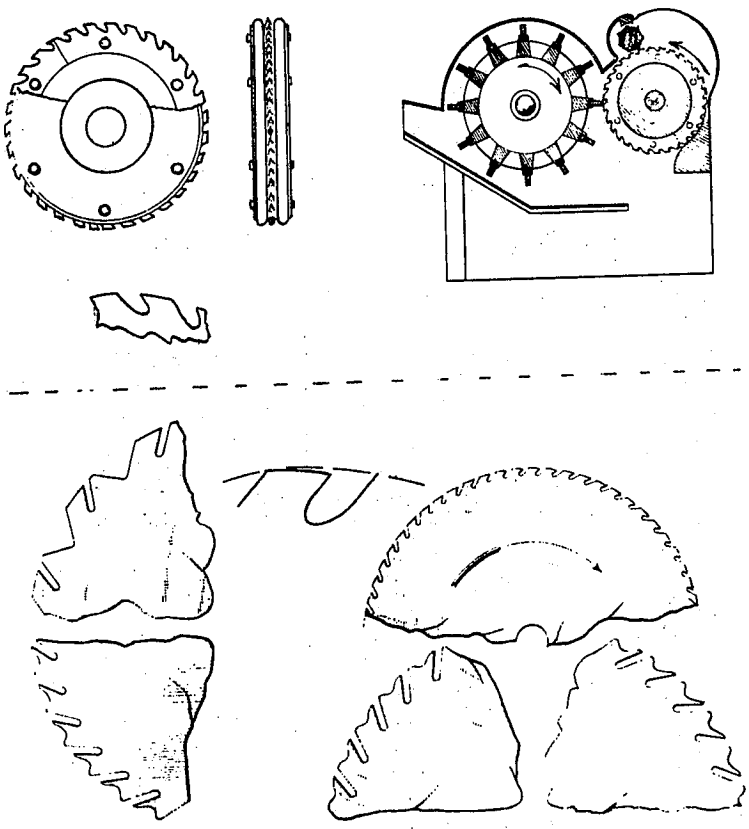


Figure 47.

Whitney's wire tooth shapes as adapted to gin saws by Clough and Haselton. Upper, Clough's design with outer edge of the teeth on the disc circles; and lower, various Haselton tooth shapes which usually kept the tip retracted.

Since Clough made the leading tip of his teeth on the outer circle, and Haselton dipped his tips inside the rotation outer arc, it is probable that Clough's teeth ginned faster and better.

While some inventors favored Whitney's ideas of wire teeth, they did not necessarily follow his shapes as to the tips or methods of dressing them. Others, like Mason (Figure 48.) made ginning teeth that were neither wire nor saws.

Figure 48, also includes two kinds of spike or wire teeth that were used in 1883 and 1912 in rows. Since then ginning has been attempted with card clothing and likerin wires taken from spinning mill practices but not fully adaptable as yet to ginning.

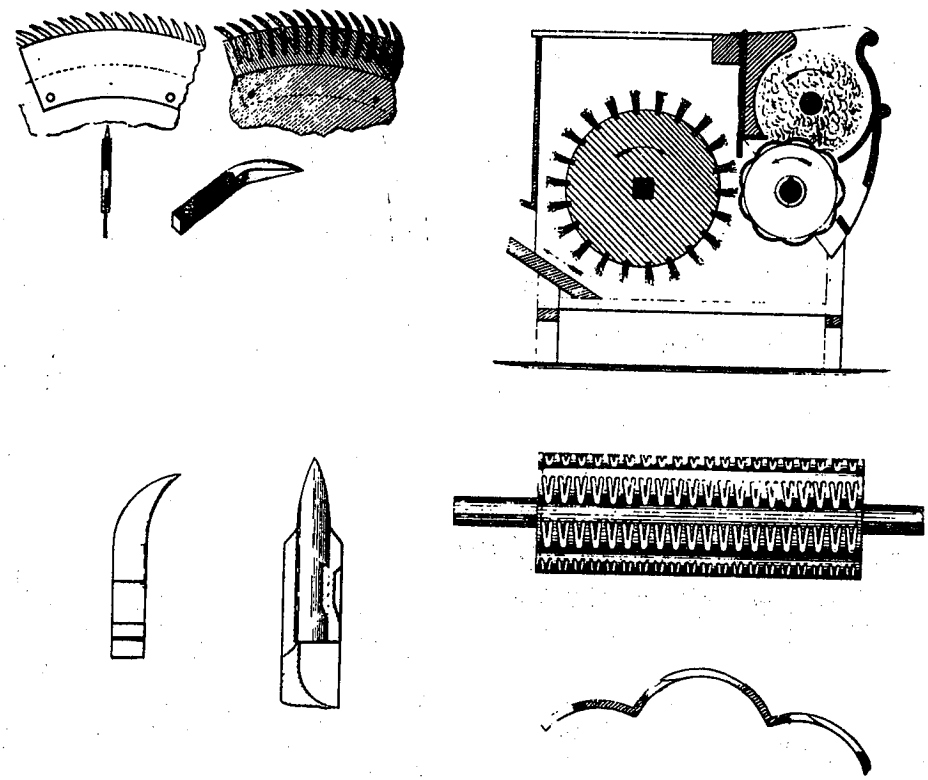


Figure 48.

Examples of some 19th century ginning teeth. Upper left, 1883 thorn teeth of C. W. Mann; lower left, Fullers' 1912 second design; upper and lower right, section and cylinder of the 1885 C. T. Mason gin.

In 1881, at the Atlanta Exposition, H. V. Scattergood won two prizes and ribbons for his "brier thorn" toothed cotton gin and its high-quality performances. The Scattergood ginning cylinder is partly shown in Figure 49. Unfortunately, the manufacture of this gin ceased during the 1880 decade.

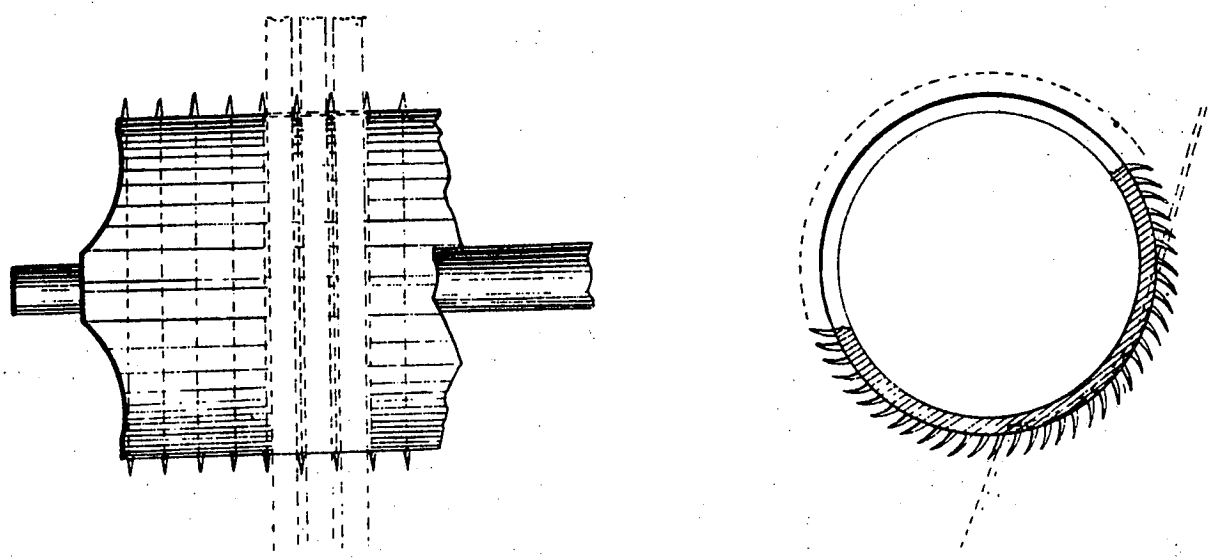


Figure 49.

Type of ginning cylinder used in H. V. Scattergood's prize winning 1881 gin. This gin was patented in 1866.

In 1902 an attempt was made to interest the cotton ginning industry in another design of needle tooth gin, namely, that of James T. Fuller and Associates, known as the Fuller Needle Gin. Figure 50 shows a redrawn catalog section, together with an enlarged detail made from some teeth that were given to the author by Mr. M. E. Pratt about 30 years ago. The factory for this gin was established in Memphis, Tenn. Cylinder speeds of the gin were about 340 r.p.m., and reports stated that for standard 70-saw width, the Fuller gin would turn out 25 percent more well ginned cotton per hour than any of its rival saw gins. The Fuller gin stands sold at about $300 each, f.o.b. factory.

Center to center of the Fuller tooth rows was approximately 3/4-inch, and there were usually 70 rows per gin stand. Each tooth ring was recessed, on one side only, to hold the teeth; and the rows were clamped into one solid cylinder. Loosening of the end shaft nuts enabled the operator to remove broken teeth readily and to make replacements.

In reviewing the attempted use of wires, spikes, and needles for cotton ginning teeth, it appears that the costs of manufacture were too great to enable their makers to compete with the Holmes' saws. Scattergood cast his wire teeth into pot metal rings; Fuller used expensive wheels with recesses; and Mann held his thorn teeth into position by clamped plates and

discs. All of these, plus the skilled workmanship necessary for manufacture and assembly, were deterrents to profitable continuation, regardless of quality of work. Table IV presents a partial tabulation of U. S. Patents on ginning teeth of wire, spike and other similar forms (other than saws), with brief remarks thereon.

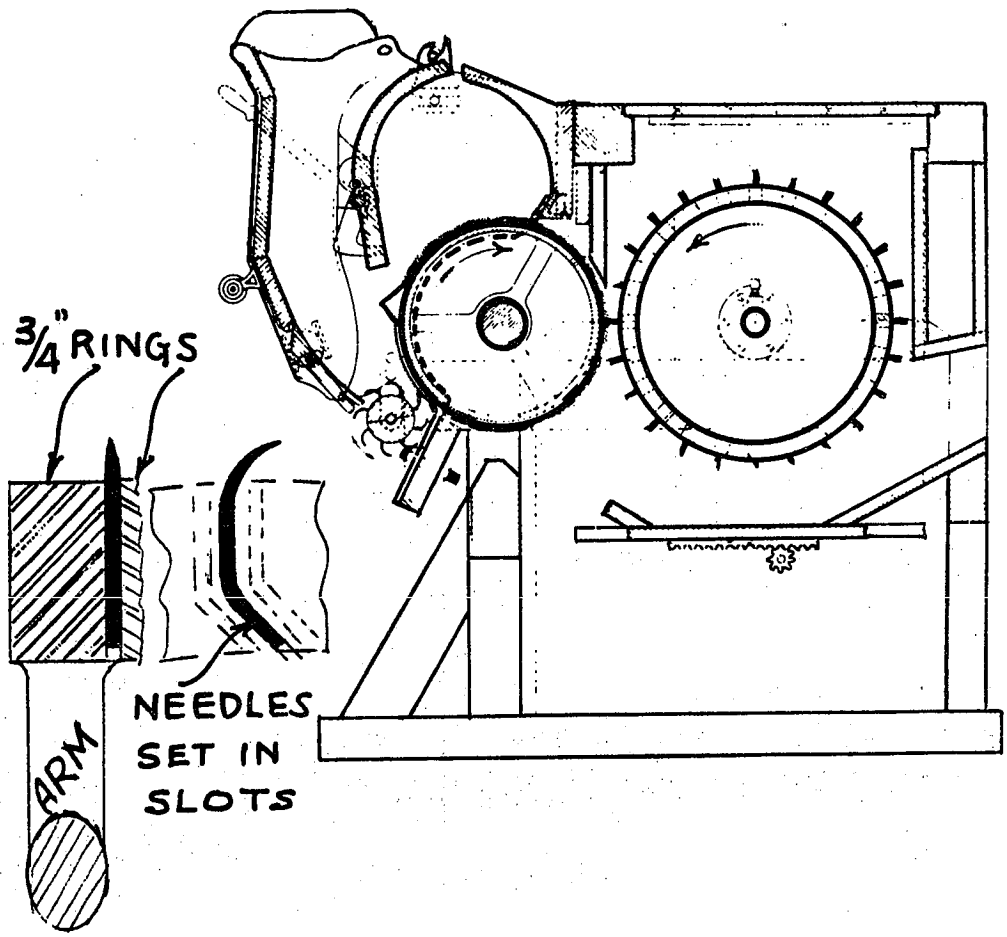


Figure 50.

Cross-section and wire tooth detail of the James T. Fuller Needle Gin, 1902 model. Very short upper ginning fingers replaced the conventional cast ribs of saw gins. The ginning needles were of # 15 B. W. G. steel wire cut into 1-inch lengths.

TABLE IV.

PARTIAL TABULATION OF UNITED STATES PATENTS ON SPECIAL GINNING TEETH OR WHITNEY SPIKE FORMS, AS SUBMITTED BY INVENTORS IN LIEU OF STANDARD SAW TEETH.

Patent Number	Inventor	Year Patented	Remarks
14,965	W. B. Lindsey	1856	Wire teeth
26,681	B.H. Jenks & W. A. Tuttle	1860	Carding teeth
41,487	T. C. Craven	1864	Sheathing wire claws
55,542	H. V. Scattergood	1866	Brier thorn spikes
93,057	J. L. Clement	1869	Ginning plus carding
103,981	J. M. Clough	1870	See Figure 47
287,450	C. W. Mann	1883	Gin saw with buckhorn needles. See Figure 48.
293,576	D. B. Haselton	1884	See Figure 47
316,378	C. T. Mason	1885	See Figure 48
379,760	G. F. Brott	1888	See Figure 52
707,096	J. T. Fuller	1902	Wire needle teeth
1,015,759	J. T. Fuller (second design)	1912	
718,635	P. F. King	1903	Toothed belt and roller
1,265,470	M. W. Marsden	1918	Spike teeth chains
2,228,619	F. Watson	1941	Spiked belt gin
1,340,691	Wheeler	1920	Carding belt & shoes
1,862,884	W. R. Collier	1932	Helical saws - spiral

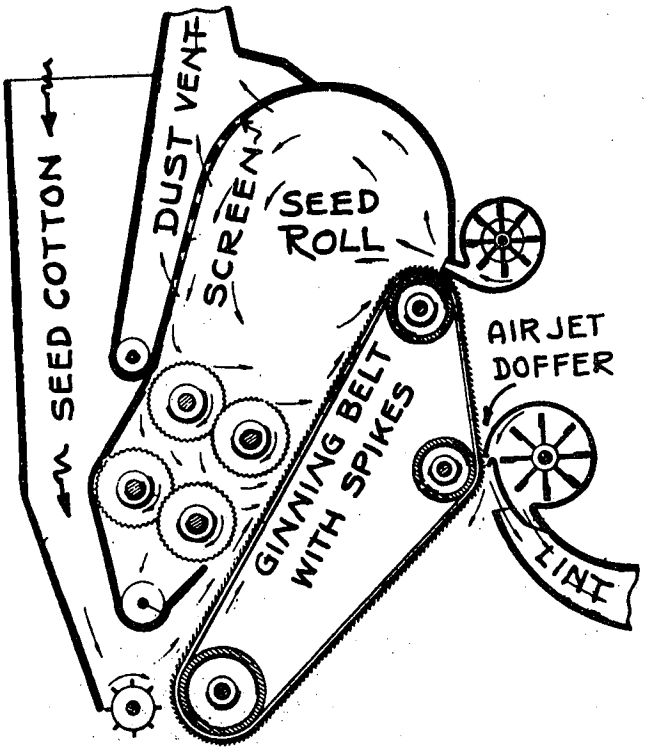
Some of the names in Table IV are connected with illustrations in this brochure, but there are several upon which the author could obtain nothing beyond the patent material.

In an endeavor to clear up questions regarding wire toothed gins, these discussions have been in advance of the general subject, to a certain degree, but one or two elements remain for presentation before a return to consideration of saw gins and their developments.

Frank Watson, in 1940, produced a special form of wire tooth cotton gin which was generally known as the Watson Centrifugal Gin. Figure 51, with additions and lettering to one of his patent figures, shows the airblast form of his design, although the test unit familiar to most present day ginners employed brush doffing. Seedshedding and roll turner devices at the bottom of the roll box were not used on the test model seen by this author, and the width of that unit was very limited in comparison to a full sized stand. We do not have here any information regarding the number of full-sized Watson gin stands that went into trade use, but the venture did not obtain financial endorsement from a sufficient number of ginners to continue its use.

Figure 51.

Section of the Frank Watson Centrifugal Gin of 1940. Airblast type from patent drawings shown here.



Returning to the 19th century in order to consider some peculiar and unusual forms of gin teeth and saws, we find a rather interesting type of gin stand offered by G. F. Brott in 1888. This gin stand used a wire brush cylinder for feeding seedcotton to the gin saws; special hooked teeth on the saws; stub ribs or ginning fingers between which were pairs of notched ribs; and other features shown in Figure 52.

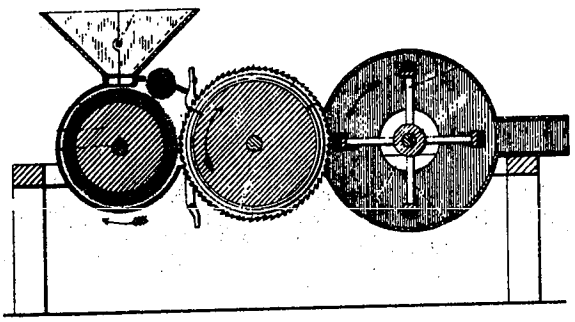


Figure 52.

G. F. Brott's 1888 needle to saw transfer cotton gin, having massed bristle feeding from hopper and special ribs and saws. The spacers were metal -- one of the pioneers of that field.

From ginning research experiments at Stoneville, Miss., by Messrs. Stedronsky, Harmond, Gaus, and Shaw, the transfer idea of Brott was found to have some merits, paralleling previous developments of Withers.

During the 19th century, many saw gins utilized wooden space blocks of one form or another and at times also employed halved saws which were nailed to their respective space blocks. The 1843 ginning design of W. B. Stewart used these halved saws, as shown in Figure 53, and relics of similar saws were displayed at Stoneville about 1930.

From 1900 gin saw teeth have gradually tended to straight leading edges (neither sharp nor rounded), with open throats to prevent wedging of fibers and with straight or modified roach backs. These backs, or trailing edges as they are frequently termed, usually have slightly rounded edges. Machine sharpening is now the established procedure.

The sharpening of gin saws in uniform manner with hand-operated machines was well established by 1900. As copied from an old Munger

catalog, one of these sharpening outfits is illustrated in Figure 54.

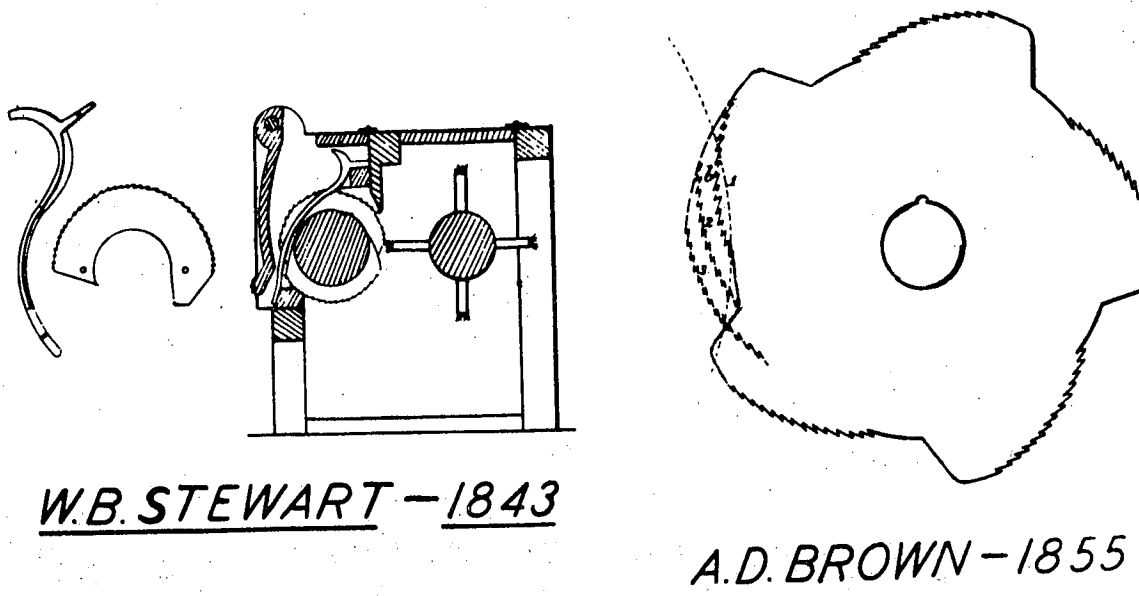


Figure 53.

Early saws not in use now. Left, the 1843 halved saws of W. B. Stewart; and right, the cam-like saws patented in 1855 by A. D. Brown.

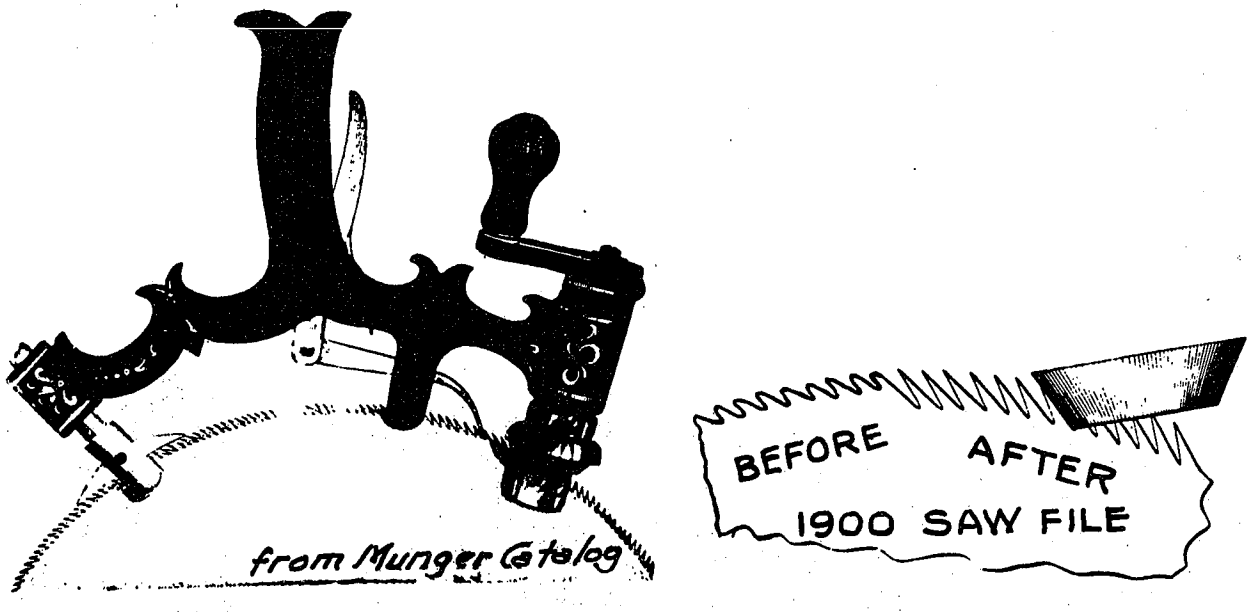


Figure 54.

A 1900 model saw-sharpening outfit.
(Courtesy Continental Gin Company).

Figure 55 shows a segment of a modern gin saw, approximately 264 teeth to 280 teeth standards, having a moderate roach (curved) back. Figure 56 is taken from an article by this author in the Cotton Ginners' Journal, Oct. 1935, and is self-explanatory as to shapes, pitch of teeth and other data.

Figure 55.

Segment of modern 12-inch gin saw in the United States. Moderate roach-back teeth.

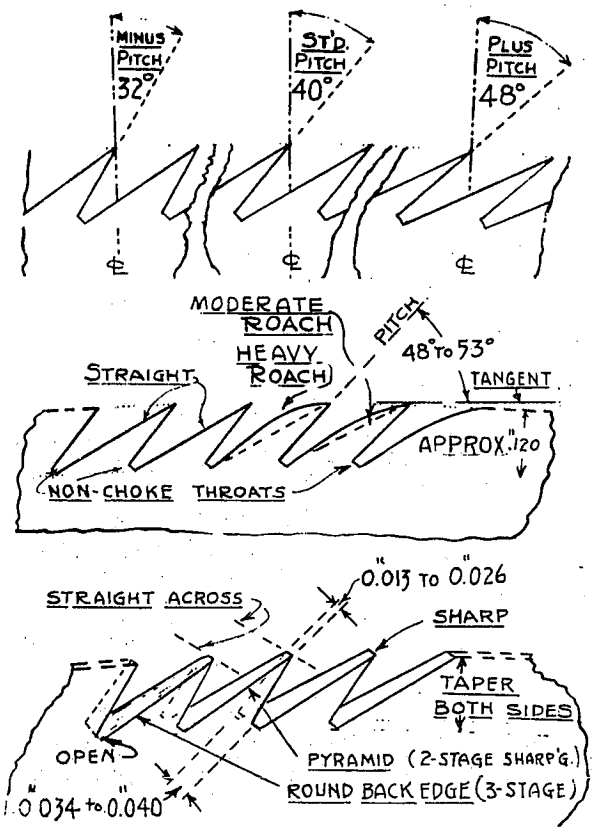


Figure 56.

General data on shapes, pitch, and other items now generally employed in the United States.

Cotton gins manufactured for export in the 19th century usually limited the diameters of the saws to 8 and 10 inches; but in the present century, saws of 12-inch diameter have become the standard. In 1960, however some large gin stands have used saws of 16-inches diameter.

From 40 saw gin stands in 1840, to 70 saw gins in 1920 seemed to be the general range of sizes; then from 1920 to date, the gins have ranged from 80 to 90 to 120 saws per unit. Each increase in the number of saws per stand has introduced both manufacturing and operating problems. In the final summary, the ginner must keep his gin running and satisfy his waiting customers; and he usually determines the size and number of stands on the basis of these considerations. His purpose is to gin cotton for profit, while giving his customer a satisfactory sample. The main purpose of the manufacturer is to sell machinery for a profit and to encourage re-sales from pleased patrons. There is no fixed answer to the optimum number of saws per stand and the optimum stands per ginnery, because of regional and other conditions.

Each gin saw of 12-inch diameter may produce from 6 to 12 pounds of

ginned lint per hour, depending on regional conditions, staple lengths, methods of harvesting and other factors. Hence, 3 to 5 stands per outfit seem to have been the general choice of ginners for two centuries.

Part II.

ADVANCEMENTS IN GIN STAND DESIGNS, 1800 to 1960.

Double-rib gins were invented in the 1880's, but single rib plain and huller types remained popular because of their simplicity and long life. About 1920, as the number of plantation small ginneries were rapidly giving way to larger community gins, the manufacturing of double-rib huller gins and improved mechanical feeders replaced the older units with flat feeders or small drum feeders. From old catalogs (Figure 57.) there are two forms of the gin stands and one of a feeder that have not heretofore been shown. They cover the wooden and cast-iron frame stands that were known as Main Belt or System gins, and they also show the pneumatic elevator dropper and small drum feeder construction that denote the difference between that type and the mechanical distributor plus flat feeder outfits.

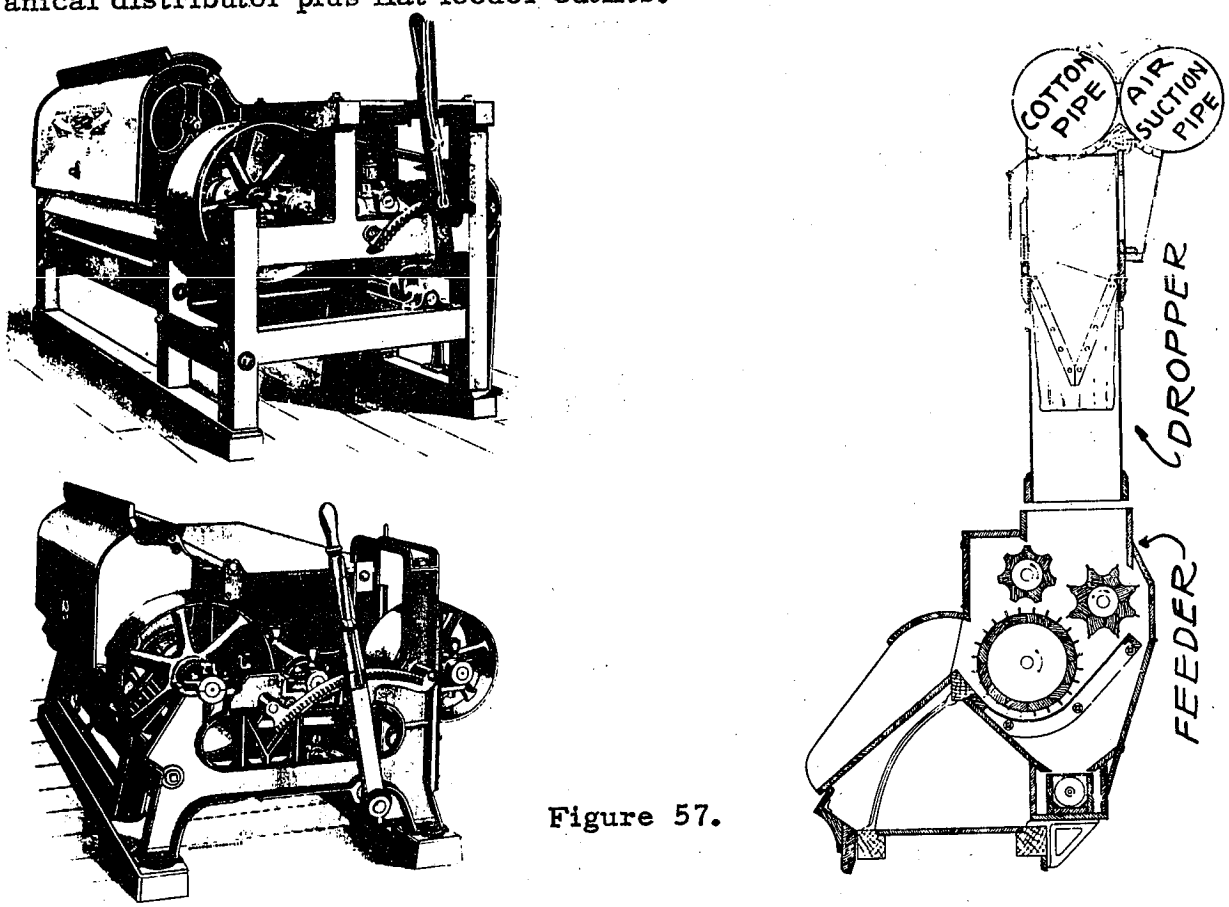


Figure 57.

Popular types of gin stands (1901-20); and alternative dropper and feeder to mechanical distributor and flat or front types of feeders. Upper left, the wooden frame main-belt type of stand; lower left, improved cast-iron frame main-belt gin of 1901; right, single drum cleaning feeder and pneumatic dropper.

The stands in Figure 57 are of the brush doffing kind, but airblast gins put in an appearance in 1893. Robert King, Mansfield, Louisiana, invented a multijet airblast gin at that time. Its nozzles or jets were placed between each pair of saws, as shown in Figure 58.

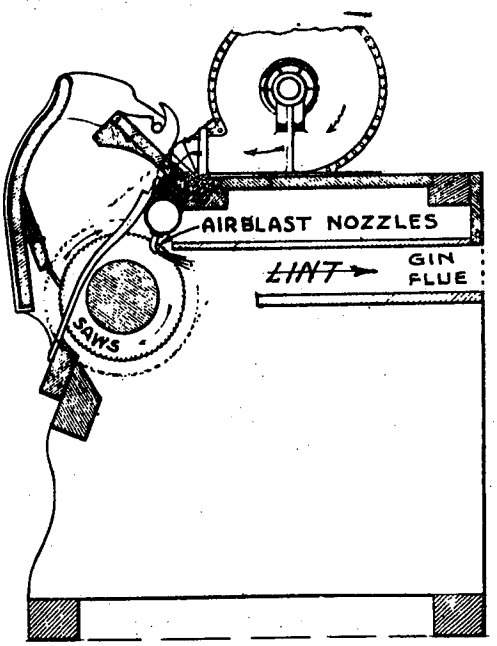


Figure 58.

R. King's 1893 airblast cotton gin.

In 1895, Lumpkin and Ogden came out with the second airblast gin which eliminated many parts by employing one long nozzle to sweep the entire length of the saw cylinder and leave no undoffed gaps. A number of prominent brands of cotton gins were licensed under this patent, Figure 59.

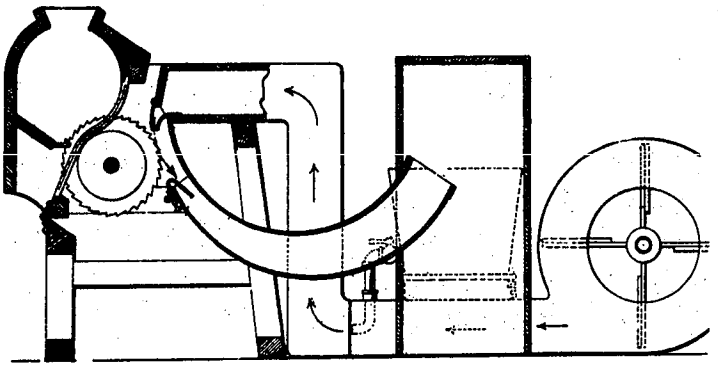


Figure 59.

Diagram of cross-section of Lumpkin and Ogden's airblast gin invention, patented in 1895.

Sixteen years after the Lumpkin-Ogden patent, Frank Phelps of Arkansas obtained a patent on another version of the airblast gin (Figure 60), from which other manufacturers fabricated their units.

From more than 30,000 cotton ginneries existing in 1900 in this Nation, the number dropped to about 20,000 by 1928 and to 7500 in 1957. But the size of these latest outfits increased so that they usually had more stands in their batteries. The annual capacities per ginnery were also much more in the majority of instances where the cotton production kept up. This significant change produced various refinements and led to about four general designs of saw gins, as diagrammed in Figure 61.

Figure 60.

The 1911 airblast gin of Frank Phelps. This inventor also obtained another patent in 1912 that is not shown here.

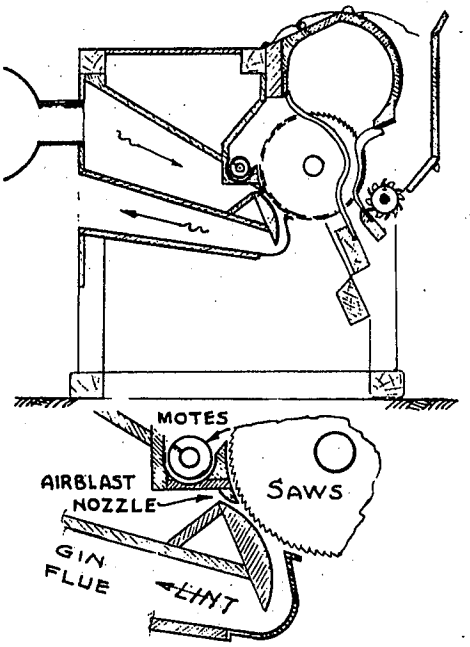
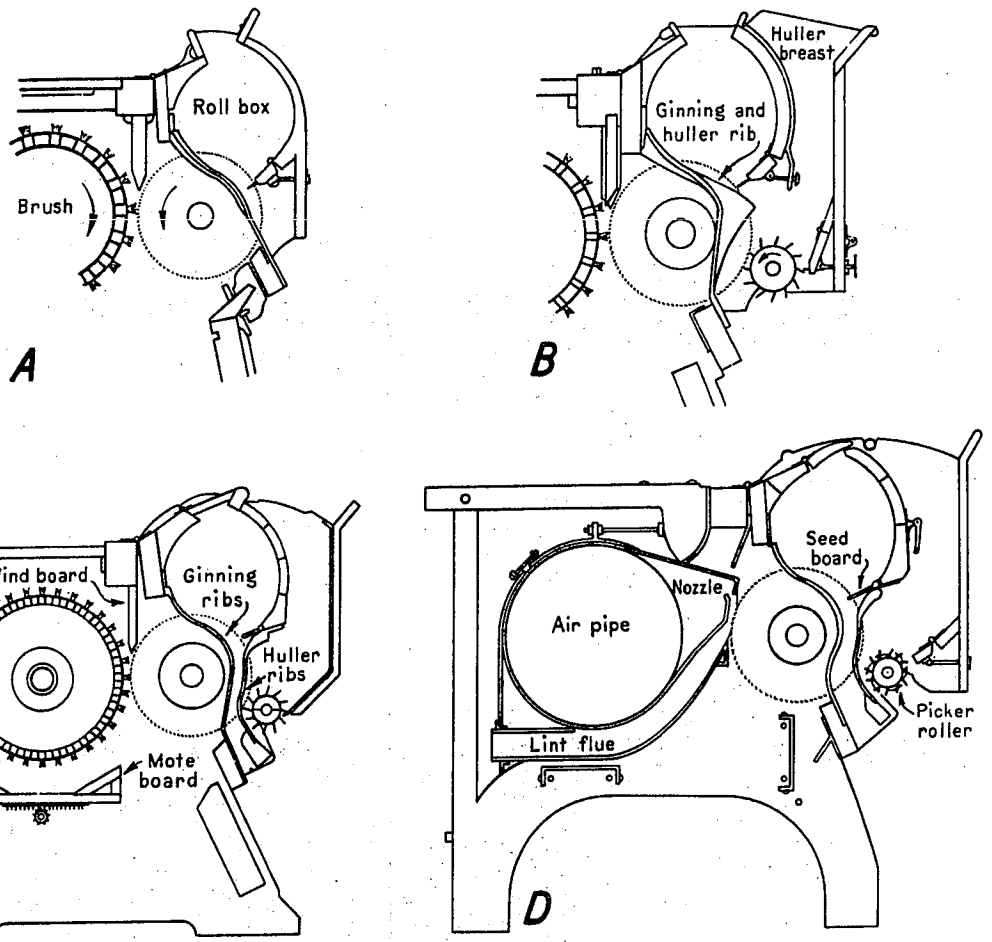


Figure 61.

General types of improved gin stands that were prevalent by 1930. (Courtesy U. S. Dept. Agriculture, Farmers' Bulletin No. 1748, Figure 21, 1935 edition.)



Organized research on cotton ginning was authorized by Act of Congress in July 1930. From this Act, the Regional Research Ginning Laboratories at Stoneville, Miss., Mesilla Park, N. Mex., and Clemson, S. C. originated, together with State and Federal layouts at Chickasha, Okla. The late Samuel H. McCrory and Dr. Arthur W. Palmer, both of Washington, D. C. headed the engineering and cotton technology aspects respectively for the Department of Agriculture. This author holds both men in highest esteem and is indebted to them for their leadership and assistance during his term of duty in the Cotton Ginning Investigations across the Cotton Belt of this Nation.

Research tests tabulated in 1942 by the Cotton Ginning Research Laboratory, Stoneville, Miss., revealed interesting and valuable information concerning aspects of relationship between the axes of revolution of gin saw cylinders and roll box cores. It was found, among other things, that for small round roll box sections, an angle of 14° for the roll box axis in advance of the vertical saw axis gave most rapid ginning and highest value per bale; whereas for other shapes of roll boxes, an advance angle of 21° produced optimum results (see Figure 62.).

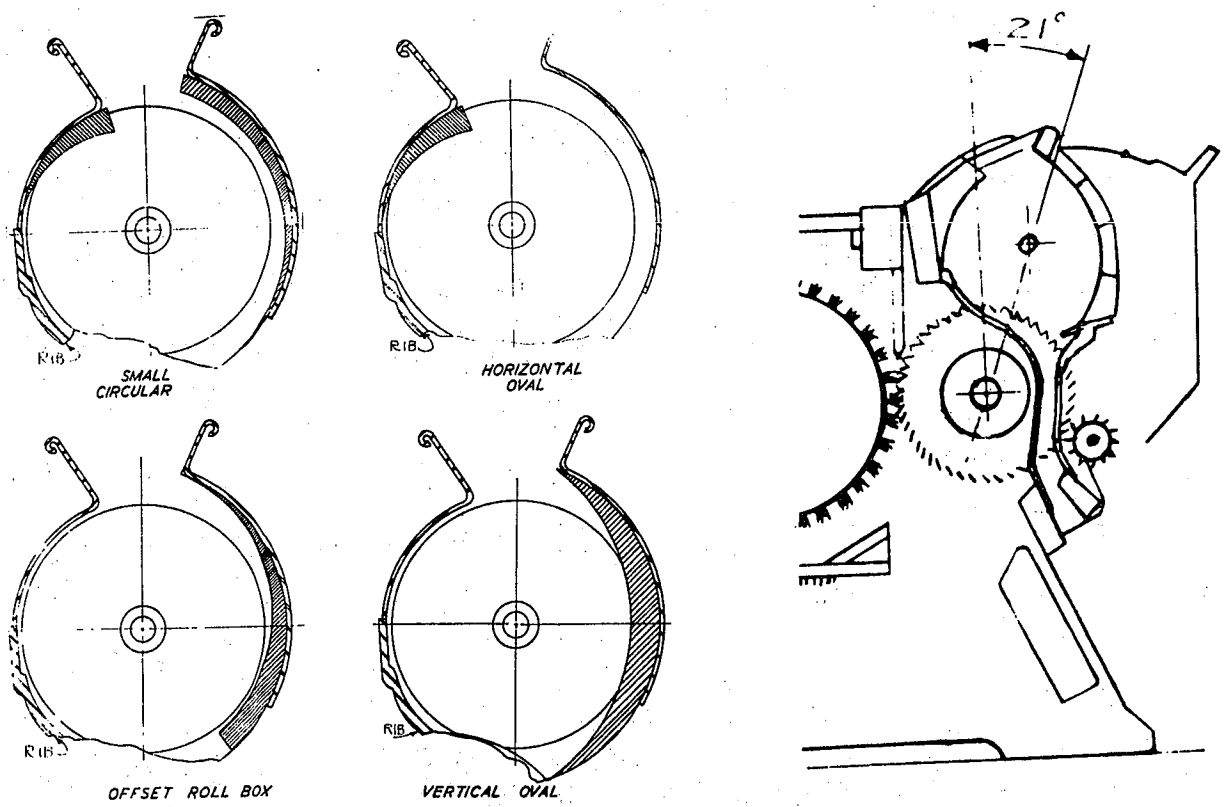


Figure 62.

Diagrams of roll box cross-sections, and axis relations between saw and roll center positions. (From USDA Ginning Research tests, Stoneville, Miss., Crops of 1938-39) The experiments were conducted on a rebuilt Liddell gin stand, arranged so that the entire roll box assembly could be rotated about the saw axis.

Full tables are on file, but results were not published here because the demand for such information was very limited and manufacturers could obtain it from the ginning engineers upon request.

Out of the eight possible positions for which the test unit had been provided, only three were used. These were identified as Nos. 1, 4, and 8; being respectively tipped off the vertical saw axis line by 7°, 14°, and 21°. Position No. 1 was the "control," and with it was the standard gin roll box (not shown). Reductions in changes and shapes of the roll box were effected by the use of filler plates. From the 1938 crop, 18 cottons were used; and from the 1939 crop, 13 cottons were used. Grade and staple results were not significantly changed, but ginning time was shortened. The standard roll box and small circular one performed best in postion No. 4, while the other 3 shapes of boxes did their most rapid ginning in position No. 8. The vertical oval roll box, next to the standard box, gave the best bale weights and bale values.

In Chapter III, Figures 29 and 40, mention was made of the two multi-cylinder gins of Jones and Brown. In the 20th century there have been two airblast multi-cylinder gins of conventional construction features that were brought out by well-known inventors, although neither invention has yet been adopted to any extent by the ginning industry. Figure 63 gives the major elements of the G. E. Evans and N. B. Henry gins, the first having two horizontal cylinders and the second having four vertical cylinders.

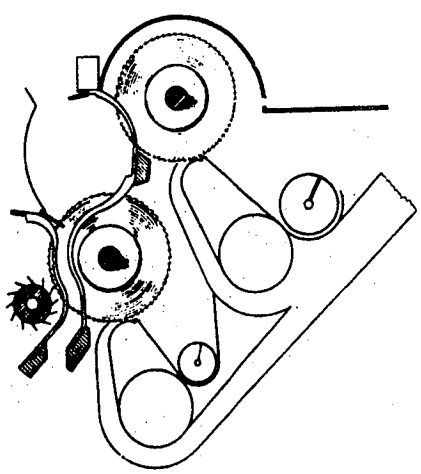


Figure 63a.

The 1924 gin of G. E. Evans.

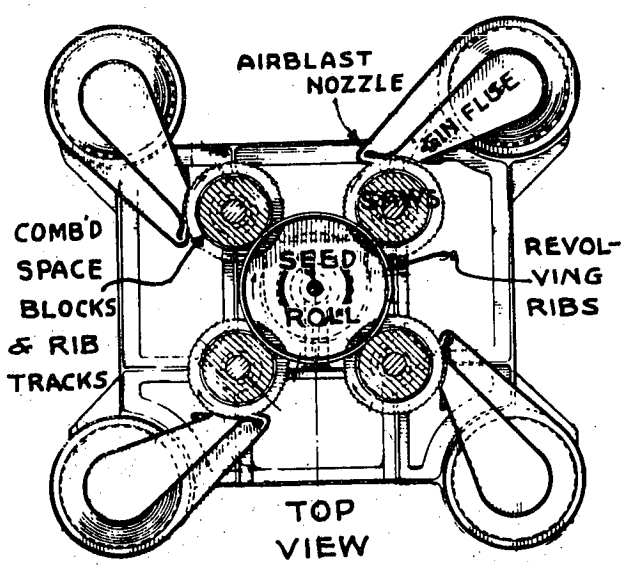


Figure 63b.

The 1935 vertical gin of N. B. Henry.

The Evans double-cylinder airblast gin operated very successfully for a number of years at Waco, Texas, and had approximately twice the capacity of a single-cylinder gin. The 1935 designs of Mr. Henry were transmitted to the USDA Cotton Ginning Research Laboratory for study, but the loss of scientists from peaceful pursuits during World War II prevented completion of the construction of a test unit, which was unfortunately set aside along with a number of other developments. The Henry roll box was also vertical, and its ribs were complete circles, running on separating rolls. Rate of seed discharge was to be controlled at the bottom of the roll box by a cone valve.

In addition to the Henry revolving rib, there have been other designs of revolving or rotating ribs to serve in whole or in part in lieu of stationary ribs. Some of the forms were virtually single-rib gins; others were revolving huller rib gins (See Figures 64 and 65.).

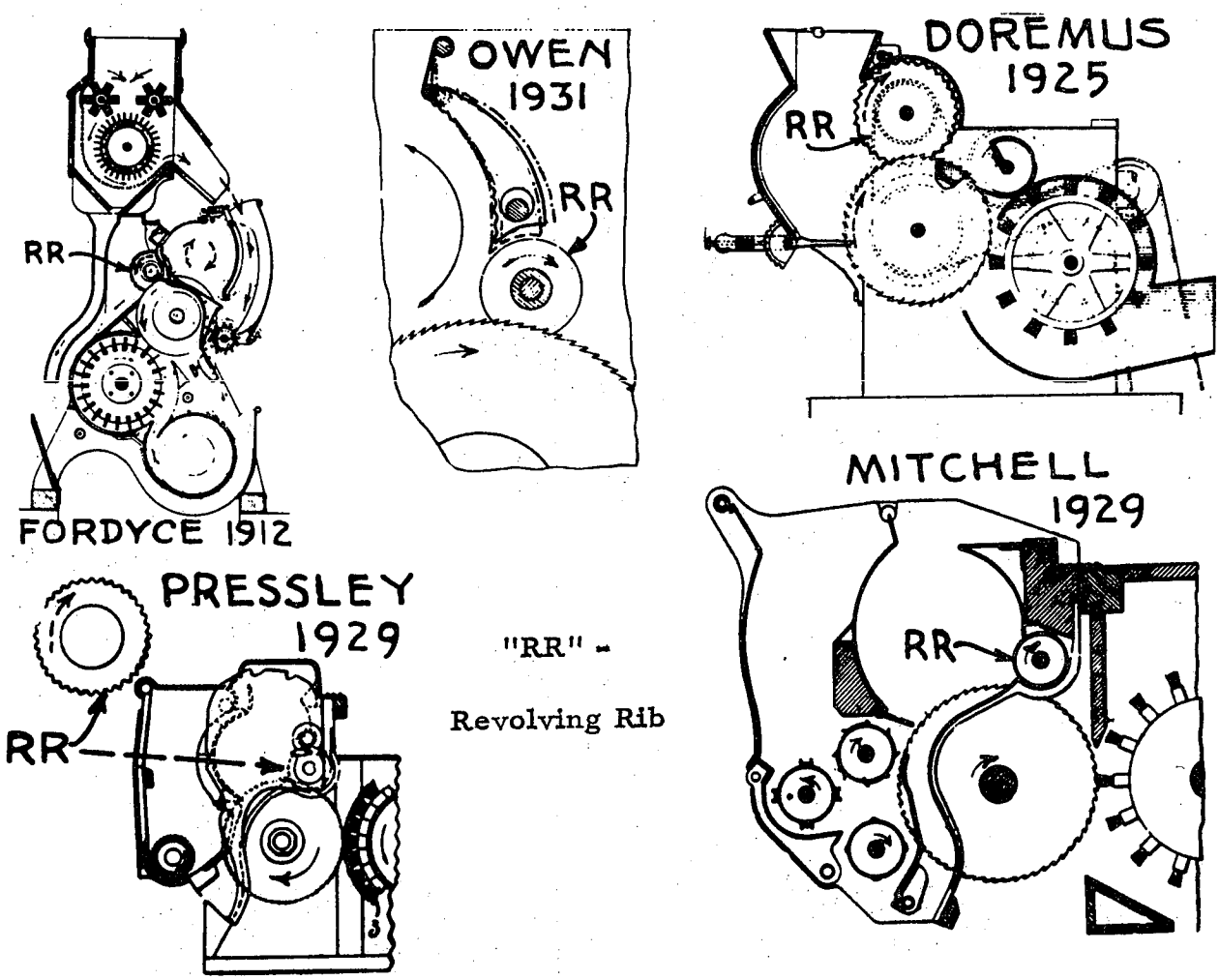


Figure 64.

A few leading inventions of gin stands with revolving ribs. The Fordyce gin, upper left, was quite thoroughly tested at Stoneville and gave good results. Test units of other models shown were not available.

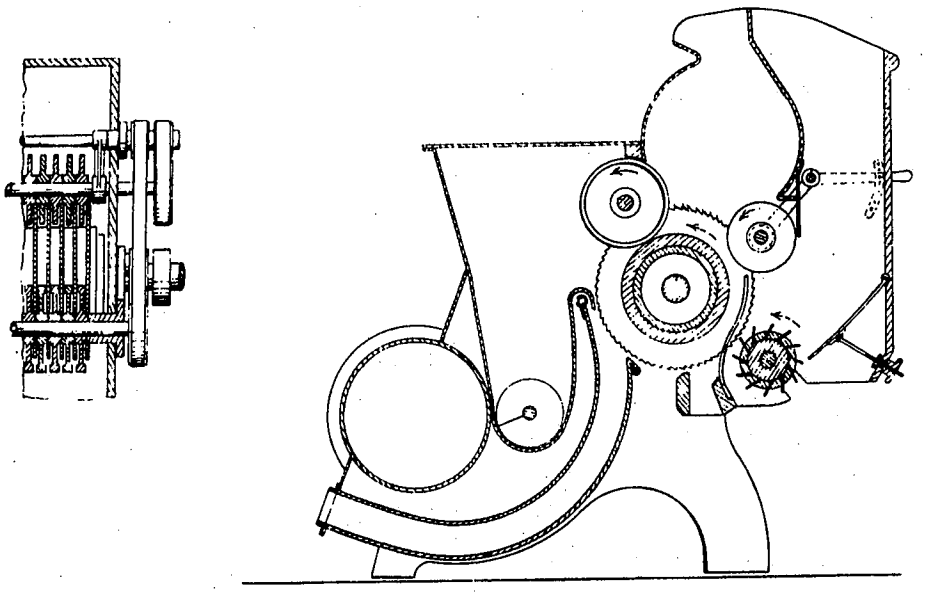


Figure 65.

1937 model of T. R. and J. D. Alley

In 1932 the Lufkin Gin Co., offered revolving rib huller breasts to fit certain models of Pratt stands. Blueprints of the front are on file at Stoneville, but tests were not attempted because of other roller rib programs.

Freedom from fiber chokage and long life without repairs were among the principal elements claimed for revolving rib gins. At Stoneville, Messrs. Stedronsky, Young, McWhirter, Baggette, Shaw and other Ginning Laboratory scientists made extensive tests on 10-inch, 16 saw export models obtained through the courtesy of the late Edward Lummus. Both smooth and knurled round ribs were tried out, together with multiple roller ribs patterned after the Gardner gin (see Figure 44.). Undoubtedly there were excellent features in these types of gin designs, but the conventional rib assemblies have not given way to the innovations of revolving ribs.

Stationary ribs, beginning with the 1796 designs of Hodgen Holmes which were reversible, received periodic attention from inventors, as some of the illustrations indicated. A full tabulation of rib features and inventions is not possible in this brief brochure, but it should be said that rib sections and designs have taken numerous forms. The sections of both ginning and huller ribs have included tees, inverted tees, roods or crosses, semi-rounds, flats, ovals, and many other shapes. Slots, throats, attachments, and other features at the tops of the ginning ribs, or at their upper ends, have been shaped in many ways; and the lower end slots to prevent back-lash and chokage of fibers have received much attention from inventors. Huller ribs have been solid and split, single and double sections, and numerous in designs. Rib assemblies have also been multiples, some in plate forms similar to grids. Such plate ribs are common in certain kinds of delinters, but are not

the orthodox style used for cotton gins. Figures 66 and 67 depict a limited number of rib types to illustrate these comments.

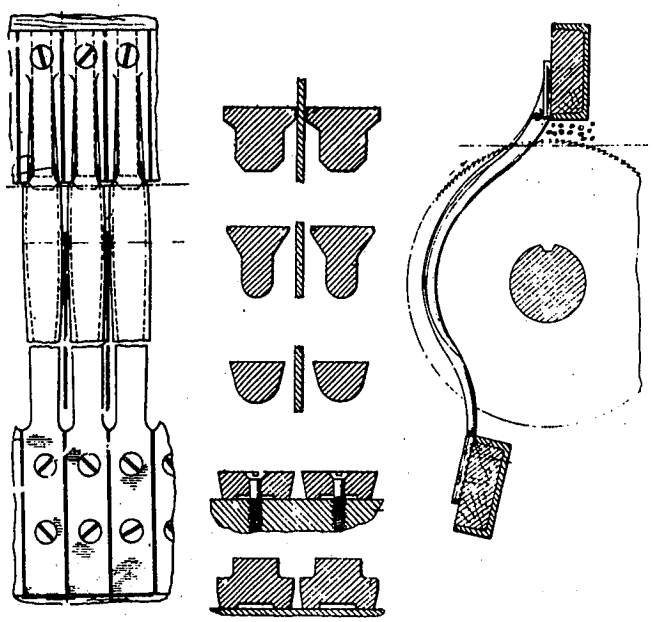
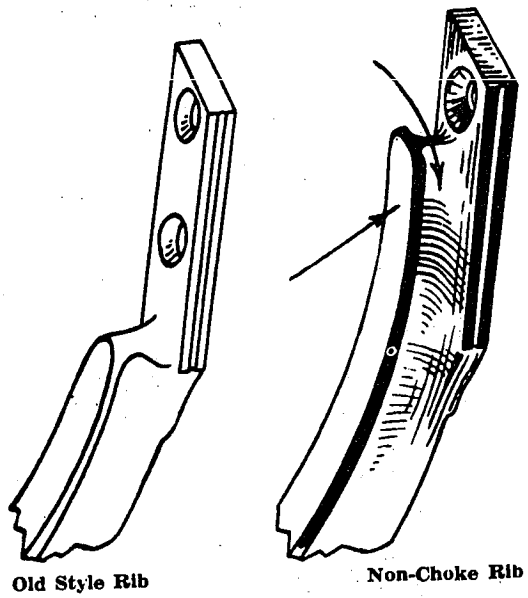


Figure 67.

Sections of J. J. Wallace model 1930 ginning rib invention. (Below).



Old Style Rib — Non-Choke Rib

Top arrow shows the concaves which are on each side to allow the trash to drop through into the motes.

Bottom arrow indicates the inch and a quarter extension on the bridge which creates additional dead air space, thus cutting out more of the foreign matters such as trash and stems.

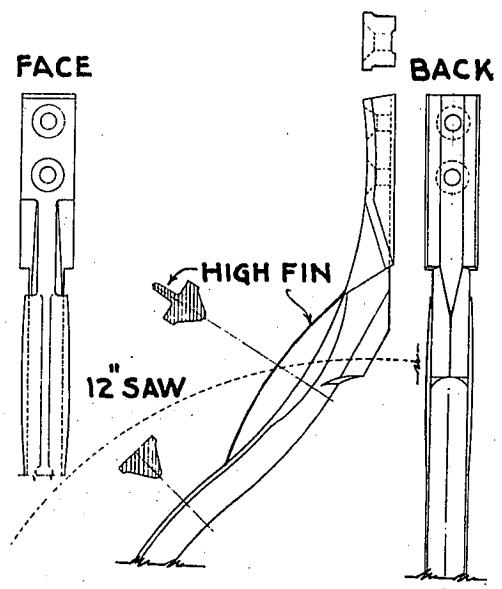
In the 1930's when the Shafter, Calif., Field Station gin was enlarged for the U.S. Department of Agriculture's activities under Mr. George Harrison, the author requested the late Edward Lummus to let him take a special Lummus gin stand to Stoneville. That stand had especially high fins on its ginning ribs (Figure 68.), and handled longer staple cottons readily.

Figure 66.

Old style and 1937 non-choke ginning rib upper ends.

Figure 68.

Special ginning rib features designed by the late Edward Lummus for a very successful experimental gin stand used for several years at Shafter (Calif.) Cotton Field Station. (Courtesy Mr. Harold C. Lummus).



From 1900 to the present there have been a surprising number of minor element improvements in gin stands to obtain longevity, safety, and smoother ginning. Collectively, their results have been most worthwhile. These have included rib rails, seedboard finger constructions, front assembly hinges and locks, protective guards against dangerous swing-outs of the ribs, and others.

Moting effectiveness and its functions of foreign matter elimination have also been greatly improved. The motivating force of moting is centrifugal, which is extremely effective at certain tip speeds of the saws. Inventions have included both overhead and so-called gravity or downward types of moting arrangements, combers, beaters, stationary whipper bars, and oscillating blades such as the public patent recipro-cleaner (Figure 69.), that was developed at the United States Department of Agriculture's Stoneville Ginning Research Laboratory by Merkel, Bennett, and Wright. The Streun and Brooks methods of achieving improved moting are shown in Figures 70 and 71. These three systems, and several others, aim at controlled moting without losses of usable fiber.

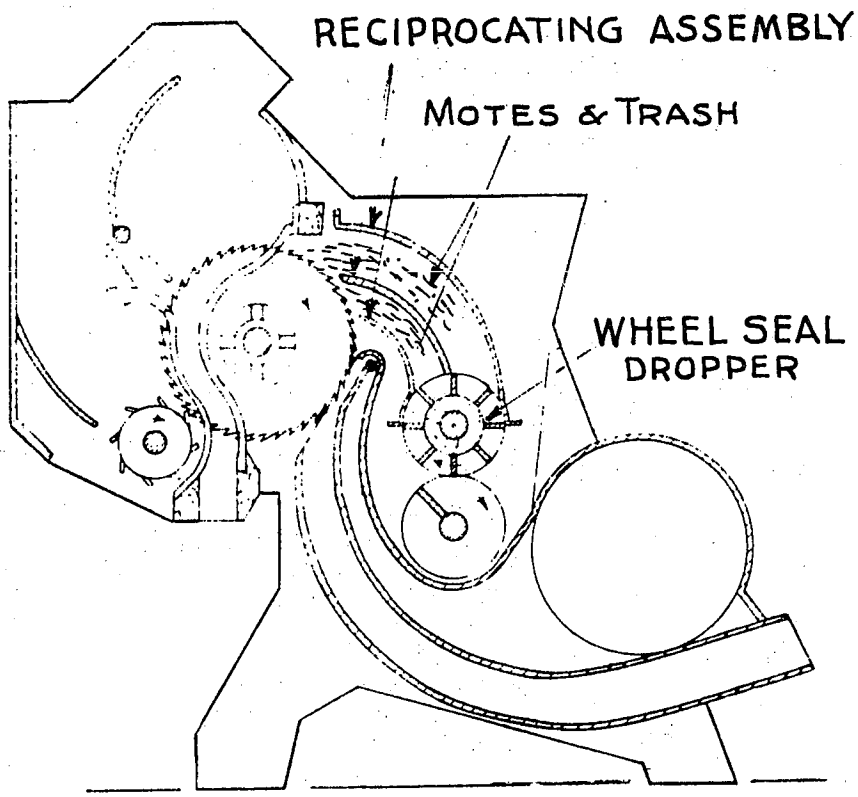
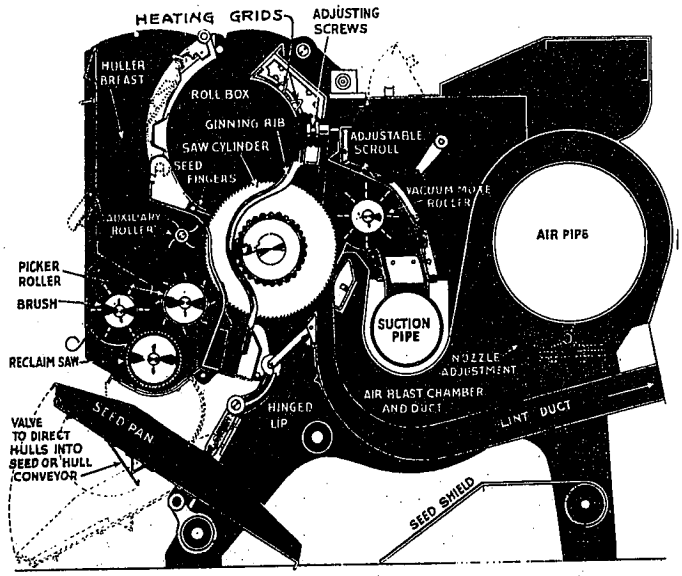


Figure 69.

"Recipro-cleaner" developed at United States Department of Agriculture Cotton Ginning Research Laboratory, Stoneville, Miss. Public patent by Merkel, Bennet, and Wright. Used in Murray gins.

Figure 70.

Cross section of a late model cotton gin developed under the direction of the late John Streun, of the Hardwicke-Etter Company, showing moting wiper roller behind the saws, and hot roll box (electrical).



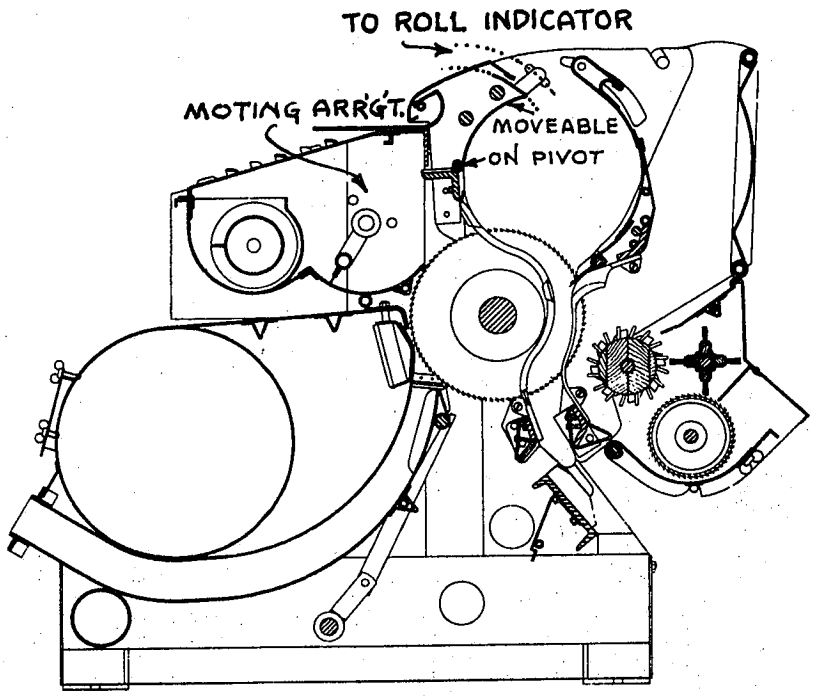


Figure 71.

Cross section of airblast gin developed under the direction of Mr. Eugene Brooks (then of Continental Gin Co.) showing moting wiper behind the saws and movable arc in roll box for indicating the roll density.

Various forms of seed roll density indicators have been developed, as shown in Figures 71 and 72. Pressure from the roll, as it varies, causes a hinged or flexible arc at some point in the roll box surface to adjust itself and thus indicate the density.

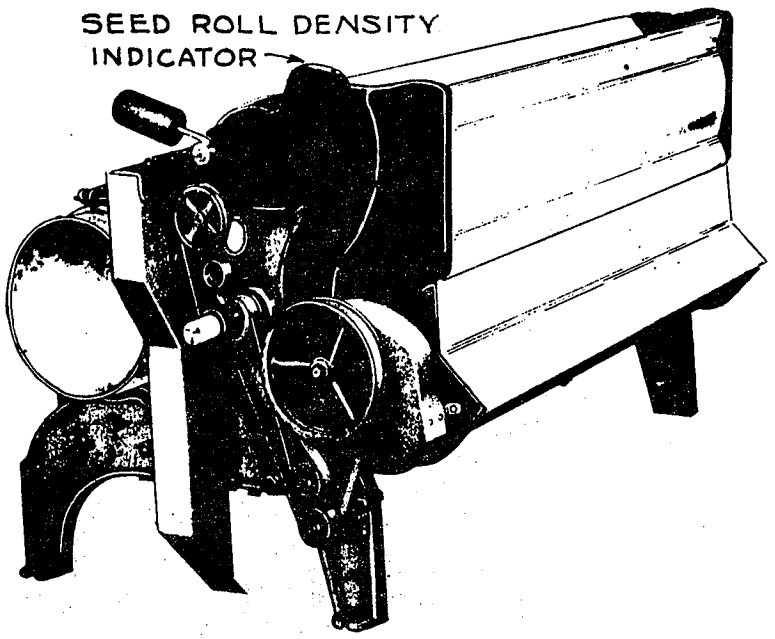


Figure 72.

A modern seed roll density indicator. Exterior view of the counterweight and indicator (see arrow) is here given to supplement the part shown in Figure 71.

Some of the gins that were made during World War II employed small troughs behind the gin ribs and over the saws for catching motes that were thrown off at that point. Drags of various kinds removed the motes from the trough.

Since the moting from the gin saws has generally been confined distinctly to overhead and down under positions, the upper was designated somewhat incorrectly as the centrifugal moting region, and the lower as the gravity region. Stroboscopic examinations show that the motes are cast or slung off, so-to-speak, from the saw teeth shortly after the teeth emerge through the ginning ribs. One prominent manufacturer employs a belt located above the airblast nozzles to convey the motes from the overhead moting region. The late model 1960 gin stands clearly show how their designs handle the moting. Figures 73 and 74 also show two other moting systems used on gin stands in the late '50's.

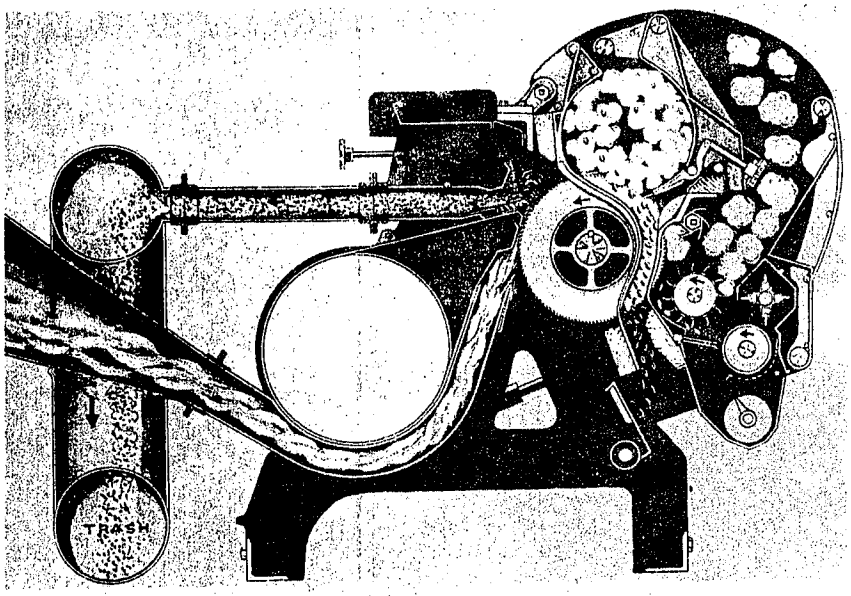


Figure 73.

Overhead cleaning and moting system used in one model by Wallace, who developed the design for the Gullett Cotton Gin Co.

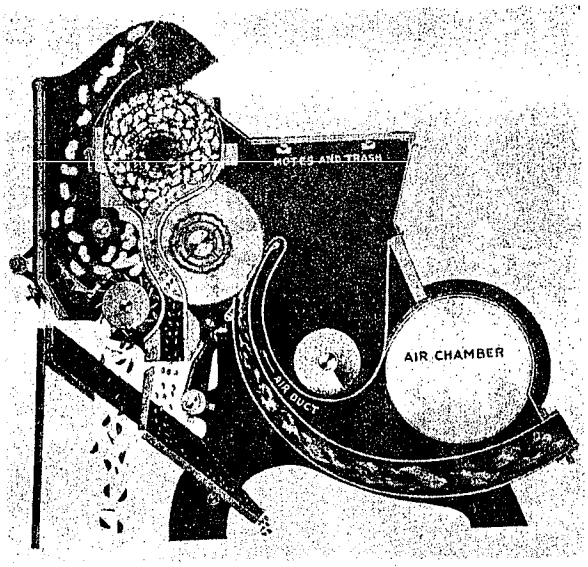


Figure 74.

Single area moting system above the airblast nozzle and behind the ginning ribs, in well-known and very simple form.

The condition of the seedcotton, especially as to its moisture content, has been found by research as well as by practical experience to be very important. The limits within which best ginning is obtainable have been investigated from 1926 to date in the Department of Agriculture projects. Dryness, as well as dampness, is objectionable in seedcotton at the time of ginning; and the range of moisture content for optimum ginning, approximately 5 to 7 percent, is good for optimum cleaning and extracting but may be slightly higher for satisfactory lint cleaning.

To improve the withdrawing or supplementing of moisture to the freshly ginned fibers before they are discharged from the gin saws, and to prevent chokage and stringing on the teeth by wet fibers, as well as to eliminate static electricity chokages from dry fibers, the author obtained patent No. 1,827,183, dedicated to the public, in 1931. The patent figures, retouched with lettering, are shown in Figure 75. Like many other inventors, the author was unsuccessful in securing the adoption of his idea, although he, too, thought that he was offering something worthwhile (see Figure 75.).

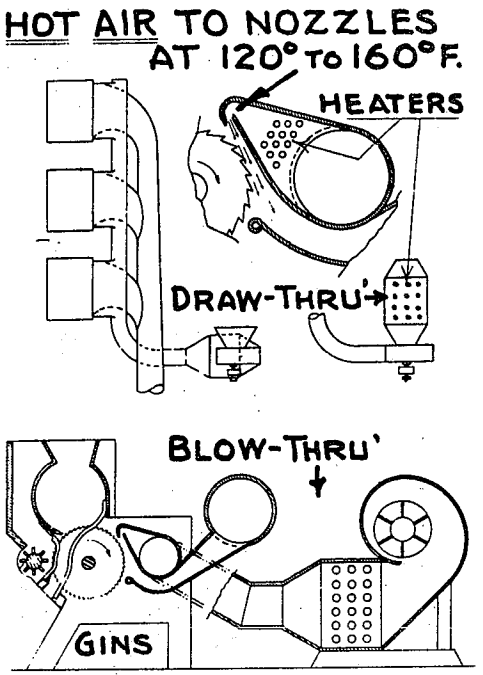


Figure 75.

Diagram of conditioning method proposed for treating freshly ginned cotton fiber by means of dry or humid air as required to obtain best samples from gin stands.

The field of conditioning the seed-cotton and fibers during the actual ginning or decortication has attracted the attention of several inventors, and is still open to improvement and control that should be advantageous to farmer and ginner alike.

In concluding the reviews of Cotton Gin Developments, it is proper to examine the cross sections of the 1960 model cotton gins now available to public use. These views have been generously furnished by the several manufacturers, to whom the writer acknowledges thanks and appreciation. They are shown in alphabetical sequence as to names of the brands and indicate an excellence of design and refinement of which we are proud.

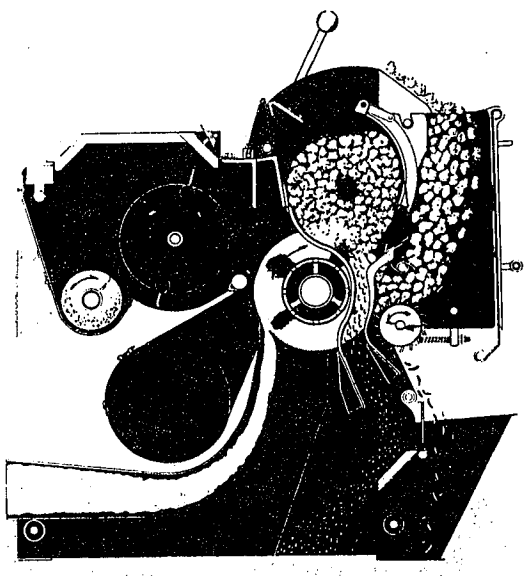


Figure 76.

The 1960 model Cen-Tennial Cotton Gin.

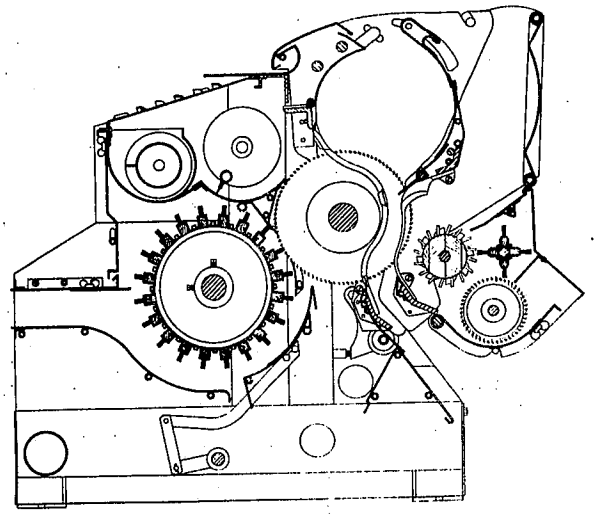


Figure 77. (upper left)

The 1960 model Continental Brush Gin

Figure 78. (middle left)

The 1960 model Continental Airblast Gin

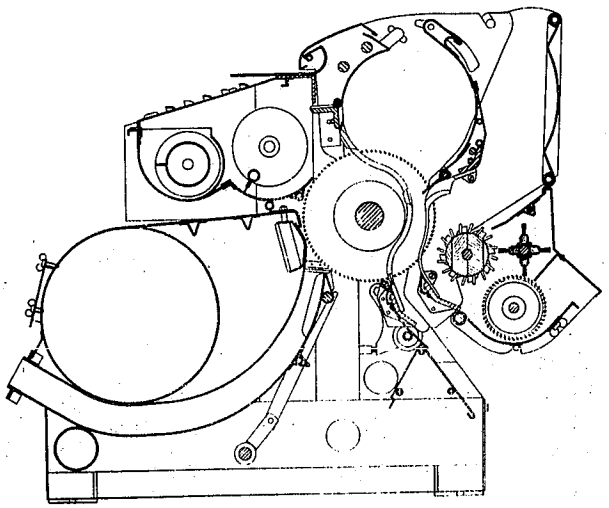
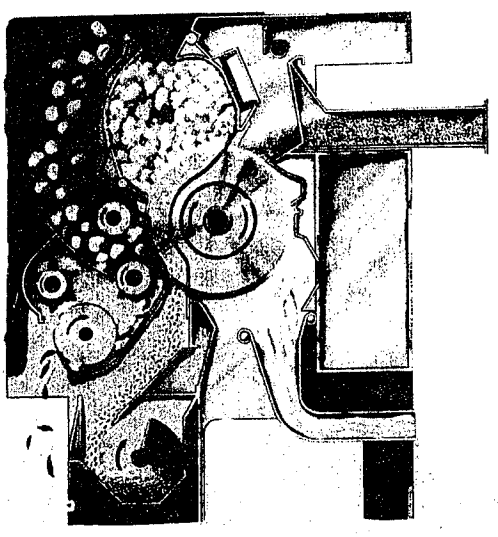


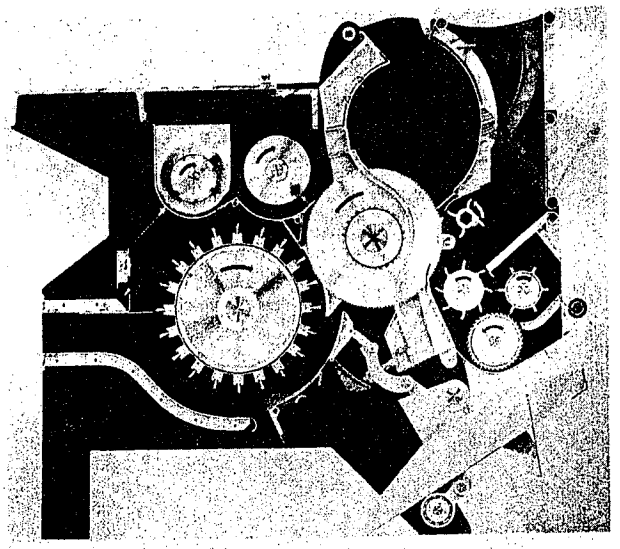
Figure 79. (lower left)

The 1960 model Gordin Cotton Gin

Figure 80. (lower right)

The 1960 model Hardwicke-Etter Brush Gin





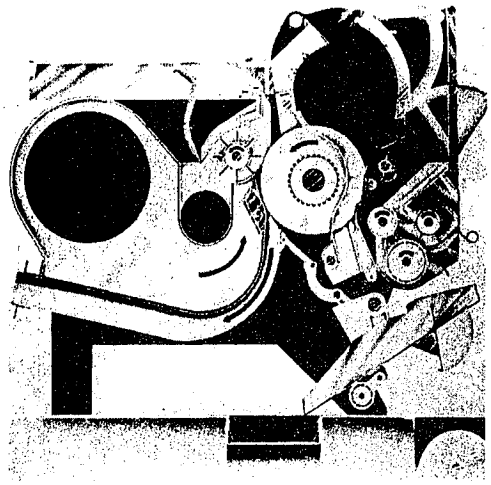


Figure 81. (upper left)

The 1960 model Hardwicke-Etter Air-blast gin

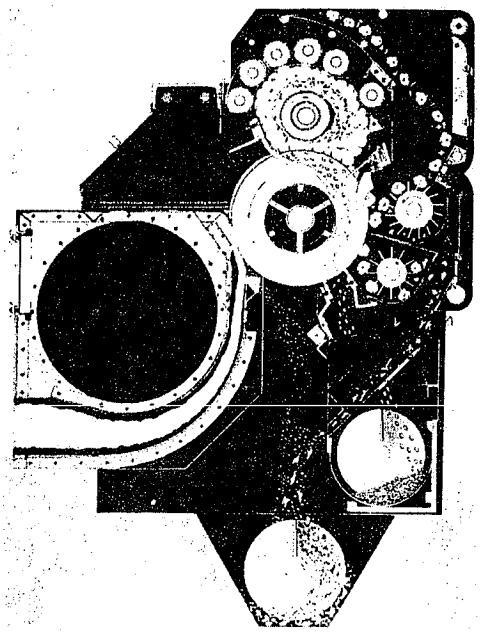


Figure 82. (middle left)

The 1960 model Lummus Airblast Gin

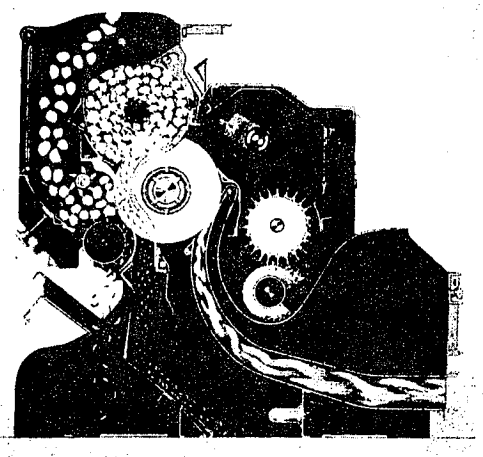


Figure 83. (lower left)

The 1960 model Murray Airblast Gin

APPENDIX

Table of Contents

ADDITIONAL ACKNOWLEDGEMENTS

In addition to those previously mentioned in the introduction, we wish to acknowledge our grateful appreciation for the helpful assistance and suggestions of Messrs. Alf and Hugh Pendleton, George E. Gaus, A. Clyde Griffin, C. Scott Shaw, William M. Bruce, E. G. McKibben, Tony Price, John C. McDonald (The Murray Company of Texas, Inc.), Eugene Brooks (Hardwicke-Etter Co.), and Charles M. Merkel (Continental Gin Co.), in making available antique catalogs, old and new photographs, and other historical data for this brochure .

ADDITIONAL LITERATURE REFERENCES

Charles A. Bennett, Cotton & Cotton Oil News, April 1, 1933 - Early Years of the Cotton Gin.

Charles A. Bennett, Cotton & Cotton Oil News, March 23, 1935 - Mechanical Progress in Cotton Ginning to 1884.

Charles A. Bennett, Cotton Ginners' Journal, April, 1935 - Some Patents Which Have Expired on Cotton Gin Saws and Ribs.

Charles A. Bennett, Cotton Ginners' Journal, October, 1935 - A Brief Discussion of Gin Saw Tooth Form and Shape.

Charles A. Bennett, Cotton Ginners' Journal, February, 1936, Ribless and Multi-cylinder Gins.

Charles A. Bennett and Francis L. Gerdes, Cotton Ginners' Journal, April, 1936 - Sharpening Gin Saws for Better Efficiency and Quality Ginning.

Charles A. Bennett, Cotton Gin and Oil Mill Press, August 11, 1956 - The World's Two Types of Cotton Gins.

Charles A. Bennett, Cotton Ginners' Journal and The Cotton Gin and Oil Mill Press, 1959 - Roller Cotton Ginning Developments. 90 pp. illustrations.

D. Olmsted, Memoir of Eli Whitney, 1832

A. J. Turner, Cotton Planters' Manual, Chapter VIII, pp. 277-321, 1845.

APPENDIX

Document I. (From Prof. D. A. Tompkins)

List of Suits for Infringement and Damages Brought by Whitney in United States District Court, Savannah, Georgia.

Edward Lyons, 1795, non-suit, 1798.
Wm. Kennedy & Co., 1795, verdict for defendant.
Fred Ballard, 1798, non-suit, 1799.
McKinney & Co., 1801, dismissed, 1804.
William Clark, 1801, non-suit, 1803.
John Morrison, 1801, defendant dead.
William Byrnes, 1801, non-suit, 1803.
John Walker, 1801, non-suit, 1804.
Charles Gachet, 1801, non-suit, 1803.
Isaiah Carter, 1801, non-suit, 1803.
William Few, 1801, verdict for defendant.
John Davis, 1801, non-suit, 1803.
Samuel Devereux, 1801, not served.
Solomon Marshall, 1801, settled.
Arthur Fort, 1801, not served.
James Moore, 1801, not served.
Ignatius Few, 1801, not served.
Samuel Higginbotham, 1801, non-suit, 1803.
Jonathan Embree, 1801, non-suit, 1803.
Henry Keebler, 1801, non-suit, 1803.
D. W. Easley, 1801, non-suit, 1803.
Silus Grigg, 1801, not found.
Arthur Fort, 1801, non-suit, 1803.
Arthur Fort and John Powell, 1804, decree for perpetual injunction, Dec., 19th, 1806.
Charles Gachet, 1806, verdict for $1,500, May 11th, 1808.
Isaiah Carter, 1806, verdict for $2,000, May 10th, 1808.
William Byrnes, 1807, judgement by default, 1811.

APPENDIX

Document II. (From Prof. D. A. Tompkins)

Whitney's Spike Gin Patent.

Certified Copy of the Original Patent Specifications filed in the Patent Office by Eli Whitney, 1793-4. This paper is now on file in the United States Court House, Savannah, Georgia.

(Note: -- Corresponding clause occurs at the end of this paper).

Original Patent

A description of a new invented cotton gin, or machine for cleansing and separating cotton from its seeds.

This machine may be described under five divisions, corresponding to its five principal parts, viz: 1. Frame. 2. The Cylinder. 3. The Breastwork. 4. The Cleaner. 5. The Hopper.

1. The frame, by which the whole work is supported and kept together, ought to be made of well seasoned timber, so that it may be firm and steady, and never become loose in the joints. Scantling four inches by three, will perhaps be stuff, of as suitable size as any. The frame should be of a square or parallelogramic form, the width must answer to the length of the cylinder and the height and length may be proportioned as circumstances shall render convenient.

In the drawing annexed, Figure 1, is a section of the machine. A represents the cylinder, B the breastwork, C the cleaner and D the hopper. 1/

2. The cylinder is of wood; its form is perfectly described by its name, and its dimensions may be from six to nine inches diameter, and from two to five feet in length. This cylender - cylender is placed horizontally across the frame, in such manner as to give room for the clearer on one side of it, and the hopper on the other as in Fig. 1. Its height, if the machine is worked by hand should be about three feet four inches; otherwise it may be regulated by convenience. In the cylender is fixed an iron axis so large as to turn in the lathe without quivering. The axis may pass quite through the cylender or consist only of gudgeons, driven with cement in each end. There must be a shoulder at C, Fig. 2, on each side the bearing or box to prevent any horizontal variation in the cylinder. The bearings of the axis or those parts which rest on the boxes must be rounded in a lathe, so that the centre of the axis may coincide with the centre of the cylender. One end of the axis should extend so far without the frame as to admit the winch, by which it is turned,

1/. Figure numbers listed in Original Patent are shown in this brochure under Figure No. 85.

to be connected with it at C, and so far at the other end as to receive the whirl designed for putting the clearer in motion. The brass boxes, in which the axis of the cylender runs, consist each of two parts, C and D, Fig. 7. The lower part, D, is sunk into the wood of the frame to keep it firm and motionless and the upper part, C, is kept in its place by two small iron-iron bolts, HH, headed on the lower end at H. These bolts are inserted into the under side of the rail or scantling of the frame and continued up through both parts of the box. A portion of the bolts as H, A, should be square, to prevent them from turning. The upper part of the box, C, is screwed down close with a nut on the end of each bolt. At E, is a perforation for conveying oil to the axis. After the cylinder with its axis is fitted and rounded with exactness, the circular part of its surface is filled with teeth set in annular rows. The spaces D, E, F, G, H, Fig. 2, between the rows of teeth must be so large as to admit a cotton seed to turn around freely in them every way, and ought not to be less than seven-sixteenths of one inch.

The spaces K, L, M, N, &c, Fig. 1, between the teeth, in the same row, must be so small as not to admit a seed or a half seed. They ought not to exceed one-twelfth of an inch; and I think about one-sixteenth of an inch the best. The teeth are made and set in the following manner: Take common iron wire, about No. 12, 13, or 14, draw it about three sizes less, without nealing in order to stiffen it. Cut it into pieces four to five feet in length and straighten them. Steel wire would perhaps be best if it were not too expensive.

Then with a machine, somewhat like that used for cutting nails, cut the wire into pieces about one inch long. In the jaws of this machine at O, Fig. 10, are fixed the two pieces of steel D, D, which are pressed together, as may be observed from the figure, by the operation of a compound lever. These pieces of steel are so set in, that upon being pressed together, their approaching surfaces, meet only on one side next to D, D, leaving between them a wedge like opening, which enlarges as the distance from the place of contact increases. On the side, D, D, about one inch distant from the place of contact, is fixed a guage. The wire is inserted on the side opposite D, D, and thrust thro' to the guage. Then on forcing down the lever the wire is separated, leaving that end of the wire next the side D, D, cut smoothly and transversely off, and the end of the other part flattened like a wedge. The flattened end is then thrust forward to the guage and the same operation is repeated. In this manner the teeth are cut of equal length, with one end flattened and the other cut directly off. Flatting one end of the wire is beneficial in two ways: 1. The flatted ends of the teeth are driven into the wood with more ease and exactness. 2. It prevents them from turning-turning after they are set. To prevent the wires from bending while driving, they are holden with pliers the jaws of which ought to be about half an inch in width, with a corresponding transverse groove in each jaw. Thus holden, the teeth are, with a light hammer driven, one by one, into the cylender, perpendicularly to its axis. Then with a tool, like a chisel or common screw driver each tooth is inclined directly towards the tangent to that point of the circle, into which it is set, till

the inclination is such that the tooth and tangent from an angle of about 55 or 60 degrees. If this inclination be greater, the teeth will not take sufficient hold of the cotton, if it be less there will be more difficulty in disengaging the cotton from the teeth, after is is separated from the seeds.

When the teeth are all set they should be cut of an equal length. In order for this, take a crooked guage, Fig. 8, having two prongs, Q, R, the curvature of which corresponds with that of the cylinder. This guage is merely a crooked fork, the thickness of whose prongs or tines, as represented between S and T, Fig. 9, equalizes the length of the teeth, and is applied to the cylinder, with one tine on each side of an annular row. With a pair of cutting pliers, cut the teeth 1, 2, 3 and 6 off even with the guage, then slide it along to 6, 7, 8, &c ., and so proceed till you have trimmed all the teeth to an equal length. This done put the cylender into a lathe and with a file bring the teeth to a kind of angular point, resembling a wire flatted and cut obliquely. After the teeth are brought to a proper shape, smooth them with a polishing file and the cylender will be finished.

Remark. Though the dimensions of the cylender may be varied at pleasure, yet it is thought that those described are the best, being more easily made and kept in repair, than those of a larger size. The timber should be quarter stuff, i. e., a quarter of the trunk of the tree, otherwise it will crack in seasoning. It must also be of wood of an equal density, such as beech, maple, black birch, &c. In oak and many other kinds of wood, there are spaces between the grains which are not so hard as the grains themselves; and the teeth driven into these spaces would not stand sufficiently firm, while the grains are so hard as to prevent the teeth from being driven without bending.

3. The breastwork, Fig. 2, and B, Fig. 1 and Fig. 2, is fixed above the cylender parallel and, contiguous to the same. It has transverse grooves or openings 1, 2, 3, 4, &c., through which the rows-rows, of teeth pass as the cylender revolves: and its use is to obstruct the seeds while the cotton is carried forward through the grooves by the teeth. That side of the breastwork next the cylinder should be made of brass or iron, that it may be the more durable. Its face or surface A, X, Fig. 1, ought to make an angle with the tangent X, Z, less than 50 degrees. A tooth in passing from K up to the breastwork B, fastens itself upon a certain quantity of cotton, which is well connected with its seeds. The seeds being too large to pass through the breastwork are there stopped, while the cotton is forced thro[1] the groove and disengaged from the seeds. Now if the point of the tooth enters the groove before the root, or that part next the cylinder it carries through all which it has collected in coming from K; but if the root of the tooth enter the groove before the point, part of the cotton fastened on it, will slide off, and this latter case is preferable as it helps to give the cotton a rotary motion in the hopper. The thickness of the breastwork, or the distance from A to I, Fig. 1, should be about 2-1/2 or 3 inches, in proportion to the length of the cotton. It should be such that the cotton which is carried through by the teeth may be

disconnected from-from that which is left in the hopper, before it leaves the grooves, otherwise that which is carried partly through the breastwork will be by the motion of that with which it is connected in the hopper become so collected and knotted at I, as to obstruct and bend the teeth.**

The under part of the breastwork next the cylender, ought, as has before been observed, to be made of iron or brass. It may be cast either in a solid piece and the openings for the passage of the teeth cut with a saw and files, or in as many parts as there are spaces between the several rows of teeth in the cylender and in form of Fig. 12, and the pieces set, by means of a shank or tenon, in a groove running lengthwise along the wooden part of the breastwork.

The breastwork described, if properly constructed, will it is thought answer every valuable purpose. But I shall mention one of a different construction which I have used with success, and is made in the following manner:

Form a breastwork of the same shape and dimensions as the one before described, entirely of wood. Place a bar of wood one inch below the cylender and parallel to it, then with straps or ribs of iron, brass or tin plate connect the breastwork of-of wood with the bar below.

The ribs or straps must be so applied as to sit close to the surface of the cylender between the wooden breastworks and the bar, and if of a width that will permit them to work freely between the annular rows of teeth. That end of each strap which is fastened to the breastwork should divide widthwise into two parts, one of which should pass along the lower surface of the breastwork, and the other run up its front. In Fig. 14, B, is the wooden breastwork. D, the bar below the cylender E, E, the strap C, the place where the strap divides, and A, A, A, wood screws or nails with which the strap is made fast to the bar and breastwork.

4. The clearer C, Fig. 1, is constructed in the following manner: Take an iron axis perfectly similar to that described as extending through the cylender, except that it need not be so large nor fitted for the application of a winch. Frame together crosswise at right angles two pieces of timber of suitable size and of a length about equal to the diameter of the cylenders, so as to make the four arms equal in length, and insert the axis through the centers of two crosses or frames of this kind. Let their distance from each other be one-third of the length of the cylender and make them fast on the axis. The arms of the two crosses are then connected by four pieces, of the same length of the cylender, equi-distant from the axis, and parallel to the same, and to each other. In each of the parallel pieces, on the outside or side opposite the axis, a channel is made lengthwise for the reception of a brush. The brush is made of hog's bristles, set in a manner somewhat similar to that

** If the perforation about 3-16 of an inch be made through the breastwork at the upper part or end of each groove, the metal part need not be more than 3/8 of an inch thick.

of setting the reeds in a weaver's sleigh. Between two strips of wood about 1/8 of an inch in thickness and half an inch in breadth, is placed a small quantity of bristles; then a strong thread or twine is wound round the sticks, close to the bristles, then another quantity of bristles is inserted, etc., till a brush is formed, equal in length to the cylender.*

The bristles on the side A, A, Fig. 6, are smeared with pitch or rosin and seared down with a hot iron even with the wood, to prevent them from drawing out. On the other side they are cut with a chisel to the length of about one inch from the wood. A brush of this kind is fixed in each of the before mentioned channels.

The boxes as well as axis of the clearer, are like those of the cylender, parallel to it and at such a distance, that while it revolves the ends of the bristles strike with a small degree of friction on the cylender's surface. Its use is to brush the cotton from the teeth after it is forced through the grooves and separates from its seeds. It turns in a direction contrary from that of the cylender, and should so far outrun it, as completely to sweep its whole surface.*

A clearer with two brushes may be made by simply screwing upon the axis the board K, Fig. 4, and another similar board on the opposite side, which leave spaces for the insertion of the brushes, S, S. The clearer may be also formed of a cylender with grooves running lengthwise in it for the reception of the brushes; or in any other way, which may be found convenient.

The number of brushes in the clearer is not material; but let it be observed that the distance from E to E, Fig. 1, between the brushes, must be at least 4 or 5 inches, otherwise the cotton will wind up 'round the clearer. The surface of the clearer moving much faster than that of the cylender, the brushes sweep off the cotton - cotton from the teeth. The air put in motion by the clearer, and the centrifugal force of the cotton disengage it from the brushes. Note. It is best to set the brushes in the grooves in such a manner, that the bristles will make an angle of about 20 or 25 degrees, with the diameter of the clearer, in the direction of E, O, Fig. 1. By that means the bristles fall more perpendicularly on the teeth, strike them more forcibly, and clear off the cotton more effectually.

The clearer is put in motion by the cylender, by means of a band and whirls. These whirls are plain wheels of solid wood, about 2-1/2 or 3 inches thick, their periphery is a spherical surface swelling at the centre, and sloping off at the edges. To give them a proper shape, take a perfect globe of the same

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* (Perhaps nailing these straps together would be better than winding them with twine.)

* (The brushes may be fixed in a stock which is movable by screws so as to bring them nearer or carry them farther from the cylender.)

diameter as your intended whirl; inscribe upon it a circle dividing it into two equal parts; then cut the globe on each side, parallel to the plane of the circle, and at the distance from it, of half the thickness of your whirl. On these whirls runs a leather band, the breadth of which answers to the thickness of the whirls. The band may be broader or narrower and the whirls thicker or thinner in proportion as the resistance to be overcome is greater or less. The reason for giving - giving the whirls this shape is to secure them the better from being unbanded. A band of this kind always inclines to the highest place on the whirl, and much less liable to be cast off from the work when it runs on a special surface, than when it runs in a groove in the periphery of the whirl.

The whirls are four in number and must be so arranged as to make their central planes coincident. The whirl E, Fig. 3, is fixed upon the end of the axis of the cylender without the frame, and the button A, Fig. 5, is screwed on with the screw driver, B, to keep the whirl in its place. L is put upon the axis of the clearer in the same manner. P, Q, whose axes are pivots made fast in the frame, are false whirls added for two purposes. 1. To make the clearer turn in a contrary direction from the cylender. 2. For the purpose of doubling the band more completely round the small whirl L, so as to bring a greater portion of the whirl's surface into contact with the band, increase the friction and consequently turn the whirl more forcibly. The first of these purposes might be accomplished by the addition of one false whirl, but the second not so fully without two. The dotted line W, V, represents the band. The diameters of the whirls E, L, should be so-so proportioned as to produce a proper degree of velocity in the clearer. The axis of the whirl Q, is fixed in a plate of iron, which is movable in a groove in the side of the frame and the band is made tighter or looser by moving the plate. This arrangement of whirls produces the same movement as a cog wheel and pinion, with much less friction and expense, and without the rattling noise, which is always caused by the quick motion of cog wheels.

5. One side of the hopper is formed by the breastwork, the two ends by the frame, and the other side is movable so that, as the quantity of cotton put in at one time decreases, it may slide up nearer the cylinder, and make the hopper narrower. This is necessary in order to give the seeds a rotary motion in the hopper, by bringing them repeatedly up to the cylinder till they are entirely stripped of the cotton. D, Fig. 1, is a section of the movable part of the hopper. The part from H to I should be concave on the side next the breastwork, or rather it should be a portion of a hollow cylinder. Between H and Y, is a crate of wire through which the sand, and the seeds as soon as they are thoroughly cleansed, fall into a receptacle below. The crate may be either fixed in the-the frame or connected with the movable part of the hopper. The wires of which the crate is made should be large and placed perpendicular to the cylender, that the cotton may turn the more easily in the hopper.

A few additional remarks will sufficiently show the construction, use and

operation of this machine. The cotton is put in the hopper, I, D, H, K, A, U, S, Fig. 1, in as large a quantity as the cylinder will put in motion. Some of the seeds become stripped sooner than others. If it be black seed cotton, the seeds become smooth, will most of them fall through the crate as soon as they are clean, but a considerable part of the green seeds which they are thus denominated from being covered with a kind of green coat, resembling velvet will continue in the hopper. It will not answer therefore to supply it gradually as the quantity in it diminishes, because the seeds will soon grow cumbrous and by their constant intervention prevent the teeth from attaching themselves to the cotton so fast as they otherwise would, but one hopper full must be finished, the movable part drawn back, the hopper cleared of seeds and then supplied with cotton anew.

There is a partition Y, W, under the cylender on the left-left hand of which or the side beneath the hopper, the seeds fall, and the clean cotton on the other side. There may be a receptacle for the clean cotton in the frame, but it is best to have an opening through the wall or partition into a contiguary room, then place the end of the machine against this opening and let the cotton fly into a close room; or it may fall through an opening in the floor to a room below.

This machine may be turned by horses or water with the greatest ease. It requires no other attendance, than putting the cotton into the hopper with a basket or fork, narrowing the hopper when necessary and letting out the seeds after they are clean. One of its peculiar excellencies is, that it cleanses the kind called green seed cotton almost as fast as the black seed. If the machinery is moved by water it is thought it will diminish the usual labor of cleaning the green seed cotton at least forty-nine fiftieths.

The foregoing is a description of the machine for cleansing cotton alluded to in a petition of the subscriber, dated Philadelphia, June 20th, 1793, and lodged in the office of the Secretary of State, all alleging that he, the subscriber, is the inventor of said machine, and signifying his desire of obtaining an exclusive property in the same. ELI WHITNEY

Signed in the presence of
CHAUNCEY GOODRICH
Counsellor at Law, Hartford.

JOHN ALLEN
Counsellor at Law, Litchfield.

State of Connecticut, ss. City of New Haven.

I, Elizur Goodrich, Esq., Alderman for said City, and Notary Public, by lawful authority admitted and sworn, residing in said City, and by law authorized to administer oaths, do hereby certify, declare and make known to whom it doth or may concern: That at said City on the twenty-eighth day of

October, one thousand, seven hundred and ninety-three, Eli Whitney, of the county of Worcester, in the commonwealth of Massachusetts, now residing in said City, personally appeared before me, the said Alderman and Notary, and made solemn oath, that he does verily believe that he the said Whitney, is the true inventor and discoverer of the machine for ginning cotton, a description whereof is hereto annexed by-by me, the said Alderman and Notary, by my seal Notarial, and that he, the said Whitney, verily believes that a machine of similar construction hath never before been known or used.

In testimony whereof, I, the said Alderman and Notary, have hereunto set my hand and seal at the city aforesaid on the day above said.

(L. S.) ELIZUR GOODRICH
Alderman and Notary Public

UNITED STATES OF AMERICA

To all to whom these Letters Patent shall come:

Whereas, Eli Whitney, a citizen of the State of Massachusetts, in the United States hath alleged that he has invented a new and useful improvement in the mode of ginning cotton, which improvement has not been known or used before his application, has made oath, that he does verily believe that he is the true inventor or discoverer of the said improvement has paid into the Treasury of the United States, the sum of thirty dollars, delivered a receipt for the same and presented a petition to the Secretary of State, signifying a desire of obtaining an exclusive property in the said improvement, and praying that a patent may be granted for that purpose: These are therefore, to grant according to law, to the said Eli Whitney, his heirs, administrators or assigns, for the term of fourteen years, from the sixth day of November last, the full and exclusive right and liberty of making, constructing, using and vending to others to be used the said improvement, a description whereof is given in the words of the said Eli Whitney, himself, in the schedule-schedule hereto annexed and is made a part of these presents.

In testimony whereof, I have caused the letters to be made patent and the Seal of the United States to be hereunto affixed.

Given under my hand at the city of Philadelphia, this fourteenth day of March, in the year of our Lord, one thousand, seven hundred and ninety-four, and of the Independence of the United States of America, the eighteenth.

(L. S.) GEO. WASHINGTON

By the President.

EDM. RANDOLPH

City of Philadelphia, to-wit:

I do hereby certify that the foregoing Letters Patent were delivered to me on the fourteenth day of March, in the year of our Lord, one thousand, seven hundred and ninety-four, to be examined. That I have examined the same, and find them conformable to law. And I do hereby return the same to the Secretary of State, within fifteen days from the date aforesaid, towit: On this same fourteenth day of March, in the year aforesaid.

WM. BRADFORD
Attorney General, United States

The schedule referred to in these Letters Patent and making part of the same containing a description in the words of the said Eli Whitney himself of an improvement in the mode of ginning cotton.

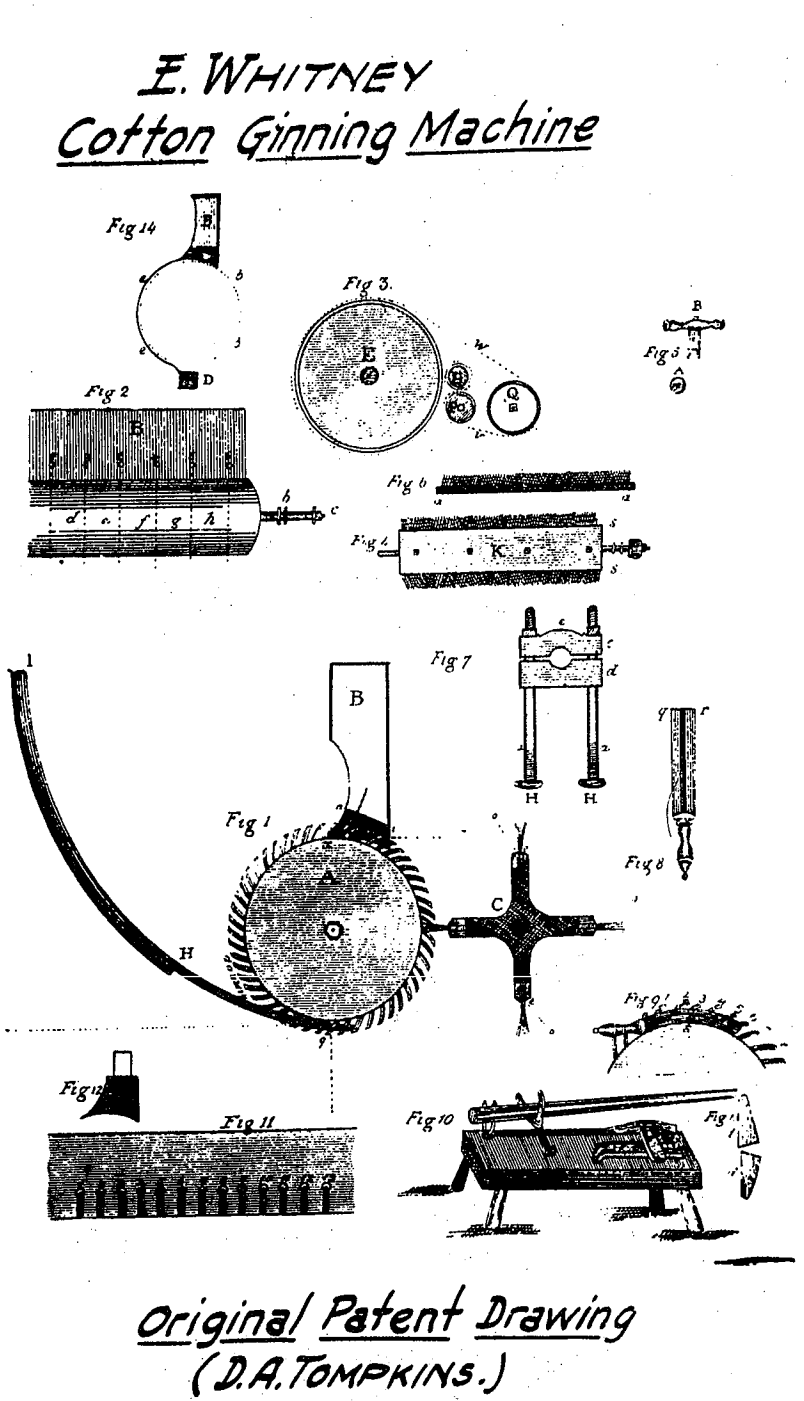

Figure 85.

Copy of the Original Eli Whitney Cotton Ginning Machine Patent Drawing, filed in the Federal Court at Savannah, Ga. (From Prof. D.A. Tompkins.) Note that it shows the overhead grid or ribs; the spiked cylinder and front wire breast, and clearer brush with 4 sticks of bristles.

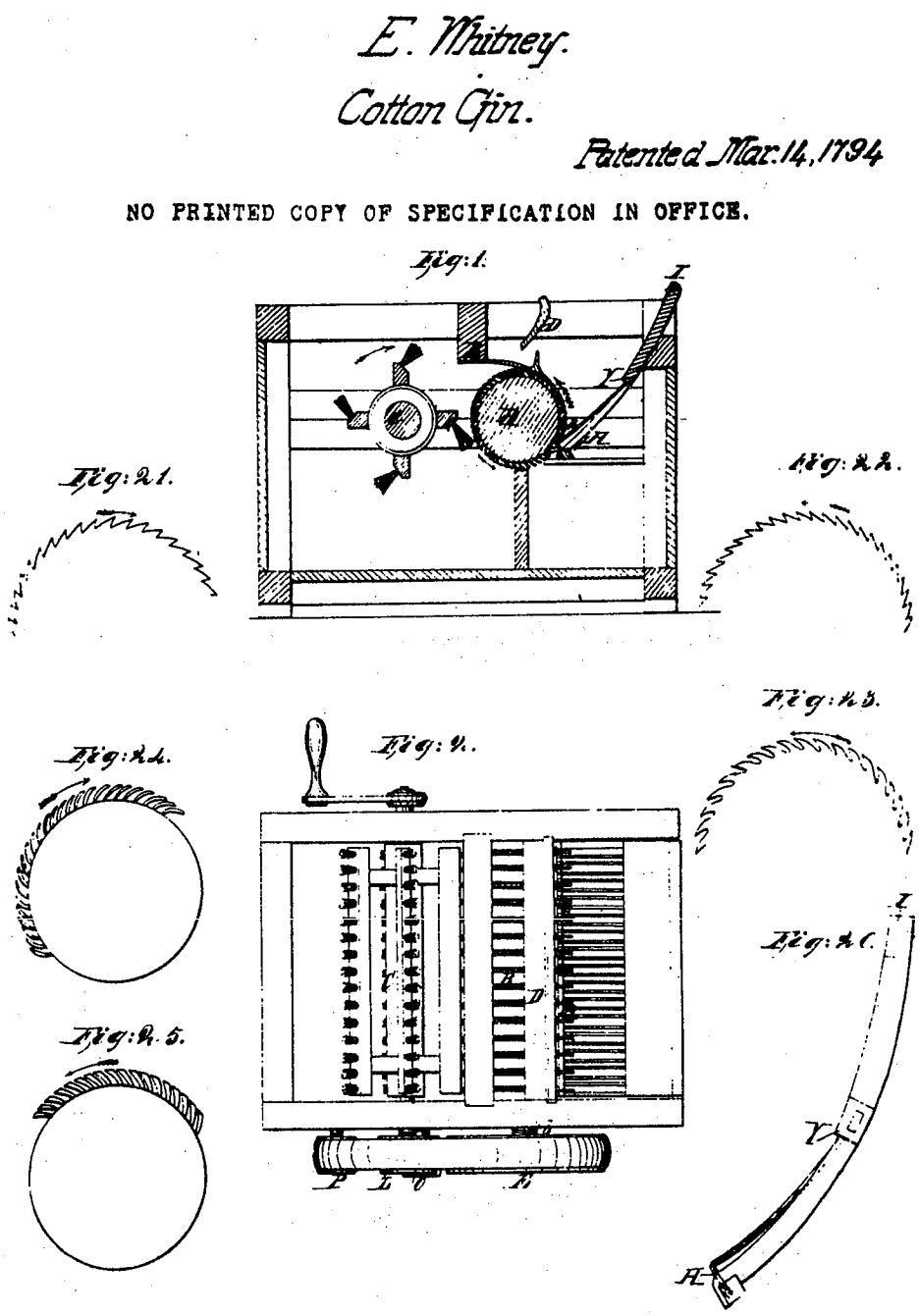

Figure 86.

Copy of the U. S. Patent Office restored (about 1840) drawing of E. Whitney Cotton Gin, being Sheet 1 of 2 sheets. No printed copy of the specification in the office because of the fire, Dec. 15, 1836. This drawing does not tally with the one filed in Savannah, Ga., and it bears proof that it does not faithfully reproduce the original features of Whitney's invention. First, the crank is put on the brush shaft in this drawing. It is impossible for any man to crank this brush at 5 to 7 times as fast as the gin saw runs; and second, this drawing shows some saws which Whitney did not use at the time of his original patent application.

APPENDIX

Document 3.

East Texas Old Gin, 1874.

By Alfred M. Pendleton and Edward H. Bush
Respectively, Extention Cotton Ginning Specialist, U.S.D.A.,
and Executive Vice-President, Texas Cotton Ginners' Association.

NOTE: This is a partial reprint of articles by Messrs. Pendleton and Bush that appeared in the March 27, 1954 Cotton Gin and Oil Mill Press, and in the ACCO Press of January, 1955.

There is an unusual gin located on the Goodman farm six miles out of Tyler, Texas, on the highway to Van. Equally unusual is the part-owner and caretaker, Mrs. Sallie Goodman Callaway of Tyler, who has protected the gin and kept it almost intact for the last half century.

The entire equipment in this 80-year-old gin consisted of one gin stand with 48 10-inch diameter saws, a wooden two-story screw press, and the necessary transmission equipment -- all powered by mules. The frame building, which housed all the equipment, including the press, is 64 feet long, 34 feet wide and of two-story construction. Except for the loss of the cotton receiving platform and the addition of a new metal roof, the building stands little changed from the time of its construction. Even the 11-inch square timbers, which were cut in the woods nearby and squared with axes, are in good condition. The longest of these timbers is more than 30 feet, and it still serves as a beam to support the second floor.

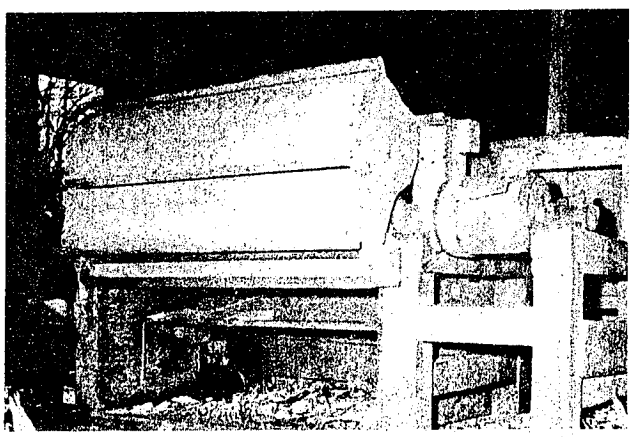

Figure 87.

Close up view of the 48 saw gin stand showing breast in ginning position.

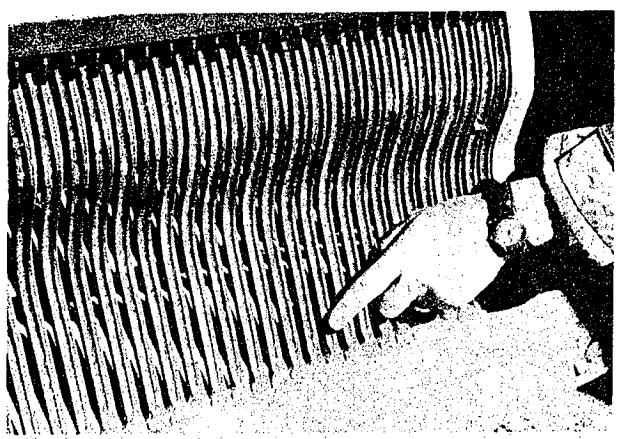

Figure 88.

Rib assembly from the 48 saw gin. The lower section of the rib has shoulder projecting to the left side only.

The gin stand bears no mark of identification. It has 48 10-inch saws and a 14-inch diameter brush. It is of simplest design with ginning ribs only. The breast dimensions are 38-1/2 inches inside and 41 inches outside. By means of detailed information not necessary to this article, it is hoped that identification of the manufacturer may be established.

Figure 89.

Closeup of gin stand showing the arrangement of saws and brush.

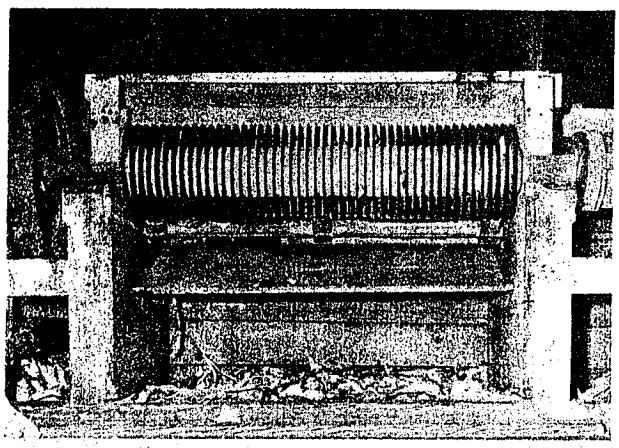

Figure 90.

Power for the vertical 89-inch pulley. extended into the second floor of the gin house.

The power for the gin stand originated in two teams of mules driven in a 24-foot circle. They were hooked up to two 12-foot tongues which were attached to the base of a 122-inch horizontal drive pulley, sometimes called a bull wheel. This pulley operated on a horizontal plane 56 inches off of the ground. Transfer of power to an 89-inch vertical pulley, along with increased pulley speed, was obtained by use of a cog track around the circumference of the horizontal pulley driving a 13-inch beveled gear loacted on the same shaft with the 89-inch vertical pulley.

APPENDIX

Document 4.

Reference List of Patents Additional to those given in Table IV.

Patent No.	Year	Name	Description
	1805	J. McBride	Cotton Gin and Spinner
	1834	Alex Jones	Duplex Cotton Gin
	1837	J. Perkins	Adjustable Seedboard
2,133	1841	A. Washburn	Repairable ribs
3,521	1844	Eleazer Carver	See text
10,406	1854	B. D. Gullett	See text
13,441	1855	J. Simpson	See text
16,096	1856	C. A. McPhetridge	Cotton Gin
20,120	1858	Wilson & Payne	See text
21,714	1858	A. Q. Withers	See text
26,516	1859	D. G. Olmsted	See text
32,116	1861	Israel F. Brown	See text
249,913	1881	W. B. Ellis	See text
343,380	1886	Lummus	Cotton Gin
348,900	1886	Gardner	See text
306,035	1884	Smith & Adams	See text
379,760	1888	Brott	See text
410,082	1889	Ellis	D. R. Huller Gin
510,269	1893	King	See text
541,868	1895	Maxwell	Saw cylinder, saws and blank discs
552,382	1895	Lumpkin & Ogden	Airblast Gin
568,610	1896	Graver	Cotton Gin
590,682	1897	Heffner	Cotton Gin
632,685	1899	Thomas	Lint cleaning, brush gin
644,155	1900	Thomas	Lint cleaner gin
660,960	1900	Jenkins	Metal brush for cotton gin
700,347	1902	Lumpkin	Cotton Gin
718,636	1903	King	Cotton Gin
735,455	1903	Brandon	Cotton Gin
897,883	1908	Dickinson	Cotton Gin
1,003,053	1911	Phelps	See text
1,022,259	1912	Phelps	See text
1,031,701	1912	Fordyce	Suction doffing gin
1,031,702	1912	Fordyce	Cotton gin
1,031,703	1912	Fordyce	Revolving ribs gin
1,039,111	1914	Fordyce	Cotton gin
1,105.026	1912	Fordyce & Keef	Double picker-roll gin.
1,086,204	1914	Murray	Cotton Gin
1,118,412	1914	Graves	Spiralled saws and ribs
1,136,969	1915	Moore	Cotton Gin
1,168,493	1916	Ginn	Cotton Gin

Patent No.	Year	Name	Description
1,175,664	1916	Shute	Cotton Gin
1,265,470	1918	Mardsen	Cotton Gin
1,448,022	1923	Wood	Cotton Gin
1,480,054	1924	Evans	Duplex Airblast gin
1,520,412	1924	Garner	Cotton Gin
1,565,626	1925	Doremus	Revolving Rib Gin
1,576,111	1926	Doremus	Revolving Rib Gin
1,709,021	1929	Jenkins	Special Brush
1,717,324	1929	Hancock	Airblast gin
1,717,268	1929	Pressley	Revolving Rib Gin
1,751,307	1930	Cumpston	4 cyl. ribless gin
1,775,111	1930	Wallace	Cotton Gin
1,795,794	1931	Owen	Vibrating breast section & revolving ribs
1,827,183	1931	Bennett	Conditioning in gin
1,862,884	1932	Collier	Spiral saws
1,986,901	1935	Starke	Cotton
2,022,564	1935	Henry	Vertical gin
2,036,067	1936	Mitchell	Cotton Gin
2,090,742	1937	Alley & Alley	Revolving Rib Gin
2,174,143	1939	Streun	Airblast gin
2,188,826	1940	Wallace	Airblast gin
2,219,402	1940	Sanders	Cotton Gin
2,250,431	1941	Wallace	Fire dump gin
2,655,695	1953	Ford	Breast lift
2,658,239	1953	Day	Airblast gin
2,731,675	1956	Wallace	Pneumatic moting
2,733,481	1956	Vandergriff	Multi-nozzle gin

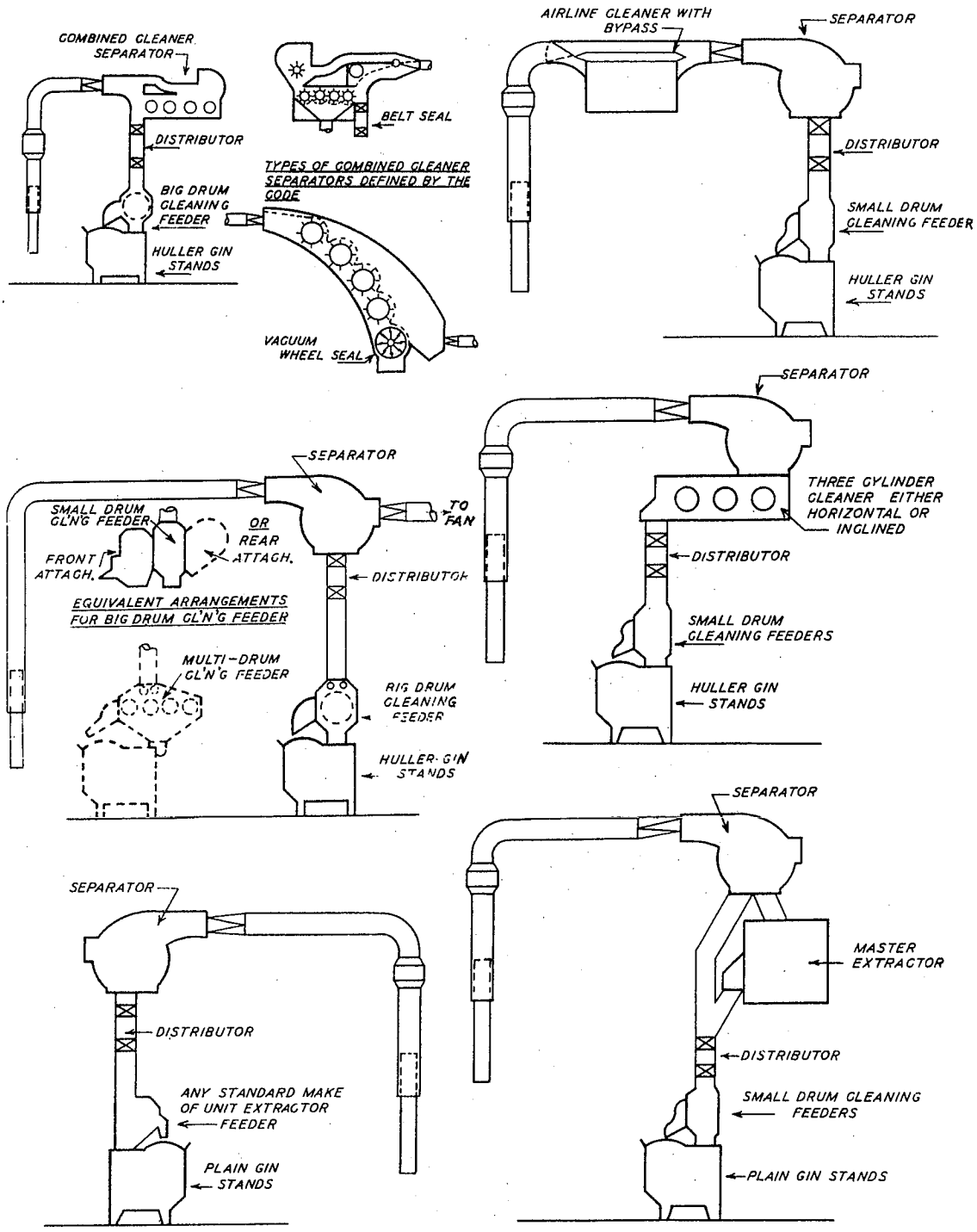

Figure 91.

Typical cotton ginning systems (condensor and press not shown) extant 1930-1931 at establishment of the U.S.D.A. Cotton Ginning and Fiber Laboratories, Stoneville, Miss. These diagrams were NRA Code figures, depicted in the Farmers' Bulletin, Cotton Ginning, No. 1748, of 1935.

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