Cotton Ginning Systems In The United States and Auxiliary Developments

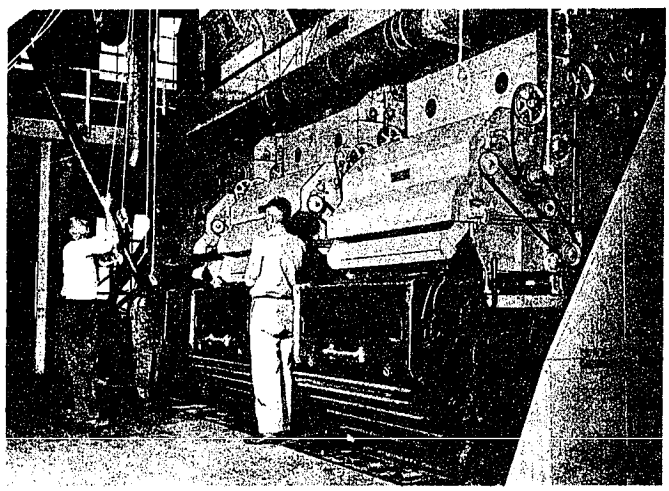


Photo of starting a research test at the USDA Laboratory, Stoneville, Mississippi

by

Charles A. Bennett, Collaborator,
Agricultural Engineering Research Division
Agricultural Research Service
United States Department of Agriculture

Sponsored by

The Cotton Ginners' Journal
and
The Cotton Gin and Oil Mill Press
Dallas, Texas

1962

Table of Contents

Preface.....iv

Acknowledgements..... v

Chronological Developments vs. Process Sequence of Cotton Ginning.....vi

CHAPTER I

Packaging Ginned Lint:..... 1

1795-1840
1841-1884
1885-1961

Miscellaneous Items; Filling the Press Boxes; Summary of Cotton Pressing Developments; Selected References.

CHAPTER II

Multiple Stand Ginning Systems and Gin Yard Facility Developments.....19

Multiple Stands; Gin Yard Facility Improvements; Selected References; U. S. Patents.

CHAPTER III

Feeders Between Distributors and Gin Stand.....31

Selected References; Partial List of Significant U. S. Patents issued on Cotton Gin Feeders, 1826-1929.

CHAPTER IV

Bulk Cleaning, Extracting, Drying, and Conditioning and Moisture Measuring..45

Bulk Cleaning, Extracting, Drying and Conditioning, Moisture Measuring, Selected References, U.S.D.A. Publications, Selected Reference List of U. S. Patents on Cottonseed Cleaners.

CHAPTER V

Lint Cleaning, Sampling, Weighing, and Input Control 72

Lint Cleaning, Automatic Samplers for Ginned Lint, Weighing Lint Weight, Weighing Seed Weight, Input Controls, Selected References on Lint Cleaning and Cotton Samplers, List of Early U. S. Patents which Include Ideas on Lint Cleaning.

U. S. Patents Cited Against Inventors After 1938, List of Recent U. S. Patents on Lint Cleaners.

CHAPTER VI

Power and Miscellaneous Improvements.....86

Power, Miscellaneous Improvements -- New Cleaners, Driers, New Conveyors, Condenser Lint Cleaners, New Cycle Cotton Gins, 1959-61; Mote Cleaner and Press; Spray Oils and Anti-Choke Agents; Special Seedcotton Storage Devices; Utility Gin Yard Unloaders; Cotton Gin Separators; Cotton Gin Tramper Improvements; Seed Treatments; Cocklebur Remover; Boll and Rock Traps and Magnets.

Summary and Conclusions 101

PREFACE

Through the generous sponsorship of the Texas Cotton Ginners' Association and the Cotton Gin and Oil Mill Press of Dallas, Texas, brochures were prepared in 1959 and 1960 to outline the major developments in roller and toothed or saw types cotton gin stands. These two brochures, Roller Cotton Ginning Developments, and Saw and Toothed Cotton Ginning Developments, gave brief histories of the developments of the ginning unit only, which in this publication is referred to as the gin stand.

Worldwide adoption of the two kinds of gin stands has followed the growth from primitive ginneries to the present costly industrial establishments.

This brochure gives a brief history of the more important auxiliary and related developments that evolved around the actual ginning units. The different inventions and the development of the auxiliaries and processes in modern cotton gins did not occur chronologically in the same order as they are now used. For example, packaging or baling is the last process in modern ginning. However, the developments of methods of baling began immediately after the invention of the toothed gin stands. Furthermore, the first stage in ultramodern gins in 1961 is the feed control for incoming seedcotton -- a process that was developed after 1950.

Ginning cycles appear to have covered periods of approximately 82 years for major developments. The first 82 years were from the time of Whitney's and Holmes' saws in 1796, to the steam packer and the beginning of the "system" era in 1878. The second cyle of 82 years, in which many great changes occurred, was from 1878 to 1960. We are today on the threshold of a new cycle which portends a new sequence of events.

As nearly as possible, each auxiliary or related development will be discussed in chronological order, although several may have developed concurrently. It has been difficult to compress the discussion of a large number of important developments into a small printed space, and some developments may have been omitted unintentionally. The writer hopes, however, that the attempt to present a useful and interesting picture of ginning system developments in the United States may be worthwhile for reference and for educational purposes.

Names, brands, and manufacturers mentioned in this publication do not imply recommendations over those not mentioned. They are included for reference and for historical interest only.

November 14, 1961

Charles Abel Bennett

Acknowledgements

I am extremely grateful to my many friends among the cotton ginners, fellow workers, editors, publishers, agencies, and organizations for thier assistance in making possible the preparation of this material.

I am especially obligated to Edward H. Bush, Jack Rohr, Tony Price, and the staff of the Texas Cotton Ginners' Association; to Richard Haughton, Sr., Dick Haughton, Jr., and the staff of the Cotton Gin and Oil Mill Press; and to fellow workers in the U.S. Department of Agriculture, among whom are Wilbur M. Hurst, William Mercer Bruce, Eugene McKibben, E. M. Dieffenbach, Vernon Moore, Charles Scott Shaw, Edsell Harrel, Jacob Shephard, Clyde Griffin, Victor Stedronsky, Clarence Leonard, Dave Alberson, Warren Garner, James Williams, Jr., John V. Lee, George Emil Gaus, R. W. Webb, Marion Whitten, Arthur W. Palmer, Samuel P. Lyle, Otis Weaver, J. C. Oglesbee, Jr., and Alfred M. Pendleton.

I wish also to thank my many friends in the ginning machinery industyr for their cooperation with the cotton ginning research laboratories.

CHRONOLOGICAL DEVELOPMENTS vs. PROCESS SEQUENCE OF COTTON GINNING

The two colums below will aid the reader in comparing the chapter subjects of this brochure with the present-day cotton ginning process sequences. The left-hand column is chronological and is the basis of chapter subjects; the right-hand column lists cotton ginning process sequences.

Chronological Developments	Process Sequence of Cotton Ginning Operations as of 1961.
Early Ginning Practices The primitive gins. Packaging for market. Presses and ties.	Gin Yard Preparation Storage; pre-ginning; drying; handling; cleaning, etc.
Seedcotton Delivery and Ginned Lint Handling Multistand ginning systems. Separators, distributors, lint flues, condensers.	First Ginning Stages With optional feed control. Seedcotton drying; cleaning and extracting, bulk.
Gin Stand Feeders and Cleaners at Gin Stands From handfeeding to feeder-extractor-cleaners.	Distribution to Regulated Streams for Stands Distributors to cleaner-extractor-feeders, with drying or humidification.
Bulk Pre-Ginning, Cleaning and Extracting before Distribution	Ginning per se, Actual Separation of Fiber From Seed in the Gin Stands
Drying or Humidifying Seedcotton, and Ginned Lint	Disposals of Products Foreign matter. Ginned cottonseed. Ginned and cleaned fiber.
Lint Cleaning, Bulk Feeding Controls, Sampling and Other Modern Improvements	Preparing Lint for Market Lint cleaning and condensing; delivery to press. Packing or tramping. Pressing and baling.
Miscellaneous Other Items Power applications, safety precautions, gages, weighing, etc.	

CHAPTER I

PACKAGING GINNED LINT
1795 to 1840

The production of the Upland varieties of seedcotton increased with the advent of 1792 of the Whitney and Holmes toothed gin stands (2) (3). 1/

The first major problem thereafter was the satisfactory packaging of the freshly ginned lint for the market. Until 1810, virtually all Sea Island and Upland cottons were packed in bags that varied from 125 to 350 pounds in weight. The ginneries then in existence usually had only one toothed roller gin stand.

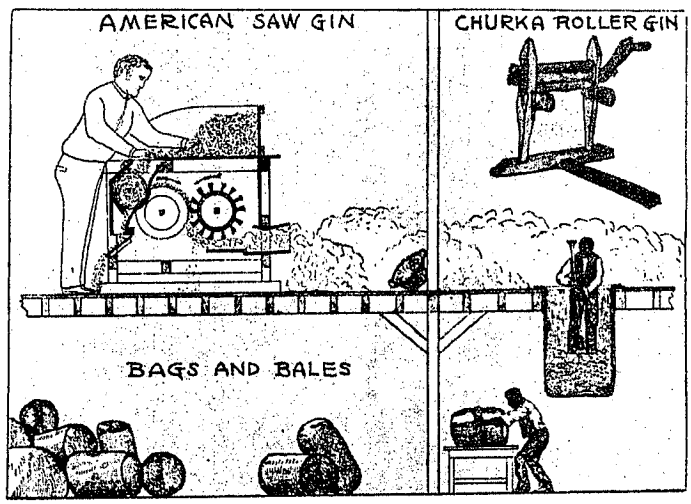


Figure 1.

Diagram (not to scale) of single-stand, plantation cotton gin of 1810, with packaging. Saw and roller gins are illustrated.

These early ginneries appear to have used single-story buildings that frequently had basements, as shown in Figure 1. Frames with hooks to hold the packaging sacks were constructed around holes in the floor that varied from 36 to 42 inches sq. The freshly ginned lint from the nearby stand was tramped down by the workers' feet and also by wooden pestles. It was then "tied out" in the long sacks or rolls as shown in Figure 1.

Early in the 19th century, larger plantations erected 2- or 3-story gin buildings to provide storage for seedcotton overhead or at gin level, and ground floor room for animal power sweeps.

Wooden and iron screw cotton presses apparently were tried out by 1799. Turner (9) cited an article from Pike County, Ga., dated 1856 and signed by "Antiquary", indicating that Ned Lyons, Jesse Bull, and Charles Lin had operated the first public saw gin with great success in 1795. (This appears to be where Whitney brought suit that year, and dropped it in 1798.) Antiquary also said that Bull and Lyons later went to Philadelphia to obtain iron screws for their presses; and that Lyons later built a cotton gin in Wilkes County, Ga., that had an iron screw press. However, Antiquary added that, while iron screws might be more durable, the age of iron screws had passed and nothing would bring them back.

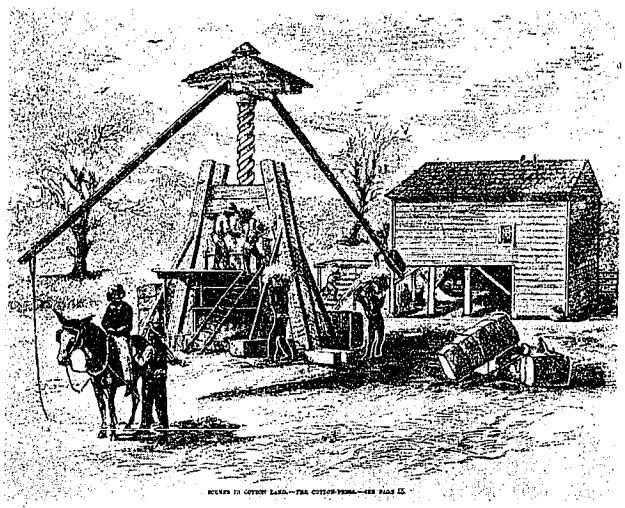
1/ Underscored numbers in parenthesis refer to selected references at the end of each chapter.

Watkins (10) reported that a Sir William Dunbar introduced the first cotton screw press in North America in 1801; and that it was cast by John Ross in Philadelphia at a cost of $1,000. Dunbar was not successful in getting his press used at cotton gins, and Watkins added that an attempt was made to use it for pressing oil from cottonseed. Antiquary and Watkins agreed generally about dates, but we have no information about Dunbar's success as a seed crusher.

After 1810 wooden screw presses gained favor and were used extensively. Some were still operable in 1903. These presses were usually placed outdoors and were often provided with small sheltering roofs. A cotton gin and a press of that era are shown as Figure 2.

Figure 2.

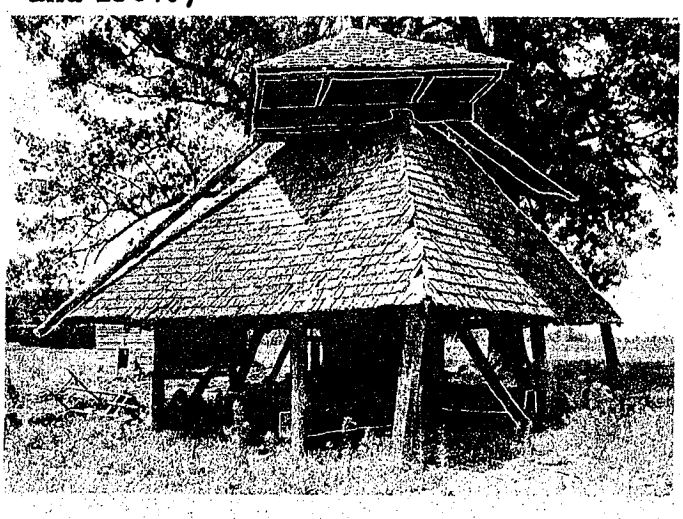
Old cotton gin and outdoor wooden screw press. (Courtesy, Library of Congress, HABS.)

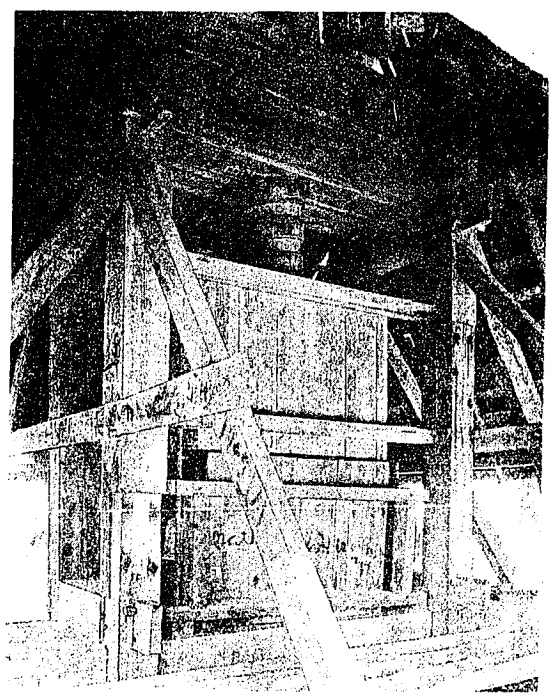


A few of the old gins employed a pit beneath the press, where the bale was tied out; but other early gins with outdoor presses did not use a pit and tied out at ground level, as was done in the press shown in Figures 2, 3, and 4.

Figures 3 & 4.

Early cotton bale press without pit --- exterior and interior views. (Courtesy, Library of Congress (HABS, File 6013 and 2367.)





From 1810 to 1840 the cotton trade slowly adopted rectangular bales for Upland cotton, but the Sea Island varieties continued to be packaged in bags at the roller gins. However, the presses were moving into the gin houses. The old 3-story gin at Blakely Plantation, north of Vicksburg, Miss., had one press in 1840. The designs of the presses were changing around that time from horizontals to verticals. By 1840 the bale weights had also increased to approximately 450 pounds.

In that same year, an interesting horizontal type of press was tried out. It comprised of a long horizontal arm or cotton box plunger and a tee head on the outer end of the ram with twin chains to wind around a vertical spindle, which as turned by animal-drawn sweeps. As the chains wound up, the ram was pulled in to the box and compressed the cotton to a bale of the desired density. What that density was is not known.

Iron strap bale ties had been tried out by 1840.

1841 to 1884

In 1841 U. S. Patent No. 2222 was issued to J. Haupt on a hydraulic press. In 1844 J. E. Carver and W. F. Pratt produced the first round-bale press of which we have record. This press produced densities of 22 pounds per cubic foot. 2/

In 1845 Tyler produced a hyrdaulic compress. In 1847 a patent was issued to J. L. Mead for another round-bale press.

In 1862 a British patent on a triple-ram gin press was issued to Patricroft. In 1876 J. T. Burris made a special duplex hydraulic ram for a cotton press in which one ram was nested inside the other to provide intensified action during the final few inches of the stroke. This method was practicable, as verified by the U.S. Cotton Ginning Research Laboratory, Stoneville, Miss., by some of its earlier pressing studies.

So far as is known, the first up-pressing, single-box, steam press appeared in use about 1870. The old wooden screw presses were down-pressing, and Newelton's screw press of iron (1840) is the first up-pressing, screw press this writer has found on record, 3/ At that time, the cotton boxes were tramped down by foot or by pestle.

The 1874 Morse single-box steam compress (Figure 5.) maderectangular bales of 22 pounds density.

2/ All densities hereinafter referred to are in pounds per cubic foot.

3/ A specimen of this iron screw press is on display at Stoneville, Miss., through the courtesy of the Blakely Plantation.

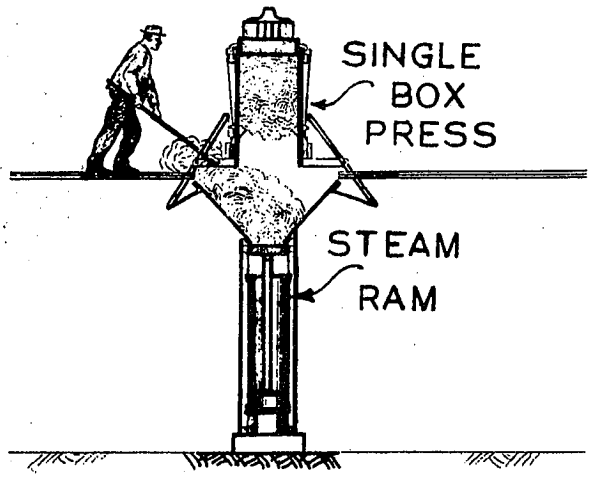


Figure 5.

The 1874 Morse steam compress.

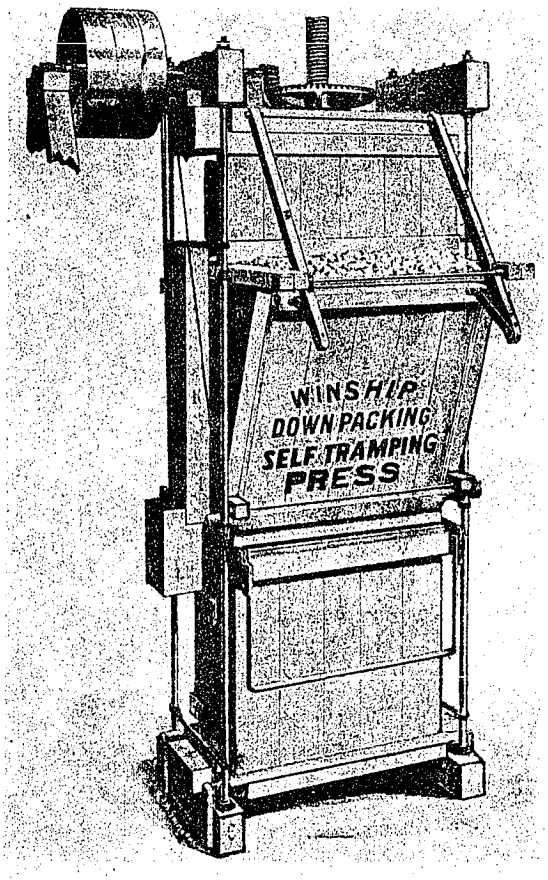
In 1881, at the Atlanta, Ga., International Exposition, a number of cotton ginning devices and accessories were displayed. Thanks are due to the late A. A. Wood, of Atlanta, for the printed report (6) of those exhibits.

Among these devices displayed was a prize-winning horizontal cotton gin press invented by P. F. Dederick of Albany, N. Y. (6). The Dederick press made small bales, 18 inches by 18 inches, that weighed about 120 pounds. These were tied out with baling wire and then slipped into gunny sacks. In special tests, the Dederick produced bales that weighed 280 pounds and had densities as high as 83 pounds. Although the Dederick bales were easily handled and transported, they were not adopted by the trade, which believed 500-pound gross weight bales were the most desirable.

Several types of single-box cotton gin presses were in use up to 1884, before the double-box press appeared. They continued in use many years thereafter. Two are shown in figures 6 and 7.

Figure 6.

Down-pressing, single-box, single-screw, iron frame press. (From an old Winship catalog).



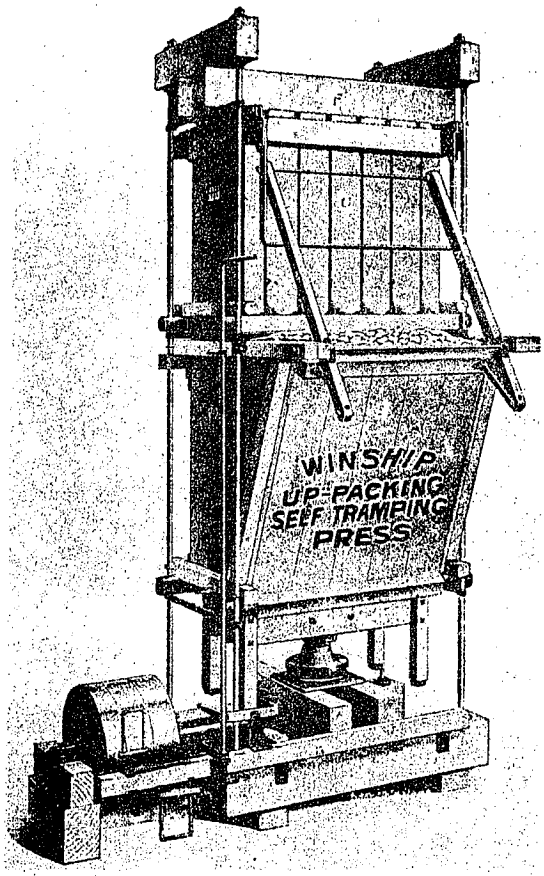
Double-screw single-box presses of the same general type as shown here were also used at that time.

The principal difference between the up-pressing and down-pressing units was that they tied out at different floor levels, although both were filled from the ginning floor level.

After 1854, when the use of steam power at cotton gins became prevalent, animal power was seldom used. During the War Between the States, 1860-65, many gins used steam engines; and the presses were moved into the ginning buildings.

Figure 7.

Up-pressing, single-box, single-screw, press. (From an old Winship catalog.)



Some presses retained the iron and steel screws; others began to employ steam plungers, and by 1878 these were being used above the cotton boxes for mechanical tramping and packing. These presses, in turn, required an operator to rake the ginned lint from the lint slide into the box and then to manually operate the steam piston tramper by means of a rod-controlled valve. (See Figure 8.)

The general development of the American cotton bales is shown on the next page in Figures 10 and 11. In both views, the upper left hand bale is the American "flat" gin bale.

Figure 8.

Munger double-box press with steam tramper and iron screw. (U. S. Patent No. 308,789, Dec. 2, 1884.)

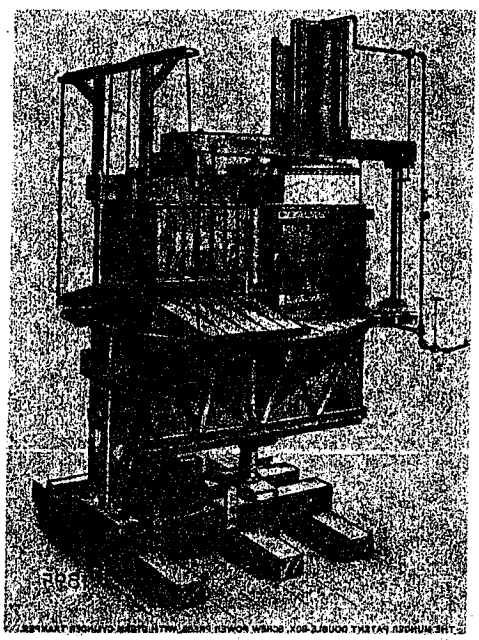


Figure 9.

1878 steam tramper operating on a 1884 double-box press. (From Continental Gin Co.)

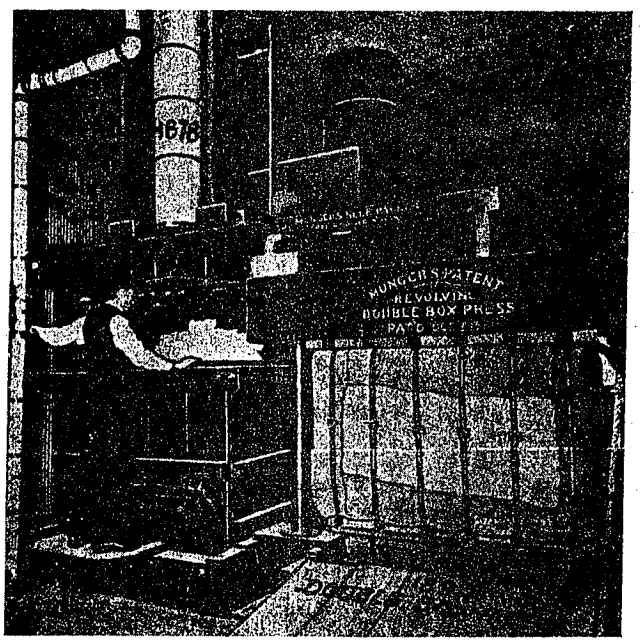


Figure 10.

Cotton bales of various types from 1810 to 1961.

Small presses of the single-box, rope winch type were used on plantations in some areas where the annual production was low. (Figure 12 below).

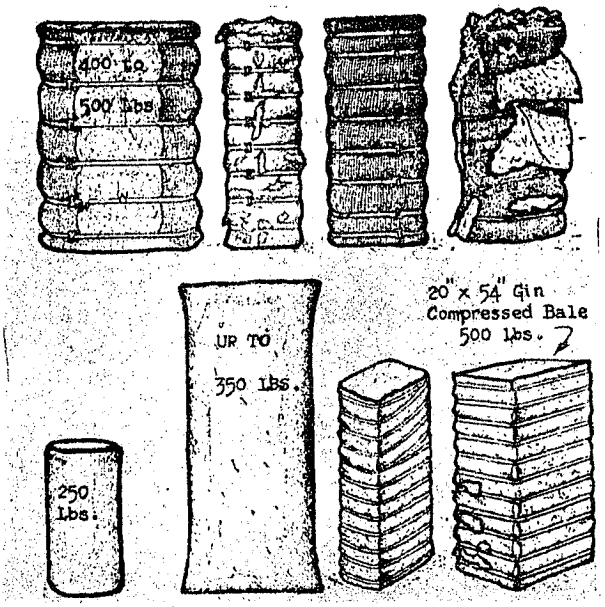
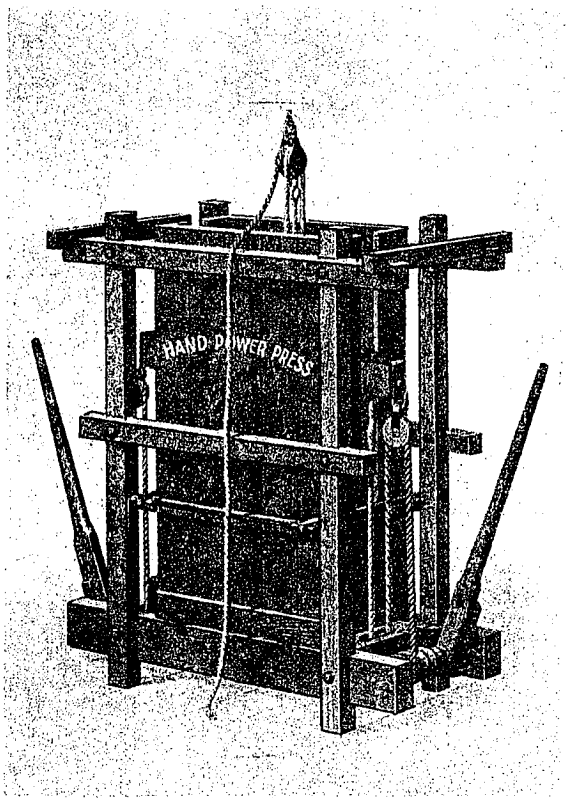


Figure 11.

Different forms of bales showing cotton bagging. (Courtesy, U.S.Department of Agriculture.)

Figure 12.

Hand-powered small bale press with rope winch. (Courtesy, Continental Gin Co.)



1885 to 1961

In 1893, the Winship Company patented a double-box, turntable cotton press that differed from others by receiving the freshly ginned lint from the condenser slide onto an extended platform. This platform was level with the top of the cotton box, and the lint was broomed into the box by hand to obtain a more uniform bale. However, improvements in condensers and more uniform operation of gin stands led to direct discharge of the ginned fiber into the cotton box from the condenser by way of a sloping lint slide.

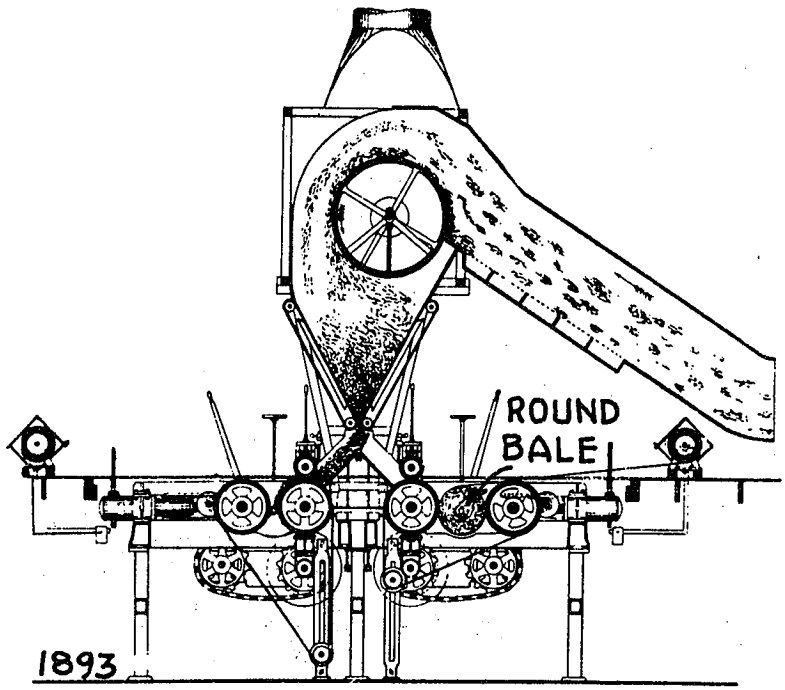


Figure 13.
The 1893 Bessonette press, after Tompkins (8).

In 1893, a rather highly publicized round-bale press (Figure 13.) known as the Bessonette, was put on the market. This press produced 250 pound bales. About 35 of the presses were installed during the next 10 years. This spurred interest in bales of higher densities; and in 1897, Munger brought out a standard density ginners' compress, which was first installed in Mexia, Texas. (Figure 14.)

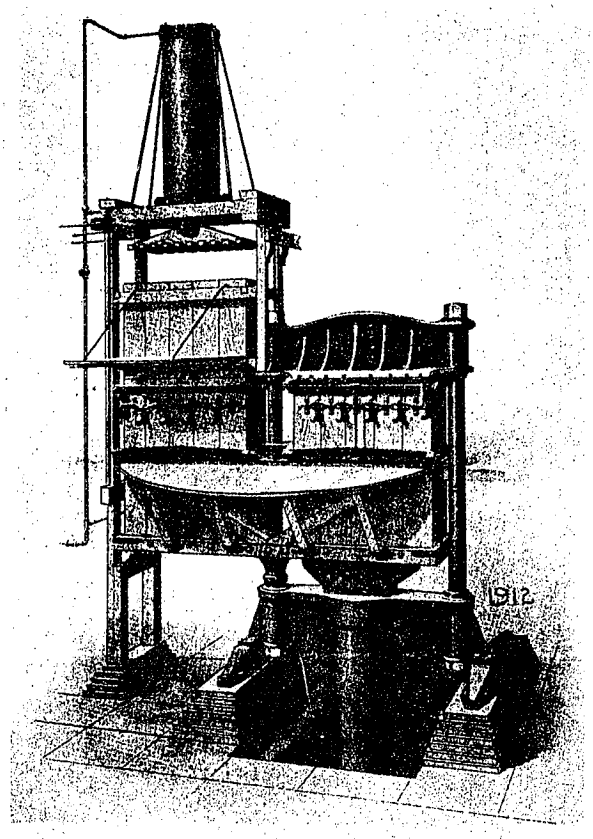


Figure 14.

Munger's ginners' compress, 1897-1913. (Courtesy, Continental Gin Co.)

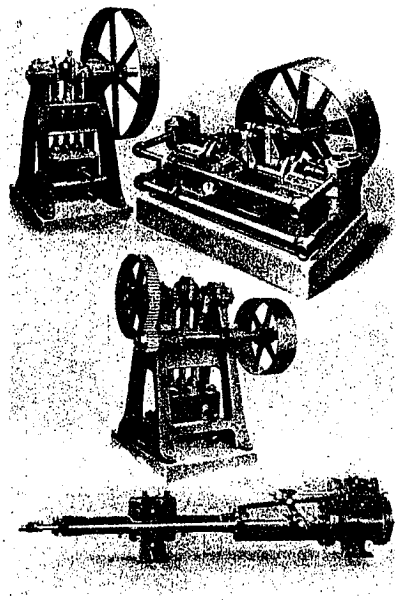


Figure 15.

Typical hydraulic press pumps from 1800 to date. Steam type back-geared, belt- and shaft-driven types. Most are capable of pressures up to 3,000 pounds per square inch.

Through the courtesy of G. A. Gerdes and David Hass, the writer made a trip to Bunkie, La., in 1938, where Mr. Hass had stored one of the 1800 Munger gin compress units. Its hydraulic ram was approximately 18 inches in diameter. The press box measured 20 x 55 inches inside, horizontally. Eight tie grooves were in the platens, and the stroke was estimated as not to exceed 58 inches. The platen beam was of structural steel, unlike the cast steel beam shown in Figure 14. Mr. Hass stated that bale densities of 30 to 40 pounds were common.

Press pumps for hydraulic rams and trampers have been both horizontal and vertical, and both steam and shaft driven. (Figure 15.)

Late types of press pumps have been motor-driven with v-belts, but there have been relatively few major changes in design. Some have had cylinders for high pressures that could be cut out from larger low pressure ones; others have been duplex, one pump for low and the other for high pressures. Since 1930, rotary pumps have also been used.

In 1898, George Lowry promoted his design for a round-bale press that discharged the ginned fiber into a sack suspended beneath the press (7). Although Lowry obtained considerable publicity and contributed valuable historical data, the press was not used extensively; and is not now known at most gins.

In 1902, A. B. Thomas brought out a rectangular-bale press very different from that of the Munger outfit. It produced standard sized (22 inch by 56 inch by about 24 inch) bales of 30 pounds density by folding a highly compressed lap, in sheet form, back and forth in the cotton box. Only a few of these presses were used.

From 1904 to 1915, some of the C. J. Luce rectangular bale presses were used by companies located in the Mississippi River Valley. They produced standard sized 500-pound bales of about 40 pounds density.

By 1908, five companies were selling rectangular, standard 500-pound bale presses for densities of 20 to 40 pounds; and three companies were selling round-bale presses for 250-pound weights.

In 1914, most of the cotton gins of the United States reverted to use of low-density flat bales; but interest in higher density bales revived in 1940. The Anderson-Clayton Company produced round bales at many of their gins.

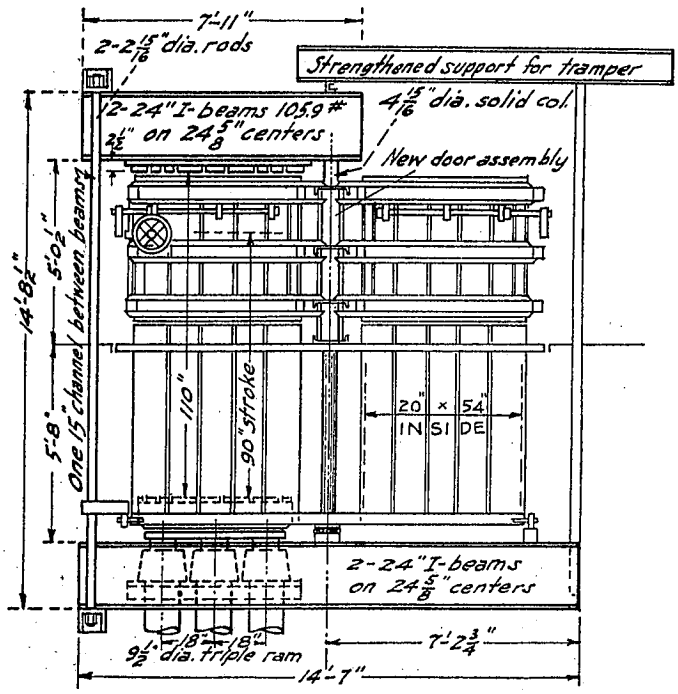


Figure 16.

Diagram of Government design, standard density press. (Courtesy, U.S.D.A.).

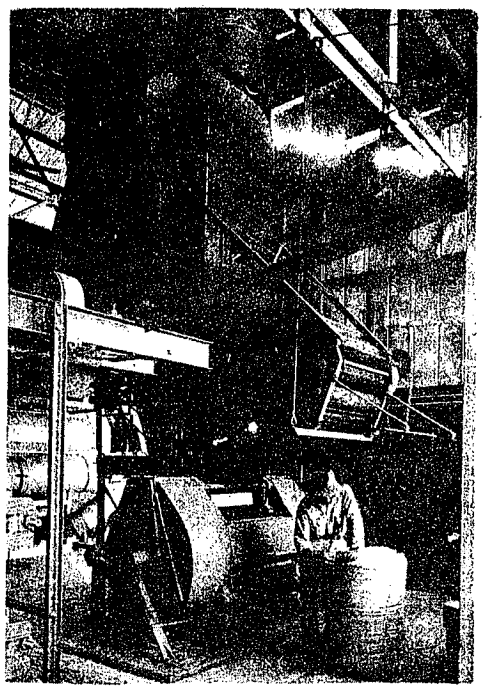


Figure 17.

Photo of Anderson-Clayton Company round bale press at Stoneville, Mississippi.

This company made significant improvements in round-bale presses and developed and excellent press. The U. S. Cotton Ginning Research Laboratory, Stoneville, Miss., is indebted to the Anderson-Clayton Company for the loan of its press (Figure 17.) and condenser.

In 1938, the U. S. Cotton Ginning Research Laboratory conducted extensive tests in standard and high-density baling, especially with a view to offsetting fire-packed bales. The increased total pressures employed in producing standard and high-density gin bales ranged from approximately 240 to 1,000 tons, respectively, as compared to only 40 tons for flat bales. Several thousand bales of 24 pounds' density, pressed out at the Aldridge (Miss.) Plantation and the Stahmann (N. Mex.) Farms, proved that the standard density compressions extinguished fire in bales; improved shipping conditions; and permitted storing more bales per storage area. The round-bale and triple-ram presses performed satisfactorily under laboratory tests (9), when suitable piping installations were used (Figures 16 and 18).

During the development of the cotton gin presses, from 1894 to 1930, the gin building had, in many areas, changed from 2-story to 1-1/2- and 1- story structures, or at ground level. Some ground level presses required a pit, but the modern press usually does not. (Figure 19, next page).

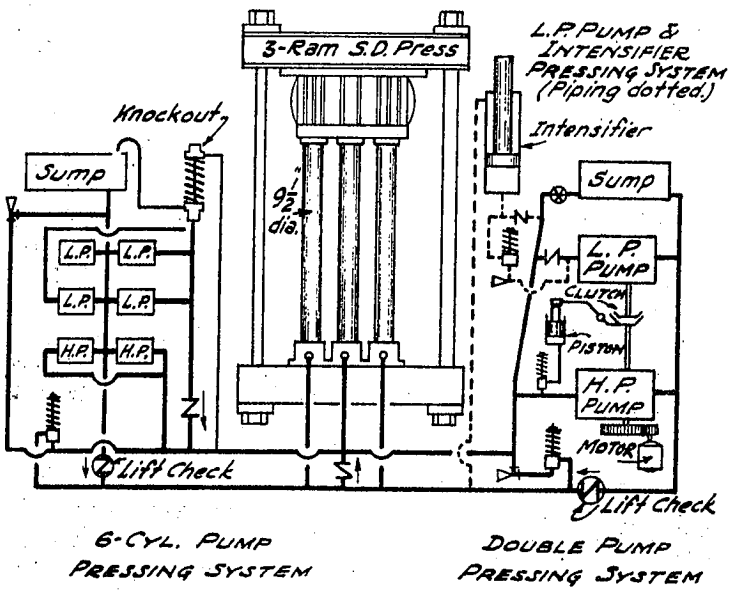


Figure 18.

Diagram of piping (less inter-system valves) for standard density test pressing. The outside rams "trail" until desired points of cut-in.

Figure 20 shows a modern, 1-1/2- or 2-story standard density press, with turntable. This could also be used for ground-level installation.

Figure 19.

A modern single-story pressing with combination ram for packing and pressing. The wooden boxes with steel framing are shown as a development stage, but all-steel presses are usual. (Courtesy, The Murray Co., of Texas, Inc.)

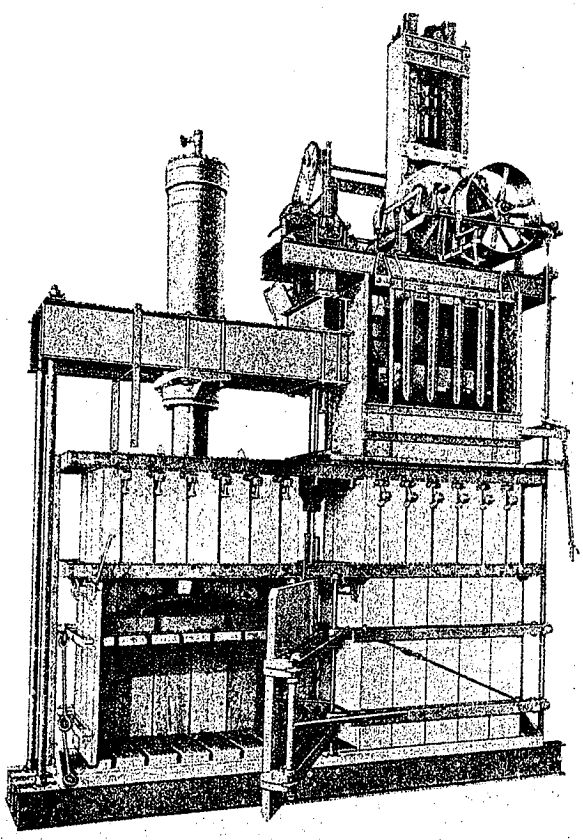
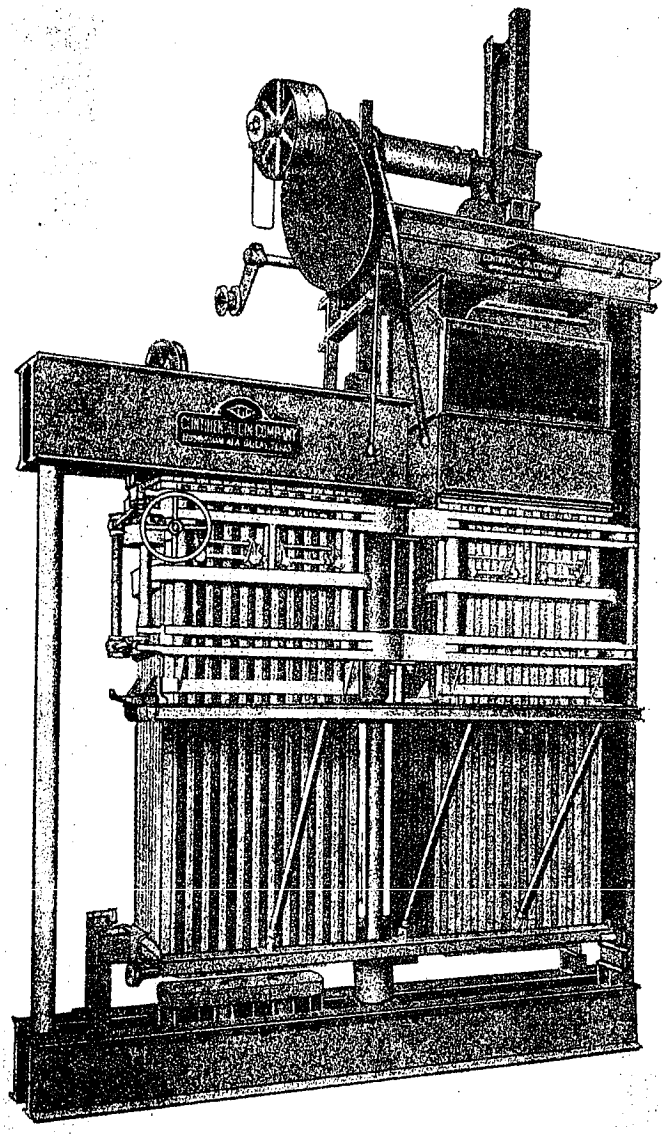


Figure 20.

Example of a 2- or 1-1/2-story standard-density press. Such presses are also used at ground level without requiring the turntable. (Courtesy, The Continental Gin Co.)



A wide variety of mechanical and hydraulic trampers are available. Some have been shown in the foregoing figures. Others employ chains and pintles of improved designs. Trampers have kept in step with the presses in their developments.

Because of more rapid bale turnouts in many gins, very large pumps with 75 or more horsepower electric motors are now in use. Safety devices are standard equipment with such presses.

Miscellaneous Items

In general, there is a 1:2:3 ratio in densities from flat to standard to high dee bales. The total bale weights average 500 pounds, with tare of 21 pounds for flat bales.

Cross sections of ordinary American flat-bale cotton boxes are 27 by 54 inches, but those for standard density are usually 20 by 54 inches. Triple rams of 8 to 9-1/2 inches diameter are common, and 4-ram presses of the same diameters have been used since 1956 in some locations.

In the 19th century, bales were often tied with cordage. The advance to use of metal strapping and wire ties has largely been a 20th century achievement, although the invention of D. McComb of Memphis, Tenn. (U. S. Patent

No. 15,112, June 17, 1856), provided a type of bale buckle similar to "wool" buckles now in use. Another bale-buckle patent was issued to J. J. McComb, New Orleans, La. (U.S. Patent No. 31,252, Jan. 29, 1861). This invention is still in use and is commonly called an "Arrow" buckle. This buckle was about 1/8 inch think, 2 inches long, and 1-3/4 inches wide. Present-day buckles invented in the United States are sturdily reinforced, as illustrated by the 1961 buckle shown in Figure 21.

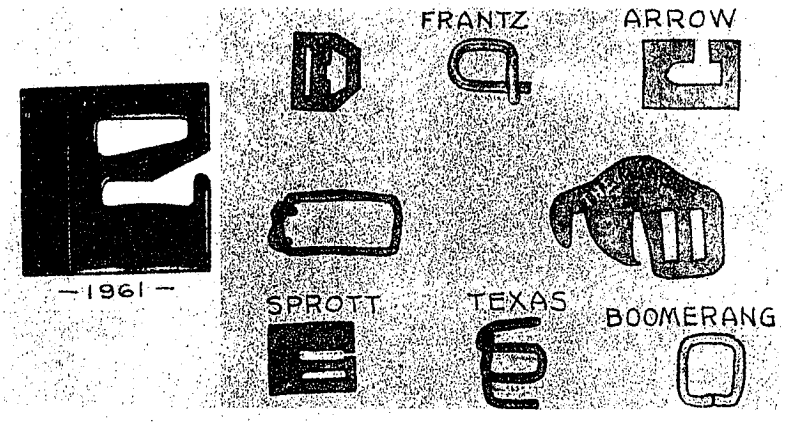


Figure 21.

Bale tie buckles used in the United States at different times and for various densities of bales. (Courtesy, U. S. D. A.)

Concurrent with the engineering studies on standard, high-density and round bale presses, George E. Gaus and Charles Scott Shaw were active in research on wire ties; and a number of valuable public patents were obtained.

In tests at Stoneville, Miss., in 1940, standard density bales weighing 551 to 617 pounds were dropped from a platform. The Frantz buckle with "60-pound" flat ties gave the best results. It did not break, and all ties were in place at the end of very rough handling tests. Despite the advantages of wire ties, flat ties ---known as 45-pound and 60-pound weights---have been proved most popular when used with the 1961 improved buckles.

Cotton pressing developments from 1795 to 1961 are summarized on page 17.

Filling the Press Boxes

Until about 1840, freshly ginned cotton was conveyed to the press manually. Presses then began to be installed in the gin house, adjacent to the stands. In 1864, T. C. Craven invented a gin stand with a built-in condenser; and by 1878 almost every gin stand had its own unit condenser; somewhat like those shown in Figure 22, on the following page.

As system ginning came into use, it became necessary to employ a master condenser in place of unit condensers, if rate of production and saving of hand labor were to be effected. Figures 23 on the following page shows the original wooden form of the Munger lint flue and double-vent condenser, and the improved metal system that came a few years later.

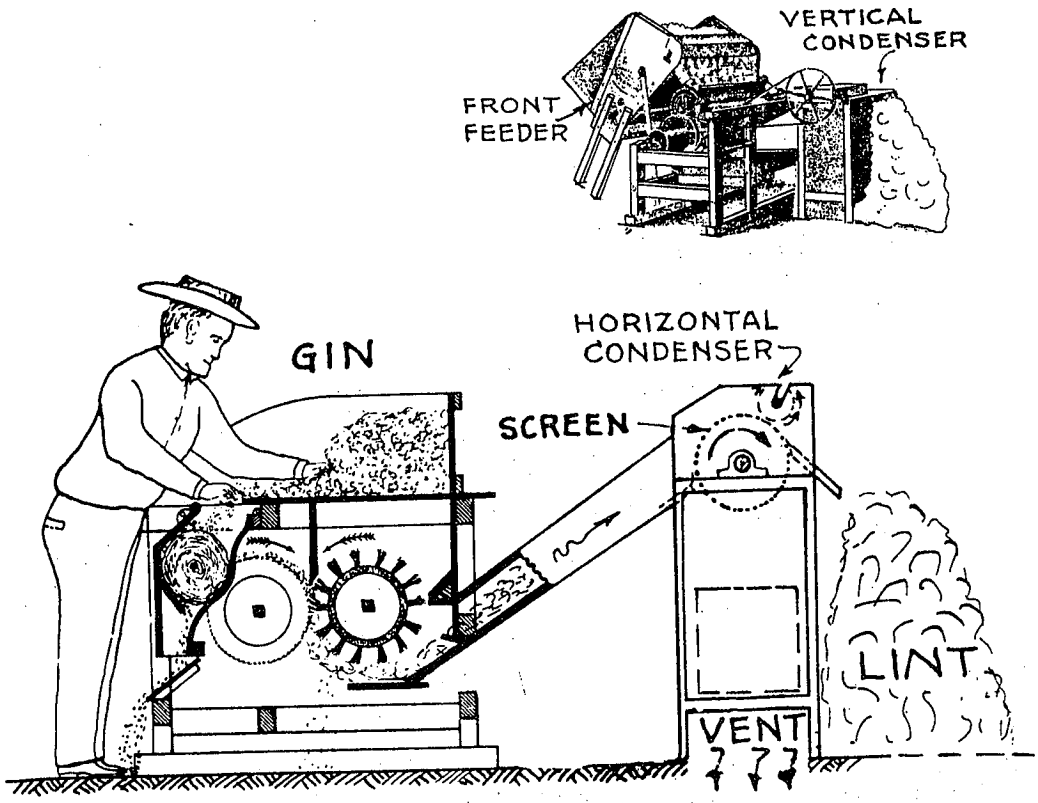


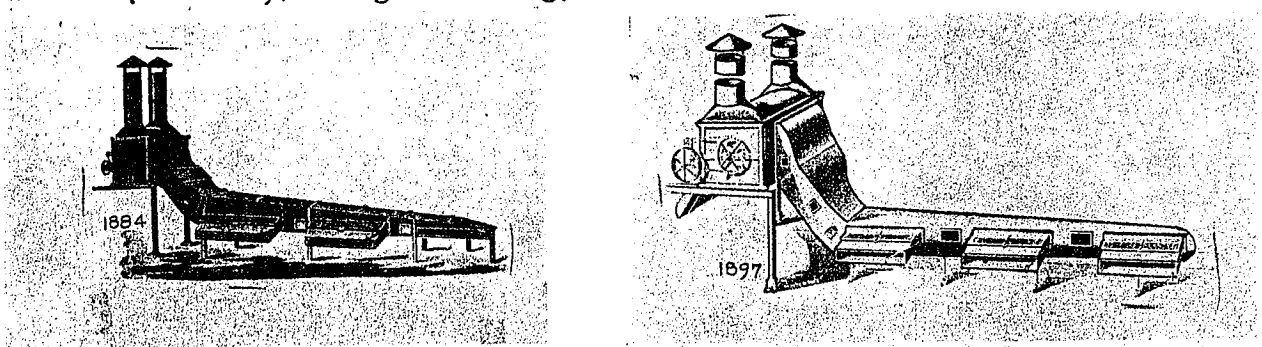
Figure 22.

Unit Condensers. Upper, a vertical type; Lower, a popular horizontal type.

System ginning with roller gins usually involves a much different methond of handling ginned lint to the press than does the method noted above. Each roller gin discharges its ginned fiber without an accompanying blast of air. The batt falls to the floor and is swept by hand to a single-box press, or falls to a belt conveyor now used in some modern establishments in the United States. From the conveyor, the lint is then pneumatically conveyed to the condenser and thence to the press (2).

Figure 23.

Lint handling systems: Left, 1884 wood construction; Right, 1897 type made of steel. (Courtesy, Munger Catalog).



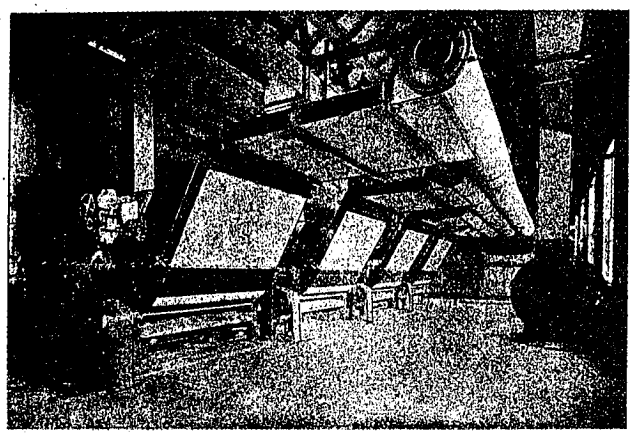


Figure 24.

The 1897 Pratt system of lint disposal behind the gins. (Courtesy, Daniel Pratt, 1930).

Returning again to saw gins, it may be said that, unlike the master lint flue shown in Figure 23, other systems with individual gin flues from each gin stand were also used before 1900. From an 1897 catalog given the writer by Daniel Pratt, a clear picture is presented showing the elevated lint trunks behind the stands, which gave a clear and unobstructed working area. (Figure 24).

A broad variety of condensers and lint flue constructions were possible (Figures 23 and 24). Figure 25 shows some typical modern installations.

Some phases of lint flue constructions that relate to lint-cleaning devices are treated in Chapter V.

The illustrations in this chapter were taken from machinery catalogs of the 1900 era. Comparison between them and modern cotton ginning layouts shows the great progress that has been made by the industry in some respects, and shows how many features contributed by its pioneers have been retained and incorporated into our modern machinery.

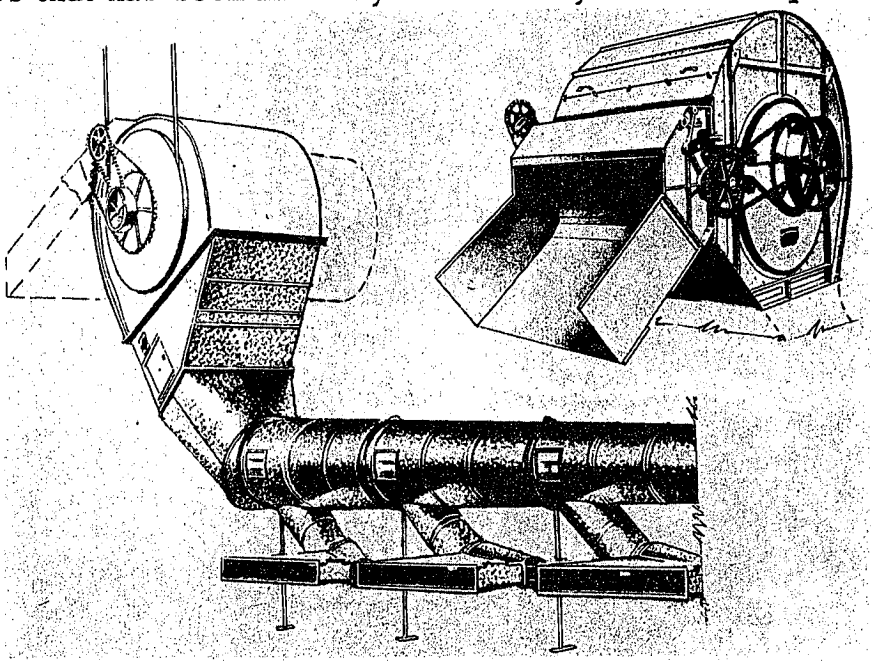


Figure 25.

Condenser and lint flue as of 1956. (Courtesy, U.S.D.A., (10).

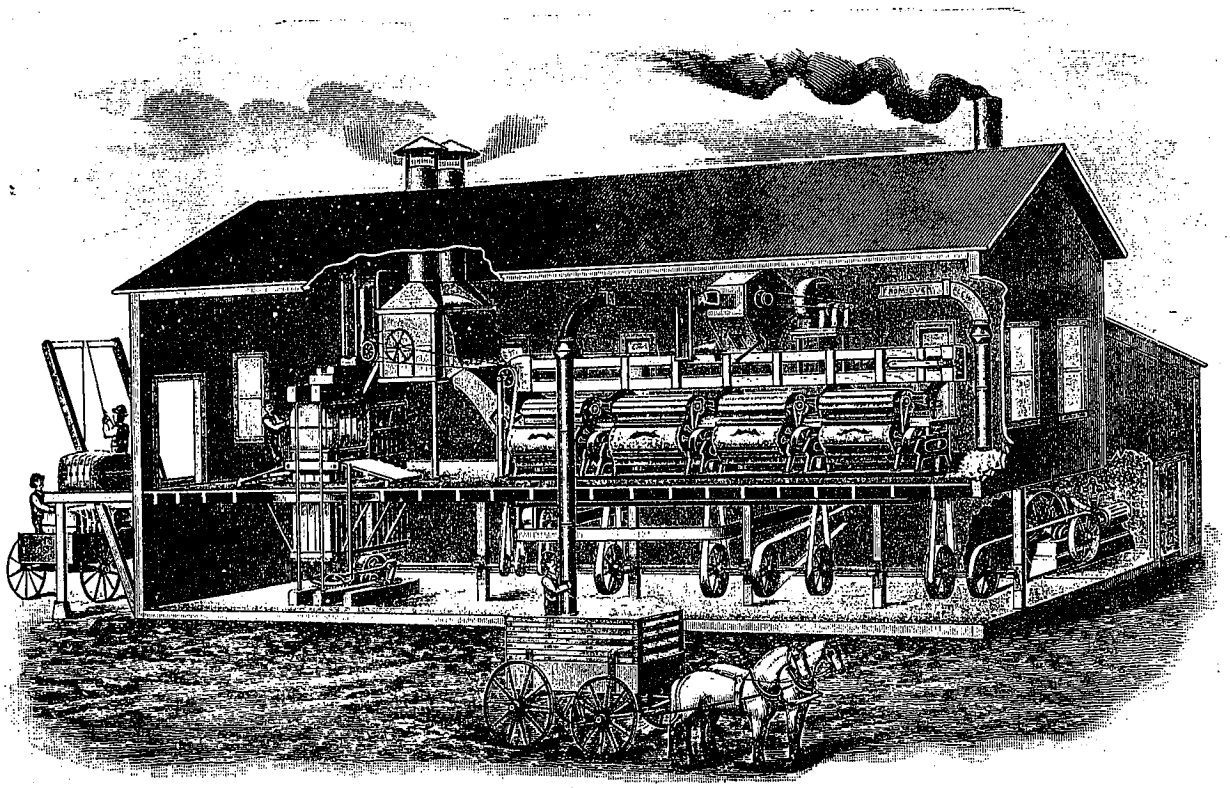


Figure 26.

Munger Ginning System, 1884-1890. (Above.)

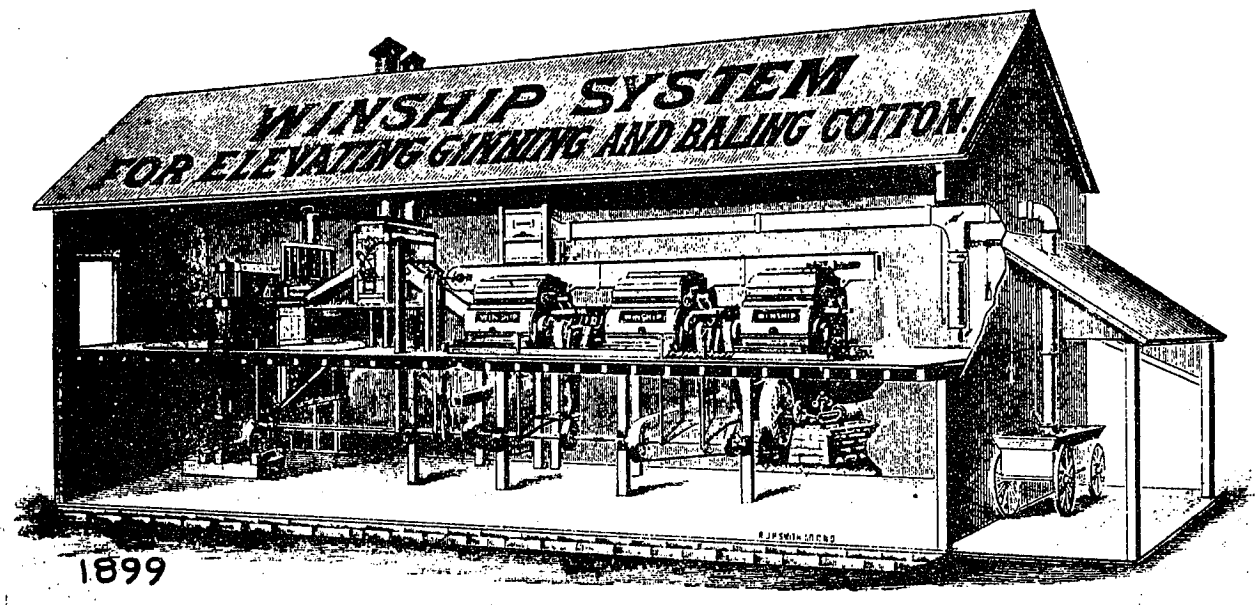
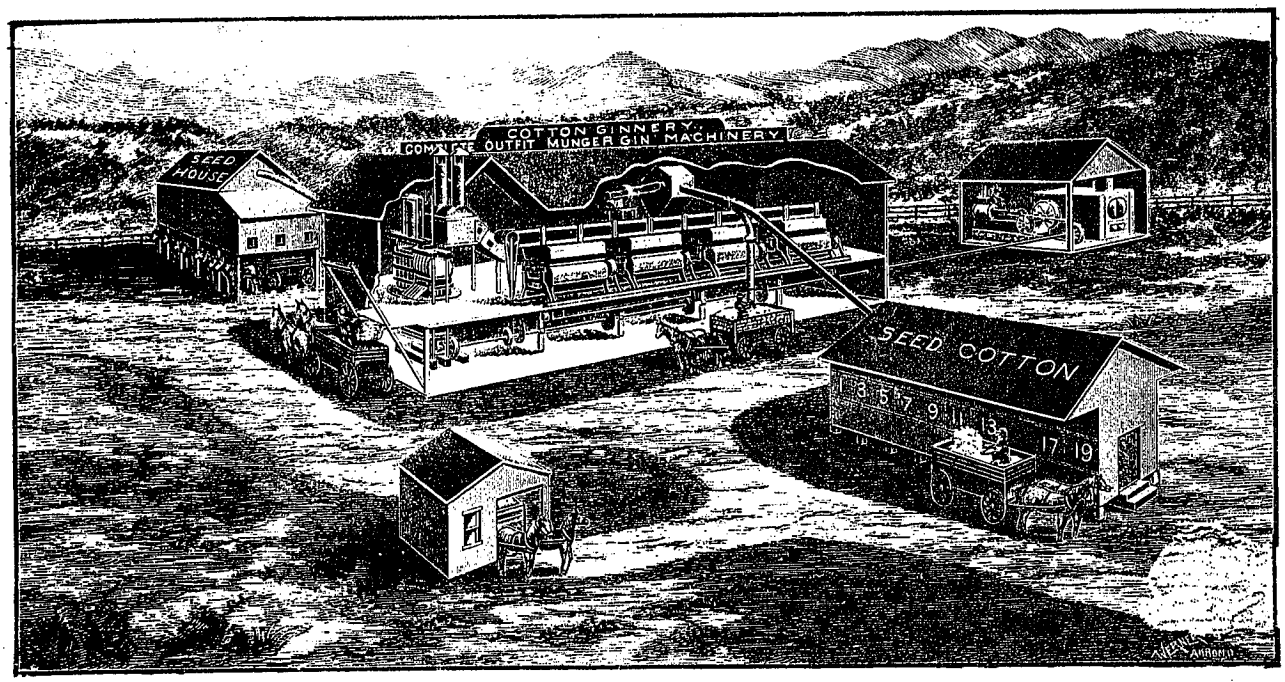


Figure 27.

Winship Ginning System with offset Condenser, 1899. (Below.)



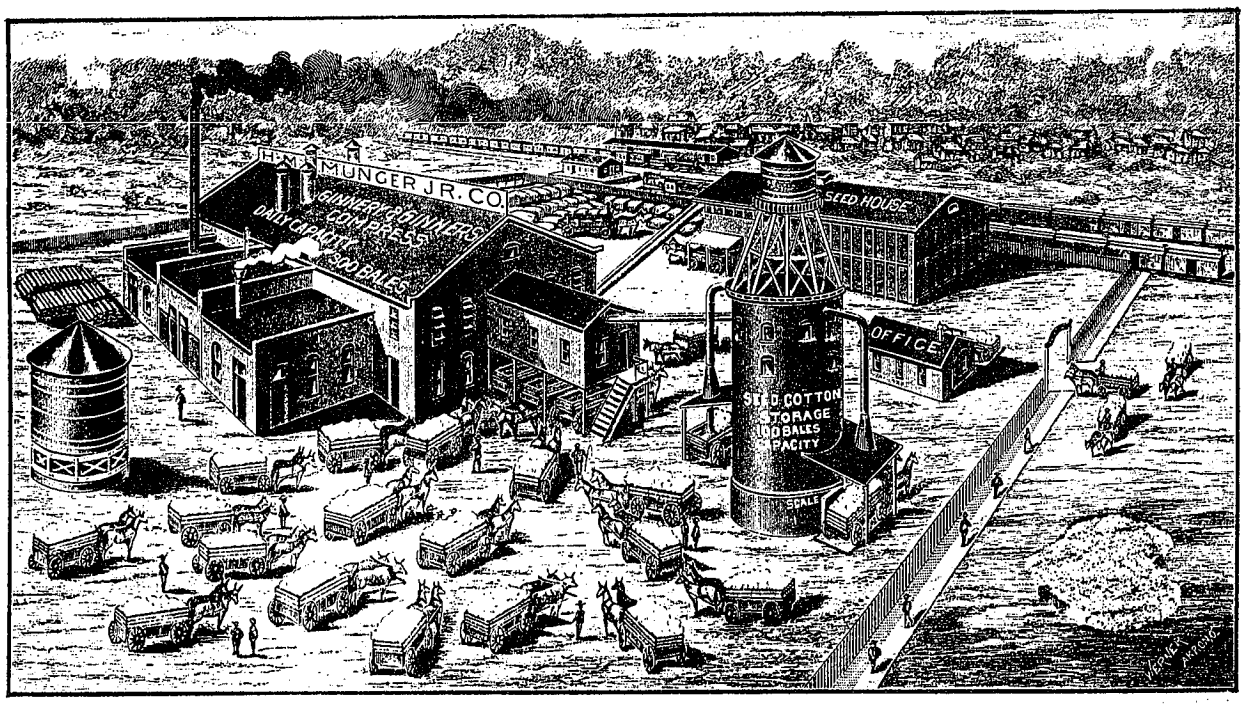


Figure 28.

Artist's sketches of world's first complete ginning system, 1883; and of the largest gin in Texas as of 1898, which used three batteries of five stands each, at Mexia, Texas.

Summary of Cotton Pressing Developments

1795 - 1825: Some forms of screw compression appear to have been employed, but packaging was largely in bags, pestled and foot packed.

1800 - 1961: Methods of packing and tramping ginned lint before applying final pressures changed radically. Timed mechanical trampers with safety guards, weight indicators, and other improvements are now widely used.

1810 - 1860: Outdoor screw presses (text Figures 2 and 3) were common, and by 1840, iron screws had come gradually into use.

1844 - 1961: Cotton bales of various densities and weights began to appear on the market. Square bales came to 500-pound averages; round bales came to a standard of 250-pound weight. A broad variety of designs and improved technical features appeared. Press doors changed from bottom-hinged to side-hinged; door locks and safety catches were improved, construction shifted from wooden to metal.

1861 - 1961: Cotton gin presses became almost entirely vertical and pressure was applied by screw, hydraulic or steam methods. In most cases, bales were tied out at ginning level or on a platform slightly above the gin stands.

1884 - 1961: Methods of filling the cotton boxes at the press were evolved and improved.

1940 - 1960: Standard and high-density presses at gins began to be widely used. Many auxiliaries to improve pressing appeared, including automatic sampling; weight indicators; safety cutouts and alarms; better ties and buckles; and better bagging.

Selected References

1. Bennett, C. A., Ginning Cotton. USDA Farmers' Bul. 1748, 32 pp., illus. 1956.

2. Bennett, C. A., Roller Ginning Developments. Texas Cotton Ginners'Assn. and the Cotton Gin and Oil Mill Press. 90 pp., illus. 1960.

3. Bennett, C. A., Saw and Toothed Cotton Ginning Developments. Texas Cotton Ginners' Assn. and the Cotton Gin and Oil Mill Press. 80pp. 1961.

4. Bennett, C. A., Harmond, J.E., and Shaw, C.S., Standard-density Cotton Gin Processes. USDA Cir. 733, 16 pp., illus. 1945.

5. Campbell, J.D. and Soxman, R. C., Baling Cotton at Gins--Practices and Costs. USDA Farmers' Cooperative Service in cooperation with USDA Marketing Service. Research Report 386, 48 pp. 1960.

6. Kimball, H. I. International Cotton Exposition, Atlanta, Ga. 1881 Report, Appleton & Co. 610 pp., illus. 1882.

7. Lowry, G. E. Ginning and Baling from 1798 to 1898. Amer. Soc. Mech. Engineers 19: 811-826, illus. 1898.

8. Tompkins, D. A. Cotton and Cotton Oil. Tompkins, Charlotte, N. C. 2 volumes., illus. 1901.

9. Turner, J. A. Cotton Planters' Manual. C. M. Sexton & Co. 320pp.illus. 1857.

10. Watkins, J. L. King Cotton. J. L. Watkins & Sons, New York. 321pp. illus. 1908.

11. Wright, J. W., Gerdes, F. L., and Bennett, C. A. Packaging of American Cotton and Methods of Improvement. USDA Cir. 737. 62pp. illus. 1945.

CHAPTER II

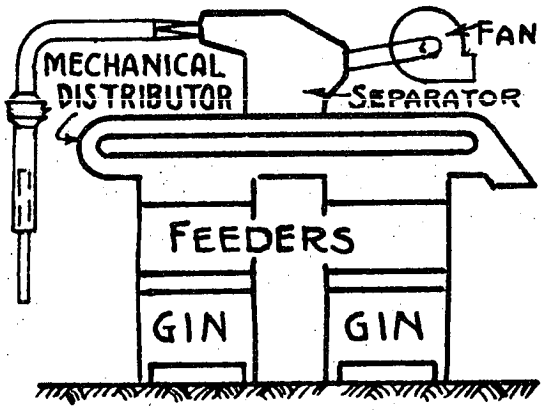
MULTIPLE STAND GINNING SYSTEMS AND GIN YARD FACILITY IMPROVEMENTS

Multiple Stands

The year 1884 ended about 90 years of rather primitive, manually operated single-stand gins, and highlighted the advent of a new era that had started in 1878. This new era marked the beginning of mechanical-pneumatic-hydraulic systems, which had several gin stands per battery and apparatus for supplying seedcotton to each ginning unit in the battery.

By 1897 three labor-saving separate systems, each involving pneumatic suction handling of seedcotton, had been developed. They were also applicable for bin storage and other uses.

The first system conveyed seedcotton by pneumatic suction from wagons or storage to a screened box that served as a cleaner for the cotton and a separator of air from the cotton (Figure 29).



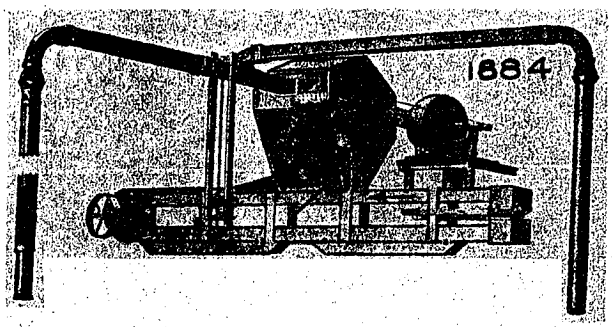


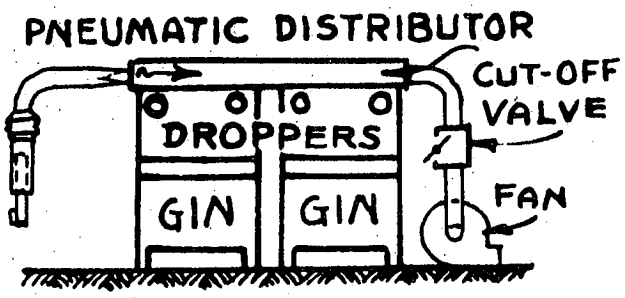
Figure 29.

The 1884 Munger unloading and distributing system.

From the separator, the seedcotton was conveyed mechanically by a belt distributor, with air-seal flaps, to individual feeders placed above each gin stand.

The separator in shown in Figure 29, was called a "B-Box." It was superseded by other types that are described later.

The second system conveyed incoming seedcotton by pneumatic suction to screened, noncleaning, special boxes with flexible fabric legs known as "pneumatic elevators." These legs were combined in a trunk



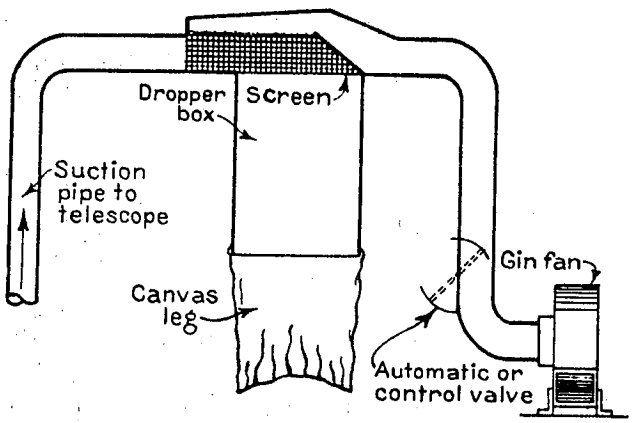


Figure 31.

Left - 1897 invention of Sam Rembert.

Right - Government Cone Fan. A special perforated guard attached to the fan wheel prevented seedcotton from striking the blades.

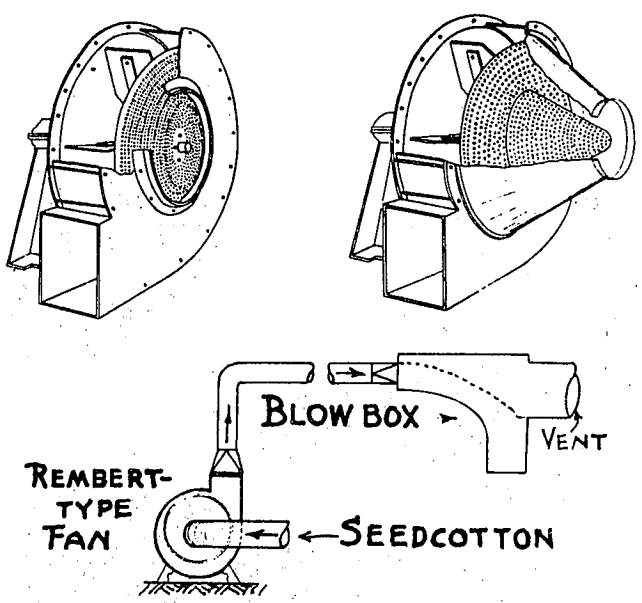
system, so that each dropped seedcotton into the feeders below. (Figure 30.) Suction in the system was controlled by a valve near the intake of the fan.

The third pneumatic system conveyed the seedcotton by suction through the fan casing and then blew it to points of distribution. (Figure 31). This system was the invention of Sam Rembert of Memphis, Tenn.

Two types of Rembert fans are shown in Figure 31. The one on the left is the original Rembert type. The one on the right is the improved cone Rembert-type fan, which has greater capacity and does less damage to the seedcotton. It was invented by Gerald Franks at the U. S. Cotton Ginning Research Laboratory, Stoneville, Mississippi.

Figure 30.

The 1887 David A. Sailor pneumatic elevator and distributing system for ginning batteries. (From U.S.D.A. files).



All three of these pneumatic suction systems described have involved patents. The suction inlets have been provided in several forms, varying from "cat-holes", where the intake end of the suction pipe is anchored in a wall or floor, to late types of swinging telescopes on tracks. The separators, or blow boxes, wherein the seedcotton was separated from the conveying air, are now generally classified as "separators" or "droppers" A few of the many good designs are shown in Figure 32.

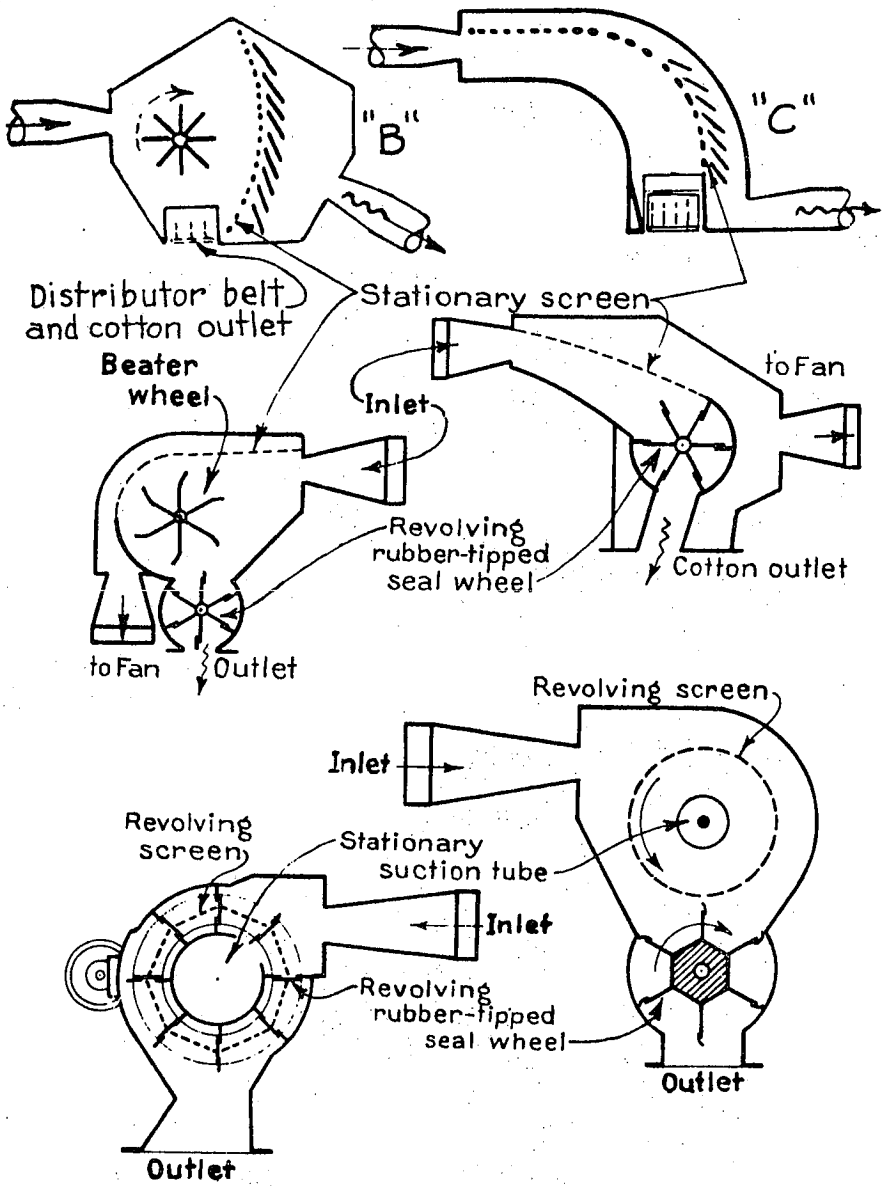
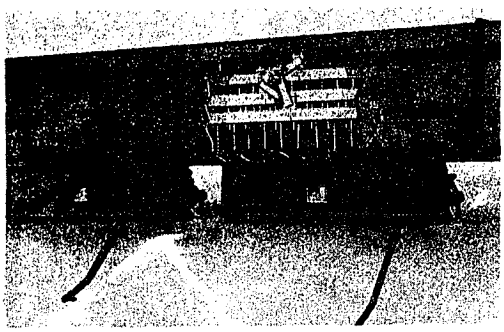
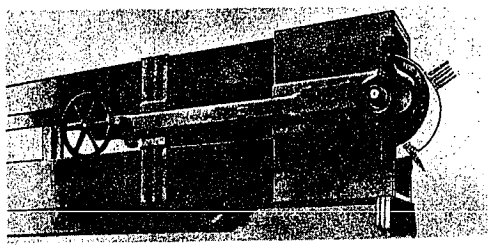


Figure 32.

Separator developments from 1884 to 1961. The upper two were named by Munger, box "B" (left) and box "C" (right). All types have been used as blow boxes with Rembert-type fans, as well as in conventional suction systems.

The B-Box and C-Box early forms of separators (Figure 32, top) depended upon the conveying belt distributor beneath them to provide an air seal. These distributors fitted snugly in closed conduits, and flexible flaps at close intervals formed pockets or divisions by rubbing on the sides and tops of the conduits. However, shortly after 1884, rotary sealed wheels began to compete with the B-Box form, and this led to the use of sealed "vacuum-wheels" beneath as a structural part of the separator. These vacuum wheels are indicated in other kinds of separators shown in Figure 33. Many other designs (not shown here) have also been employed.





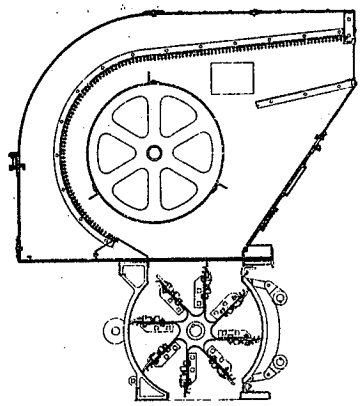


Figure 33.

Belt and gyrator types of mechanical seedcotton distributors.

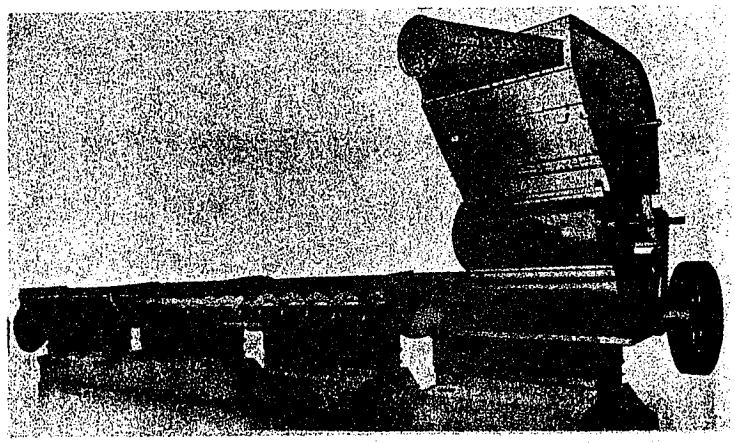


Figure 34.

Munger Cleaner Separator cross-section with vacuum cotton dropper. (Continental Gin Co.)

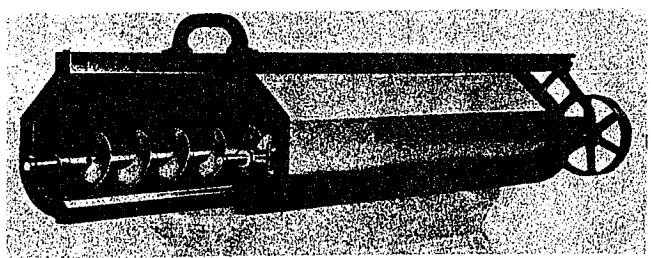


Figure 35.

Single and double auger type seedcotton conveyor distributors.

A large quantity of fine foreign matter is removed by all types of screened separators. Cleaning feeders and overhead bulk cleaners were developed rapidly after 1900. These are described in the following chapters.

Principal forms of mechanical distributors above the gin stands and their feeders were developed between 1884 and 1961. See Figure 35 on previous page.

Overflow pens for mechanical distributors were in use by 1890. The earliest catalog illustrations of the 1884 system show a separate pickup telescope for that purpose without any pen or overflow box. In some gins, a fixed hole in floor or wall, to which the excess seedcotton is fed by hand, has long been used. In other gins, cirulation loops returned excess cotton to the unloading wagon; so that feeding rate could be controlled. Other overflow warnings have included bells and automatic shutoffs.

Gin Yard Facility Improvements

Storage facilities for seedcotton at the gin have been used since the first gin stands appeared in this country. Pneumatic conveying of seedcotton in connection with storage was introduced with the 1884 system. The pipes were usually rectangular in cross section and were often combined with seed storage bins (Figure 36.). Twentieth-century additional forms of seedcotton storage houses (Figure 37) are also familiar to modern ginners.

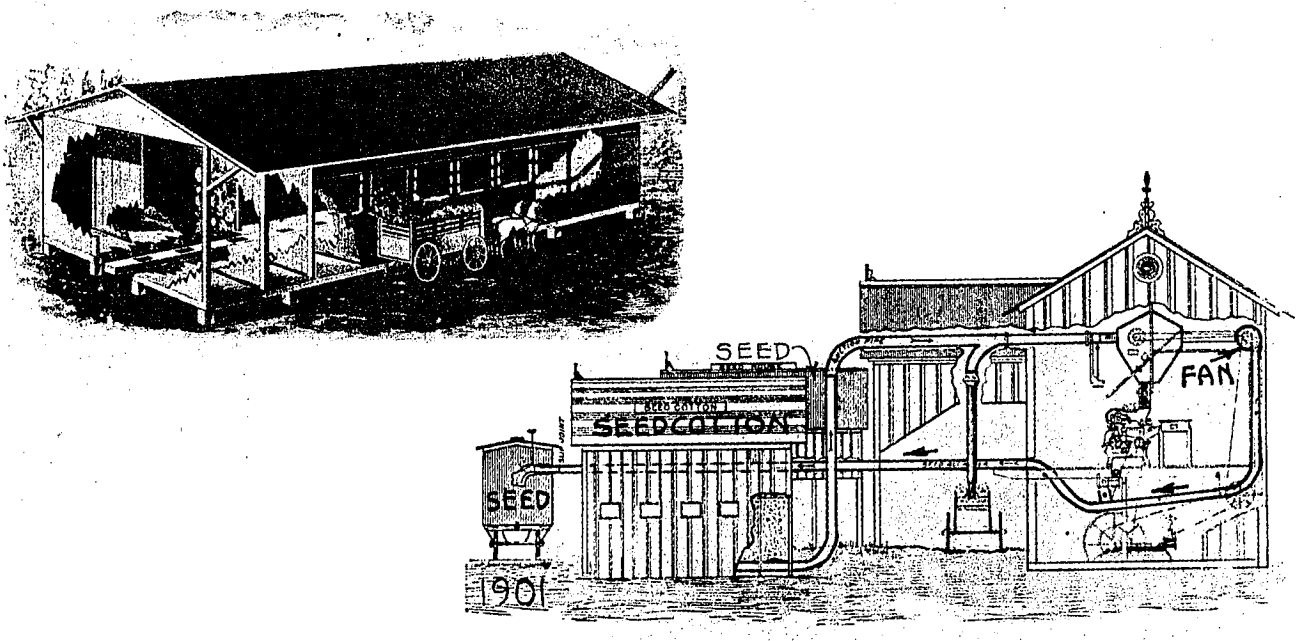


Figure 36.

An 1890 rectangular seedcotton storage house and a1901 seed and cotton combination storage arrangement.

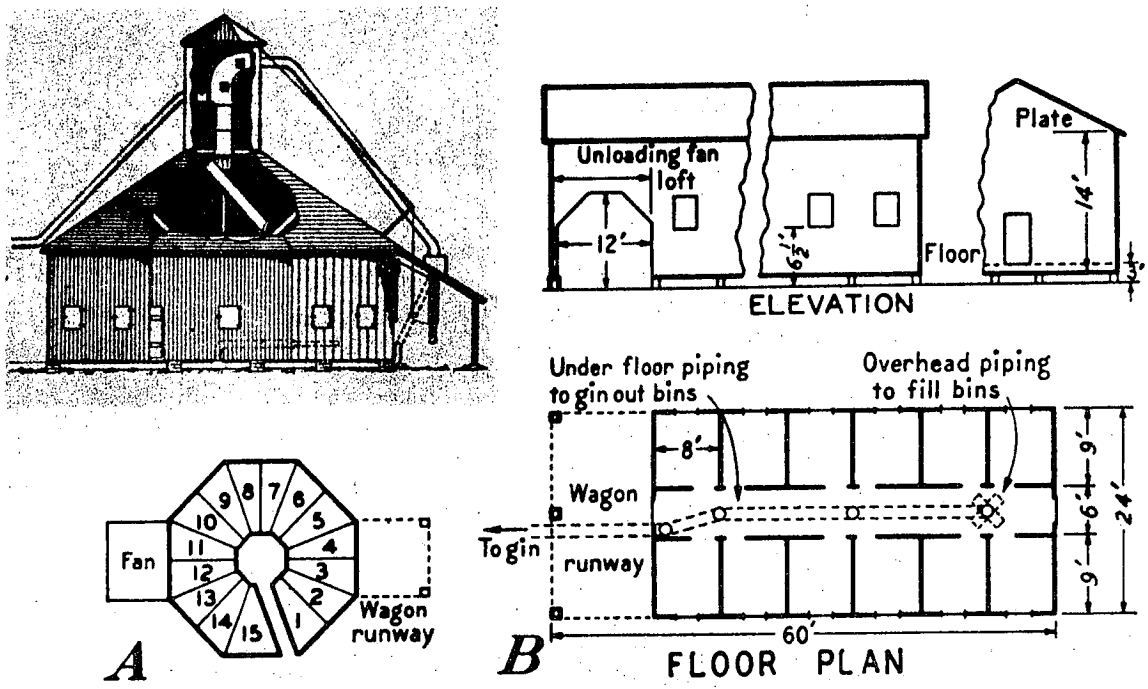


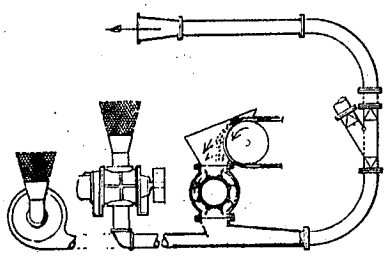
Figure 37.

Examples of 20th century seedcotton storage houses.

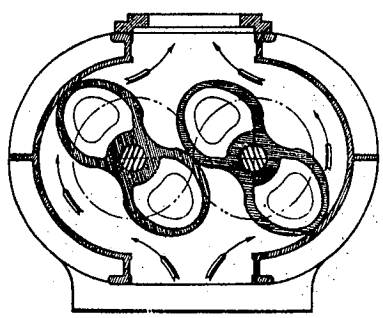
Seedcotton handling at the gin has been materially aided by the cone-type Rembert fan, shown in Figure 31. The foraminous or perforated cone and large blades increase the capacity and reduce cone abrasion. The sloping surface of the cone allows it to handle the seedcotton without damage to either seed or fiber. Rembert-type fans may discharge seedcotton into any type of separator or blow boxes, or directly through open-end pipes, all of which should be provided with megaphone-shaped discharge nozzles.

In 1942, the U. S. Cotton Ginning Research Laboratory at Stoneville began extensive research to develop small-pipe seed-handling systems (2) (3). These systems (Figure 38) save power and reduce cost.

Figure 38.



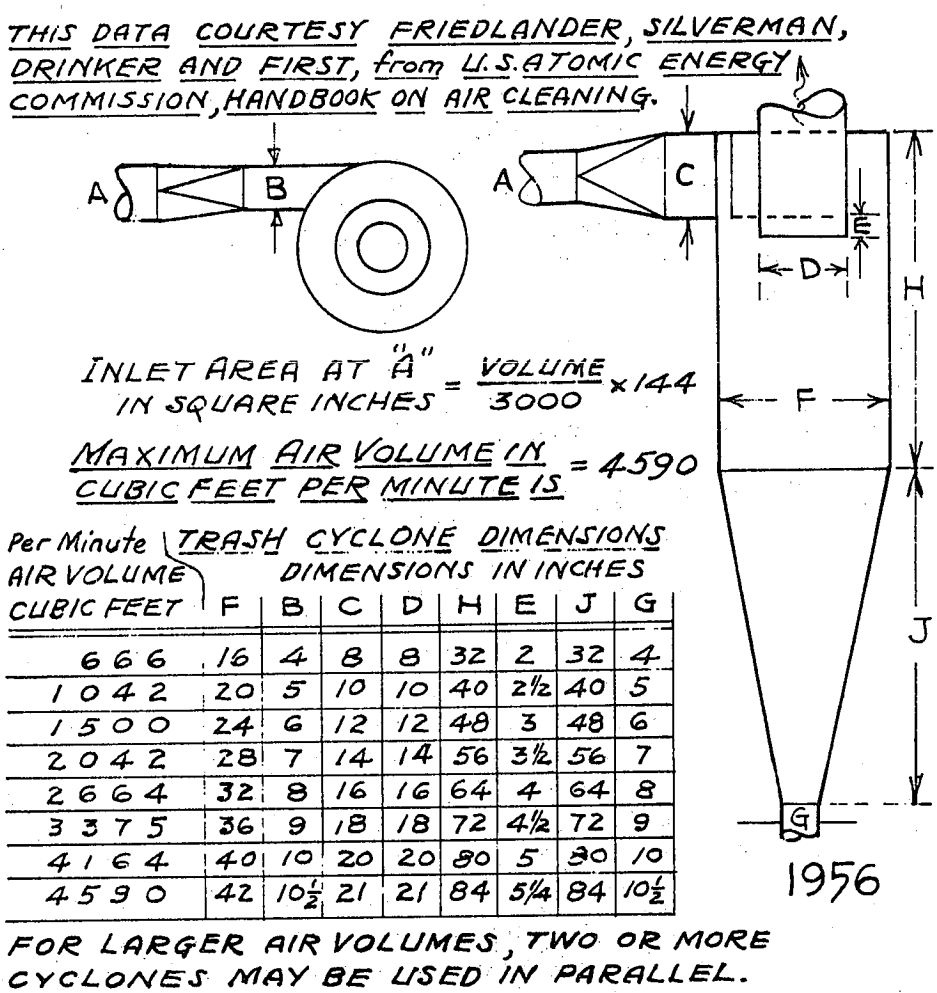
Some general features of small-pipe, cotton-seed handling systems; the general layout, and a section view of a lobed rotary pump. Such a pump is usually reversible and may blow either up or down, as desired.



Continuing improvements in labor-saving methods and processes in cotton ginning facilitated rough hand-and machine-harvesting practices. However, these labor-saving farm practices further complicated ginning, since the seedcotton contained more trash and dirt when brought to the gin than when it was carefully hand picked.

After World War II, ginners were confronted with the need to eliminate dust and windborne foreign matter. The transfer of the gins to rural locations was promptly followed by residential buildups nearby.

Dust-collecting bins, houses, vortical cycles, and filters were used to help resolve the problems (Figure 39). In 1954-55, the Texas State Department of Health; the U. S. Department of Health, Education and Welfare; the Bureau of Mines of the U. S. Department of Interior; and the U. S. Department of Agriculture cooperated on a study of these problems. Much headway was made as a result of tests at the U. S. Department of Agriculture cotton ginning research laboratories, and through the cooperative efforts of Federal and State scientists.



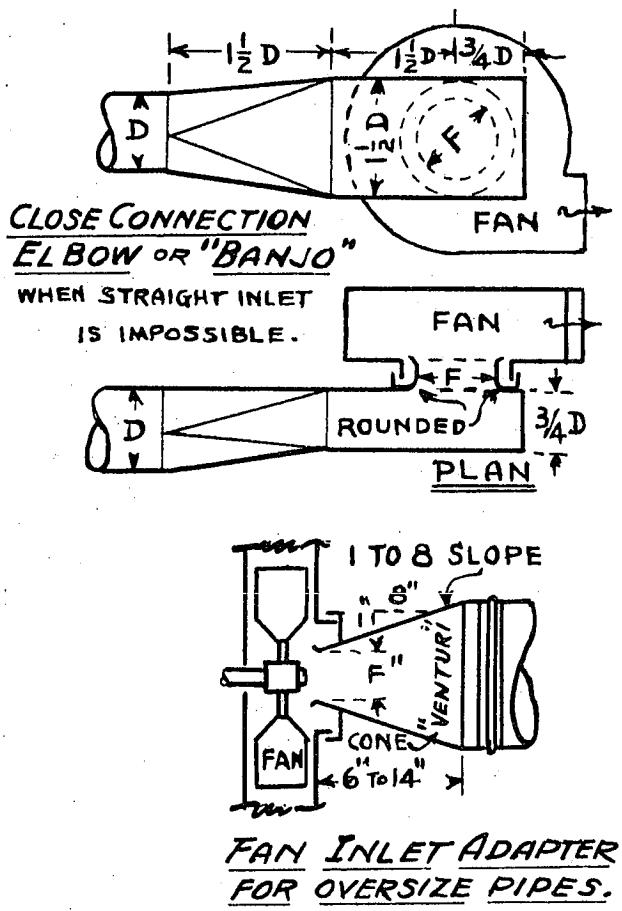
Per Minute AIR VOLUME CUBIC FEET — TRASH CYCLONE DIMENSIONS — DIMENSIONS IN INCHES

	F	B	C	D	H	E	J	G
666	16	4	8	8	32	2	32	4
1042	20	5	10	10	40	2½	40	5
1500	24	6	12	12	48	3	48	6
2042	28	7	14	14	56	3½	56	7
2664	32	8	16	16	64	4	64	8
3375	36	9	18	18	72	4½	72	9
4164	40	10	20	20	80	5	80	10
4590	42	10½	21	21	84	5¼	84	10½

FOR LARGER AIR VOLUMES, TWO OR MORE CYCLONES MAY BE USED IN PARALLEL.

Figure 39.

Design information regarding high efficiency cyclone trash collectors for cotton gin use.



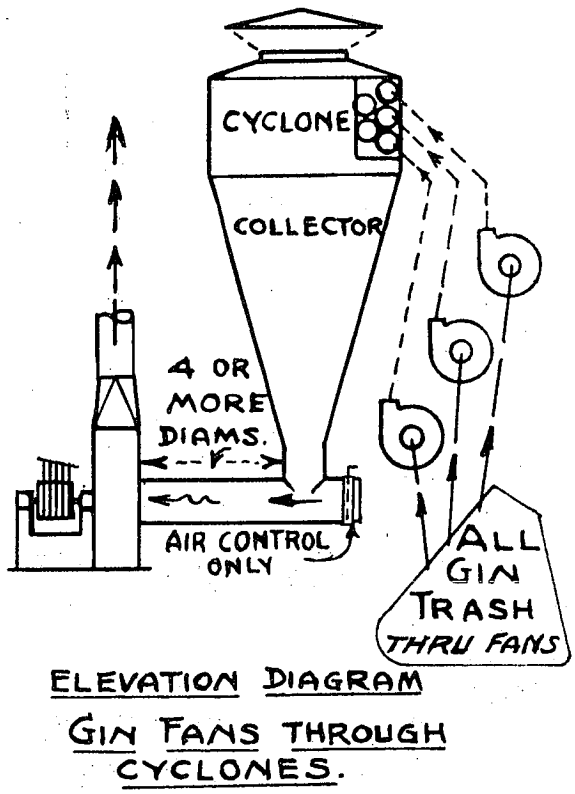
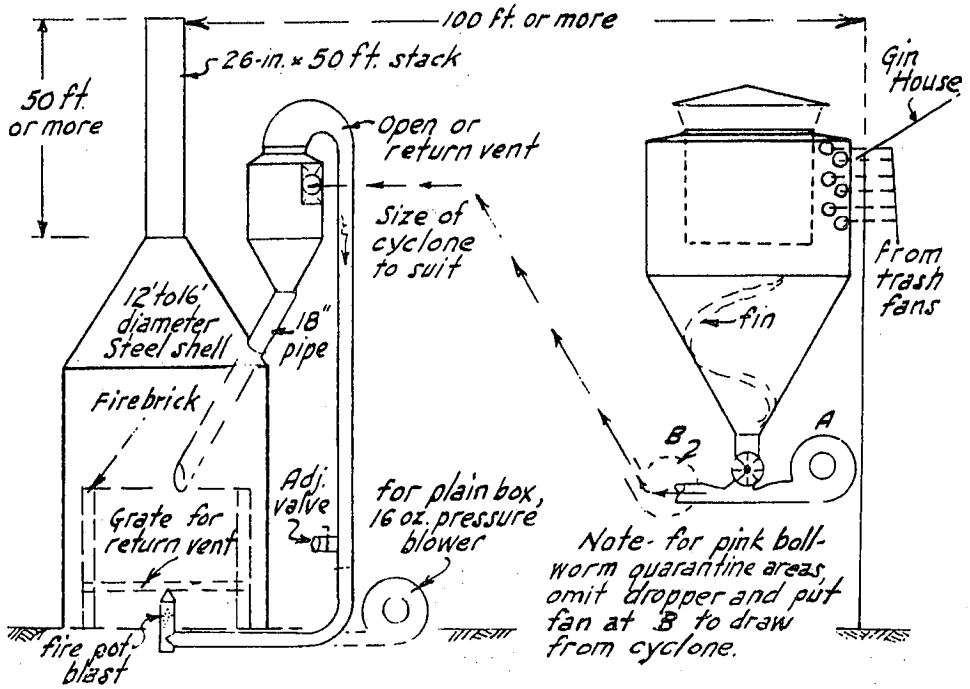


Figure 40.

Schematic diagram of gin trash collections, passage through fan blades, and details of piping.



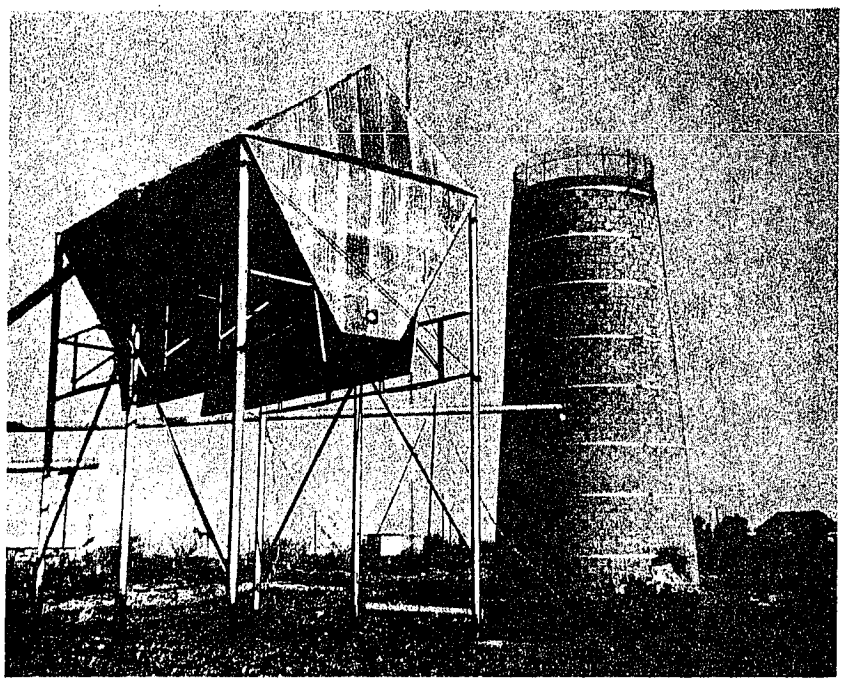


Figure 41.

Diagram of an incinerator designed for burning of gin trash, and photo of overhead bur hopper and 18 ft. I. D. x 40 ft. incinerator. (Courtesy, Reynolds Burner Co.)

Two general methods of incineration and mechanical maceration have, in large measure, overcome the danger of insect infestation present in piles of untreated gin trash. The methods (Figures 40 and 41) resulting from extensive cooperative research between the entomologists and the ginning research engineers of the U.S. Department of Agriculture have been generally adopted by the American cotton ginners. Research at the Southwestern Cotton Ginning Research Laboratory at Mesilla Park, N. Mex., resulted in the development of straight blade fan specifications as to design and operation for obtaining 100 percent kill of pink bollworms in handling gin and oil mill waste.

From 1940 to 1960, numerous improvements of material handling methods were introduced. Spiral conveyors or augers, drag chains, endless belts, pneumatic piping, rotor lifts, bucket lifts, and manual tools --- all have been improved. Distribution of gin trash on fields has helped to eliminate unsightly and dusty trash piles. New designs of elevated bins with dumps to trucks and wagons have been developed for use in hauling the trash from the gin yard. (Figure 43).

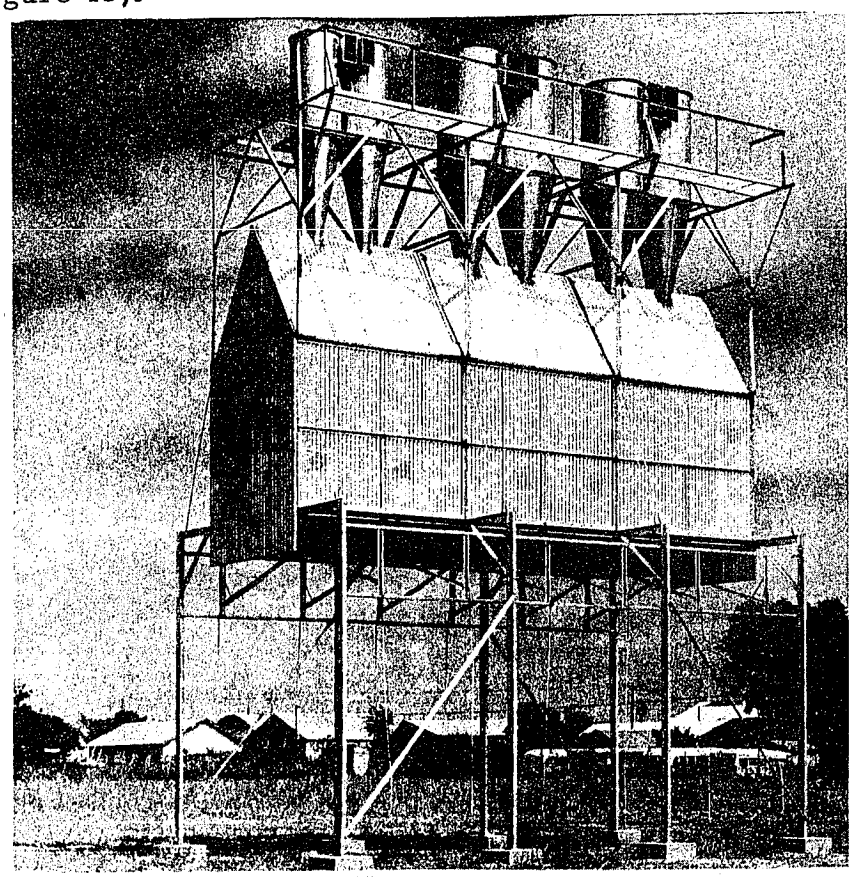


Figure 42.

Gin yard temporary storage. Elevated seed house, with overhead blow pipe or screw conveyor for delivery from the gin, and with dump doors to trucks.

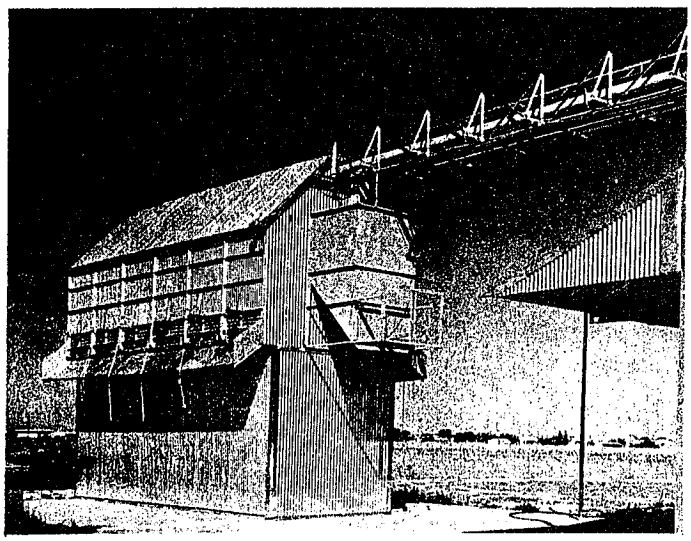


Figure 43.

Elevated trash or bur bin with side and bottom dumps. (Courtesy, Tru-Fab Metal Products Co.)

Augers and rotor lifts (Figure 44) have been very useful for handling cotton seed. (Courtesy, Southwestern Supply and Machine Works).

In ginning areas where it has been the practice for the cotton producer to take home his planting seed, the gin machinery manufacturers have made excellent cyclone storage bins for gin yards. Figure 45 shows an all-metal unit.

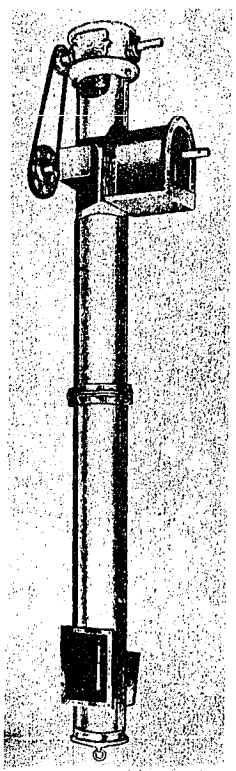


Figure 44.

Rotor Lift Cottonseed Elevator for transferring ginned seed economically to overhead disposals. (Courtesy, Southwestern Supply and Machine Works.

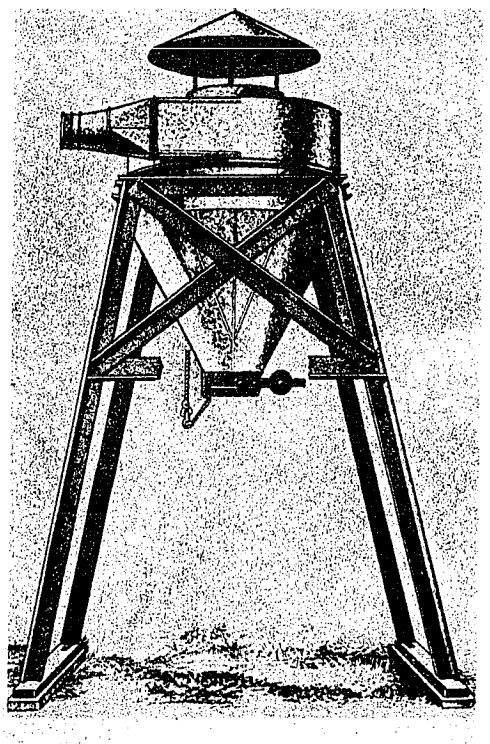


Figure 45.

Modern gin yard all-metal cyclone seed bin for use of their customer. (Courtesy, Lummus Cotton Gin Co.)

Other improvements that have appeared since 1950 are multibale trucks and trailers of demountable types, meshed bodies and special designs for aeration and drying during storage, and better bale cranes.

Selected References

1. Bennett, C. A. Ginning Cotton. U. S. Dept. Ag. Farmers Bul. 1748. 32 pp., illus. 1956

2. Bennett, C. A., and Franks, G.N. Cottonseed Handling with Small Pipes. U. S. Dept. Agr. Cir. 768, 8 pp. (1948, rev. 1953)

3. Johnston, Tom J. Arkansas-Missouri Cotton Ginners' Association. Ginners' Handbook. 159 pp., illus.

4. U. S. Department of Agriculture. Modernizing Cotton Gins. Agr. Handbook 99, 45 pp., illus. 1956.

U. S. Patents

Number	Date	Inventor and Invention
308,790	Dec. 2, 1884	Munger - "B"-box Separator and belt distributor system with suctions.
362,041	Oct. 11, 1887	Sailor - Pneumatic elevator and dropper.
472,607	Apr. 12, 1892	Murray - Pneumatic distributor.
579,081	Mar. 16, 1897	Rembert - Cotton unloading fan.
732,969	July 1, 1903	Stephenson - Suction distributor.
985,037	Feb. 21, 1911	Johnston - Type C Separator with vacuum wheel and single cylinder underneath.
2,225,397	Dec. 17, 1940	Franks - Cotton fan.

CHAPTER III

FEEDERS BETWEEN DISTRIBUTORS AND GIN STANDS

The development of feeders, which began in 1794, took place in four general steps: (1) hand feeding (See Chapter I, Figure 1) directly to the gin front from a basket or flat tray placed on top of the stand; (2) a limited form of mechanized feeding by means of spiked claws or spiked cylinder placed at the front of the tray to kick seedcotton into the roll box; (3) horizontal tray with traveling slatted apron having speed adjustment and a kicker wheel at discharge end (but without cleaner elements); and (4) simple to elaborate horizontal and vertical mechanisms having cleaning cylinders, extracting elements, and drying provisions. The advent of multistand ginning systems in 1884 required mechanized feeding in order to expedite the rate of ginning.

From 1794 to 1860, hand feeding prevailed; although early patents, such as that of Alex Jones in 1834, portrayed a type of mechanical feeding. The U. S. Patent Office lists a gin feeder patent issued in 1826 to O. B. Barnes, but no number is given; evidently, the 1836 Patent Office fire destroyed the descriptions and models.

From 1860 to about 1900, aside from the vertical pneumatic chute of Sailor, the feeders (2) and (3) described above were used principally. In 1860 a patent was granted to S. Z. Hall of Seguin, Texas on a mechanical feeder; and one month later a patent was granted to J. W. Thorn of Courtland, Ala., covering a so-called cotton picker, which was actually a cleaning feeder. However, Thorn obtained a second patent in 1868 on a greatly improved version of his cotton picker. This latter invention was chosen by Munger for his 1884 cotton gin (Figure 46).

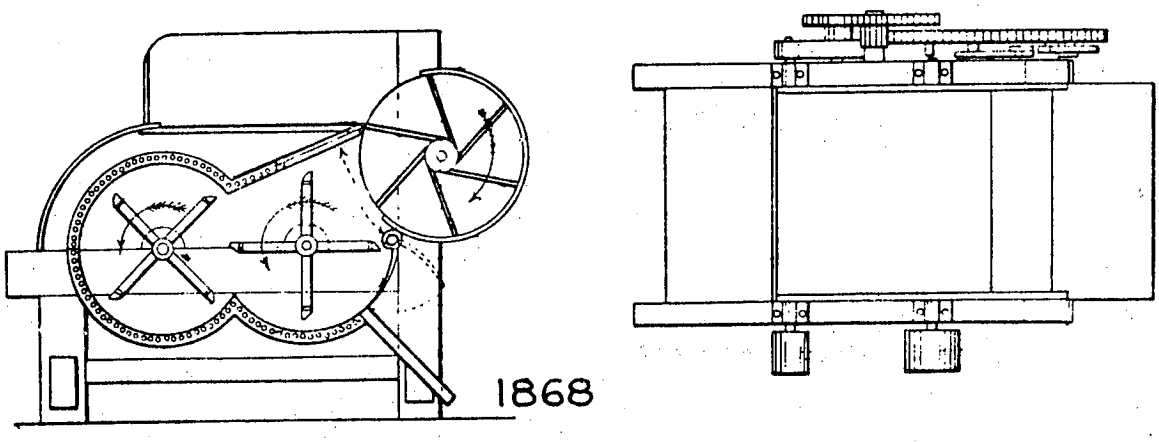


Figure 46.

J. W. Thorn's 1868 cleaning feeder. (U. S. Patent No. 74,776, Feb. 25, 1868).

The late John Streun told the writer that Munger had used the Thorn feeder for several years, and Streun found the drawings of the 1860 patent. However, after careful patent search in Washington, the writer found the 1868 patent, which convinced him that Munger would have used it in preference to the 1960 feeder.

The forms that followed the Thorn feeder from 1889 to 1903 are shown in Figure 47.

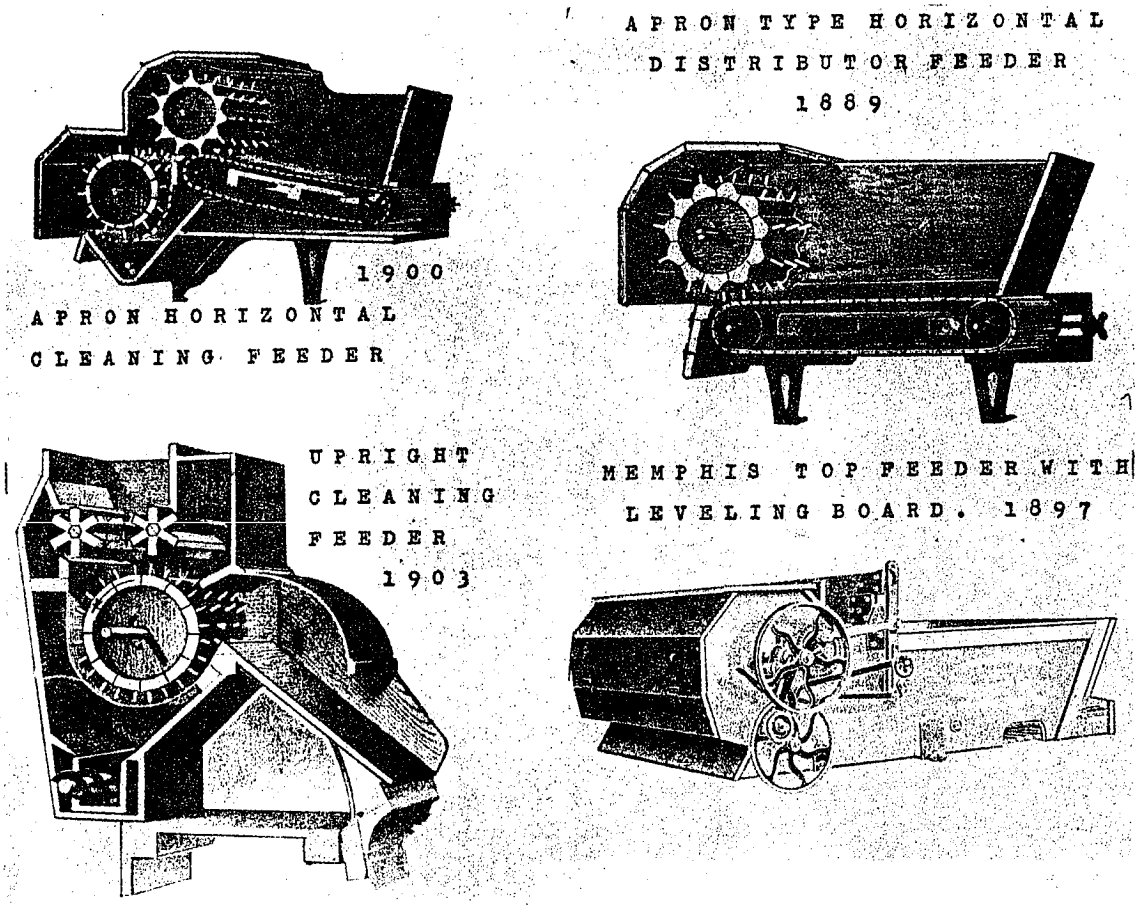


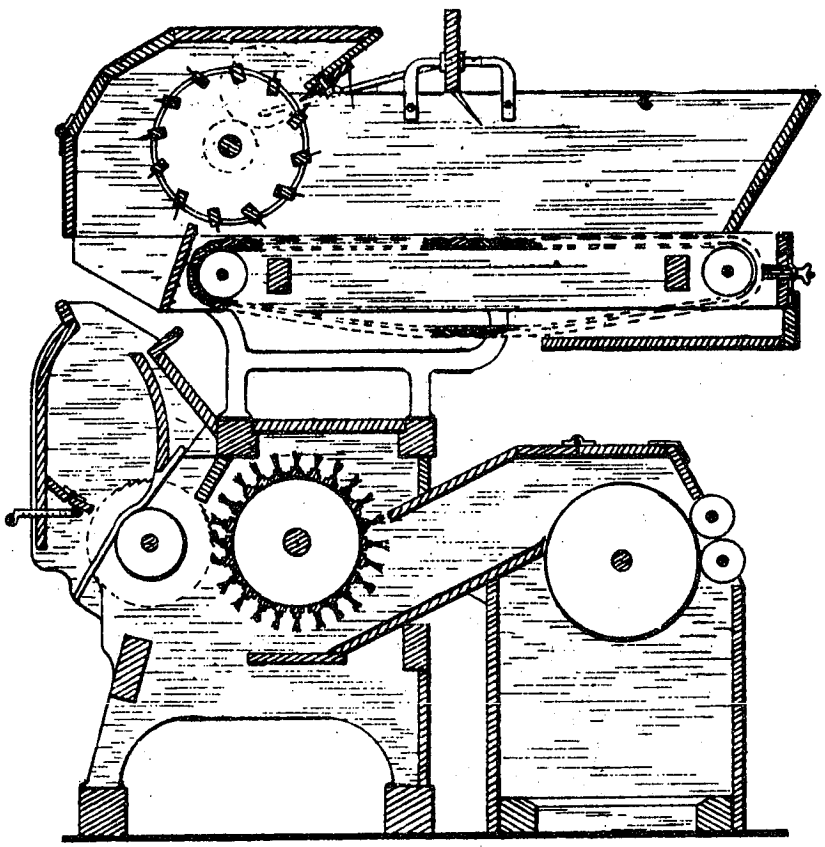
Figure 47.

Examples of feeder developments 1889 to 1903.

A patent dated Sept. 10, 1872, issued to L. Z. Hall of Singsing, N. Y. probably was for the first complete flat apron feeder. After 1900, much attention was given to improving feeder cleaning and to rate of feed controls. Figure 48 on the following page shows the feeder devised by Jeremiah W. Smith, of Atlanta, Ga., in 1891.

Figure 48.

1891 Cotton Gin Feeder of J. W. Smith, U. S. Patent No. 464,483, of Dec. 1, 1891.



The turn of the century, 1899-1900, was a milestone in the introduction of overhead bulk air line and gravity type cleaners, as well as improvements in feeders. These will be discussed in Chapter IV; they are nentioned here because of their concurrentness in the history of ginning. While slightly out of line chronologically, there was a trend toward combining overhead cleaning and separators. This trend is portrayed in Figure 49, on the following page.

The 1902 vertical, small-drum cleaning feeders clearly reflected the departure of the ginning industry from flat to vertical cleaning features.

From 1910 to 1930, small-drum feeders became popular. Various front and rear attachments were devised to increase their effectiveness and also to compete with big-drum cleaning feeders that were coming into use. (Figure 50 on page 35).

Figure 49.

Improved (1926) combined separator and overhead cleaners (air line and gravity) in one assembly. (Courtesy, Continental Gin Co.)

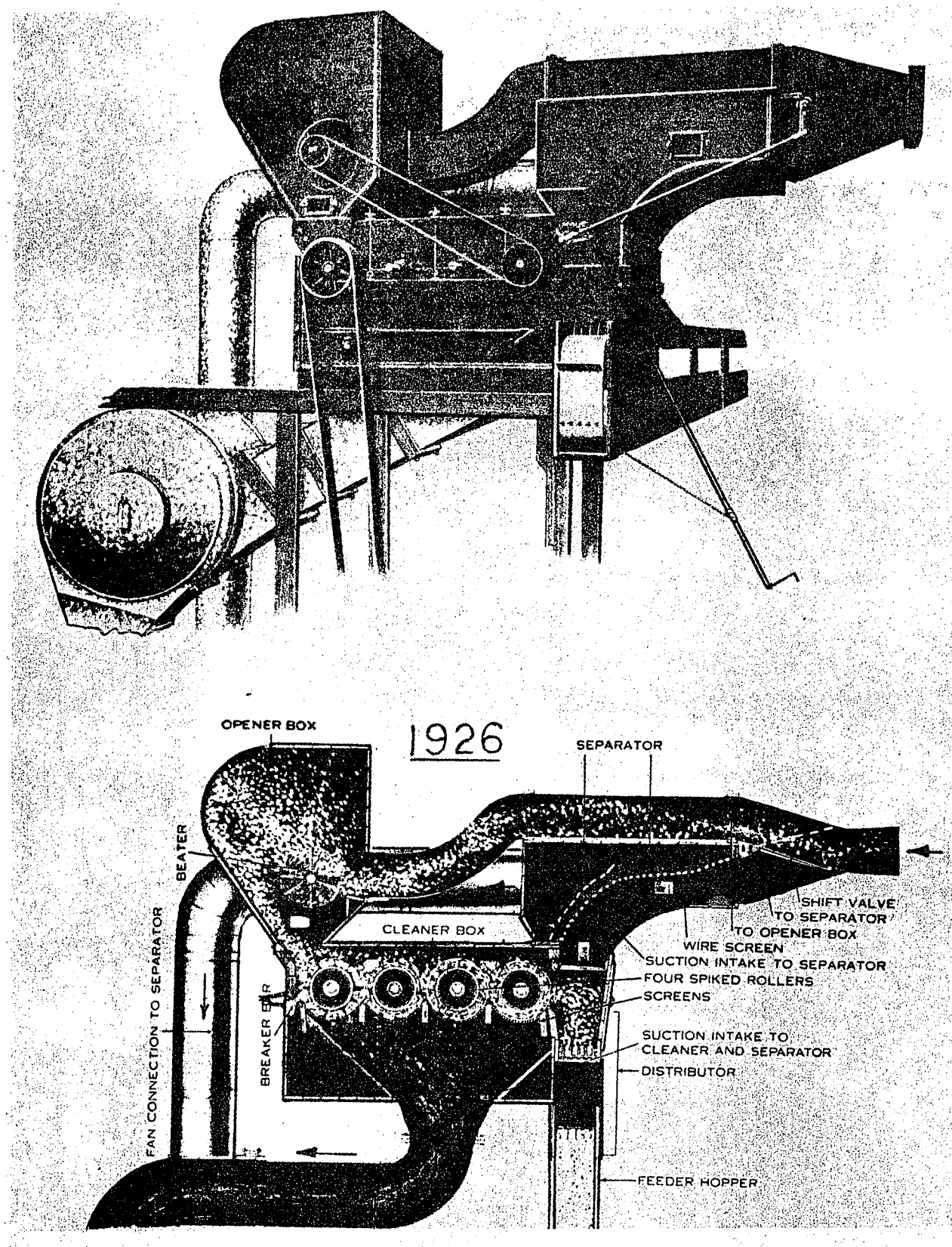
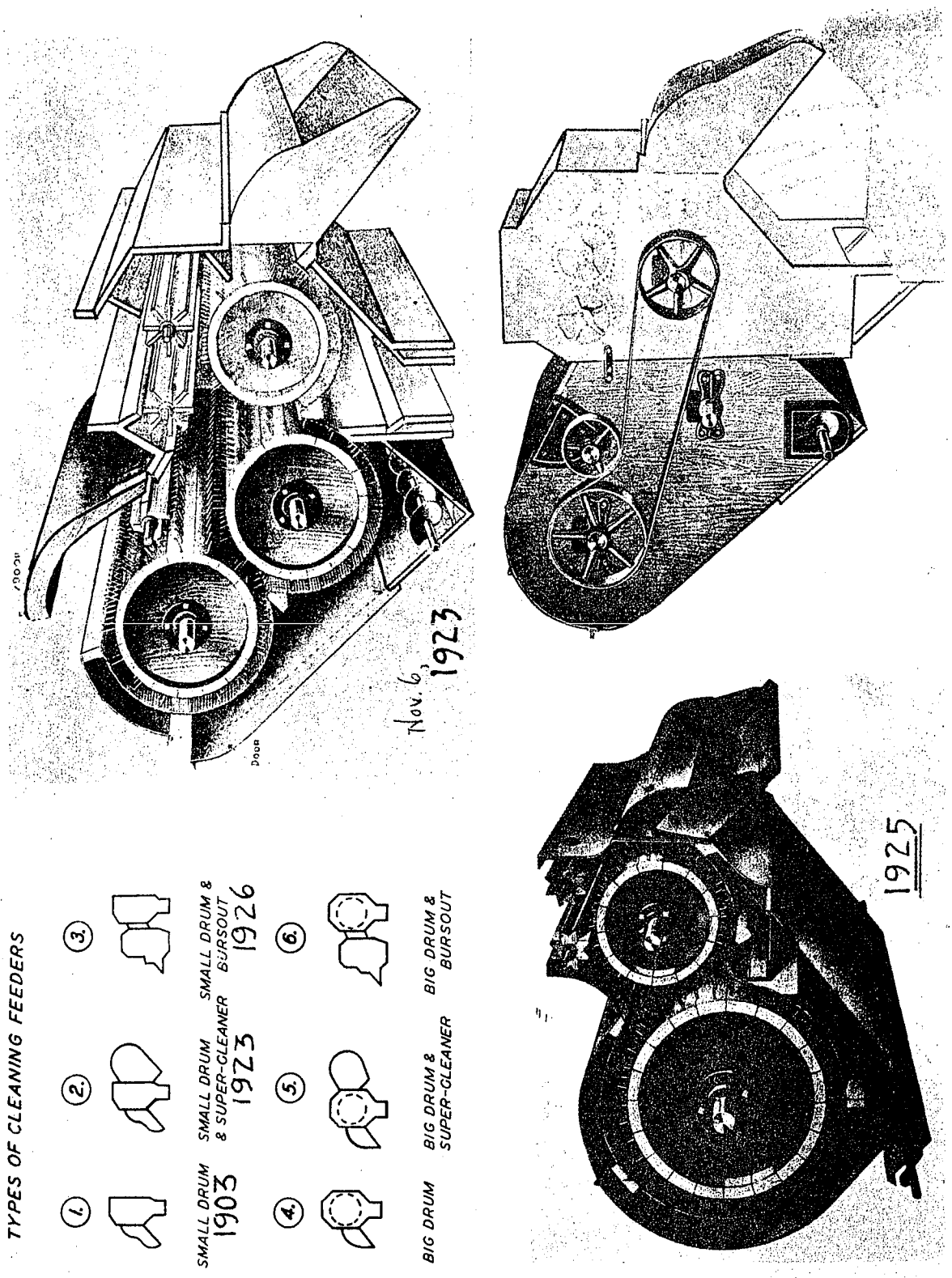


Figure 50.

Examples of feeder attachment designs used between 1910 and 1925.



Four types of feeders used by the U. S. Cotton Ginning Research Laboratory are shown in Figure 51. They represent improvements made between 1920 and 1930.

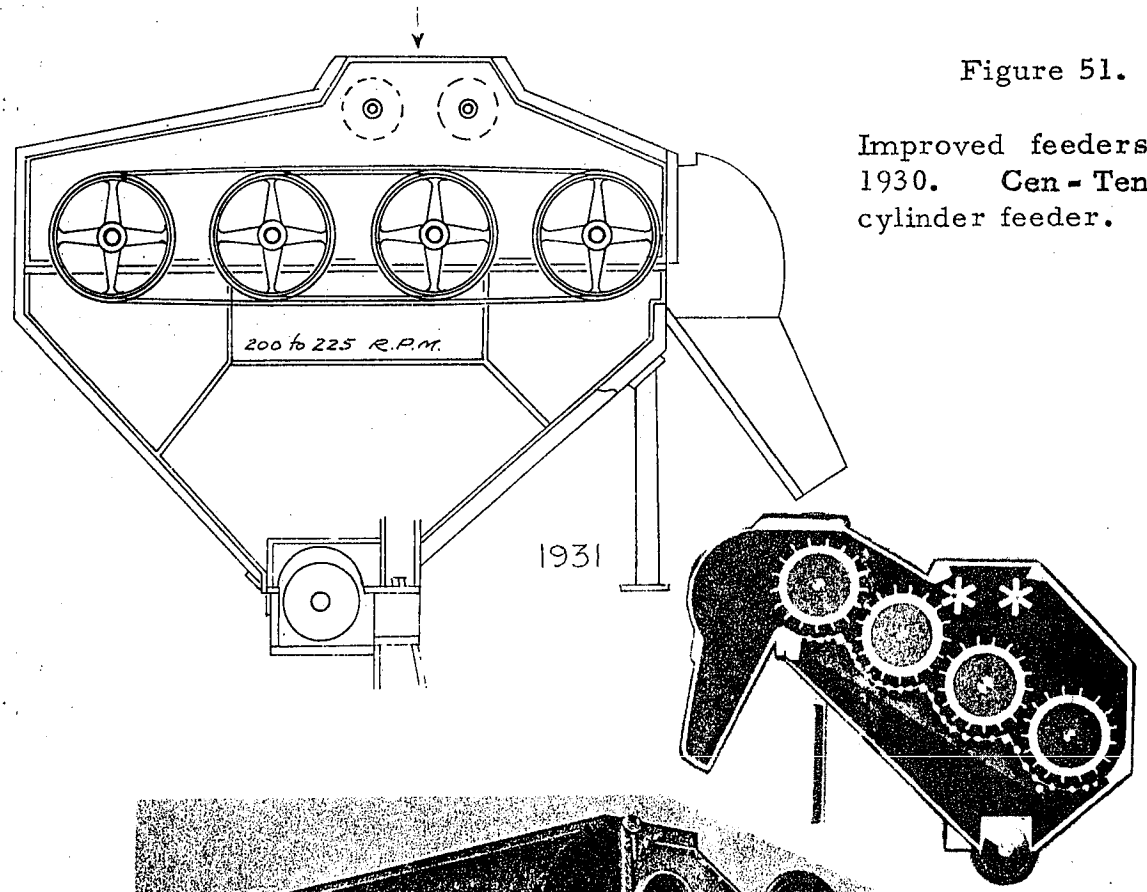


Figure 51.

Improved feeders 1920-1930. Cen-Tennial 4-cylinder feeder.

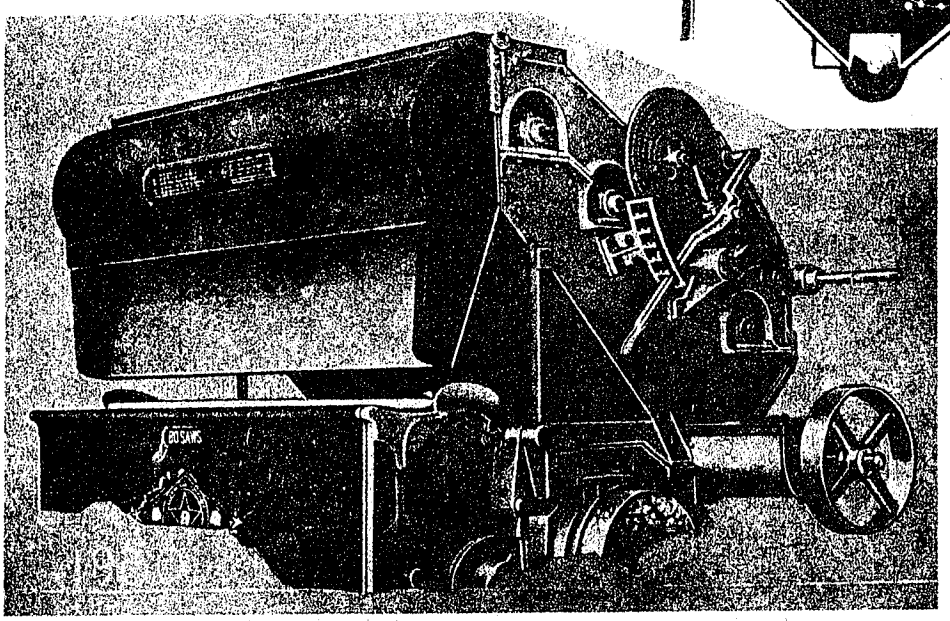


Figure 52.

Improved feeders, 1920-1930. Lufkin 4-cylinder feeder.

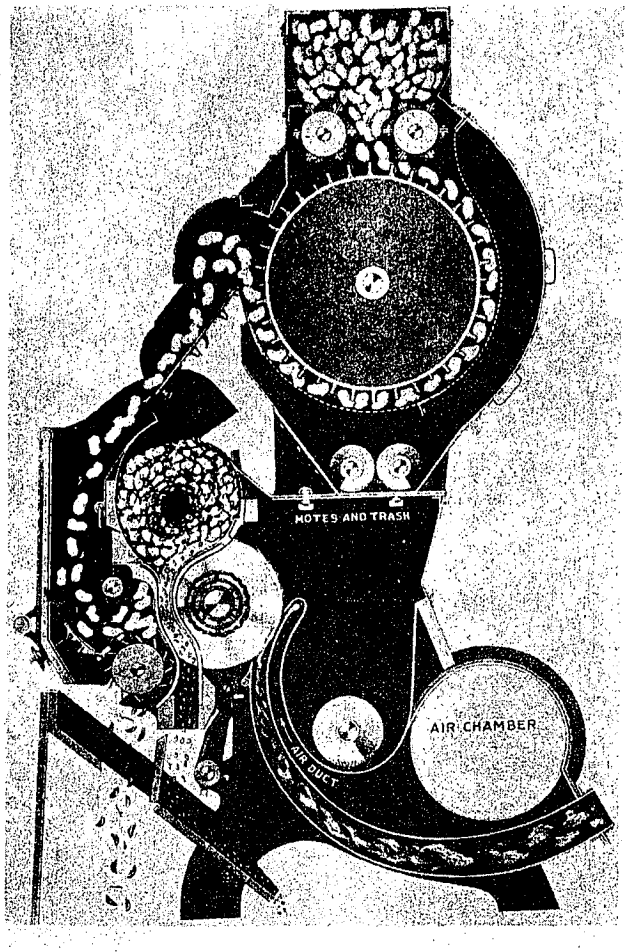


Figure 53.

Improved feeders, 1920-1930. Murray big-drum feeder.

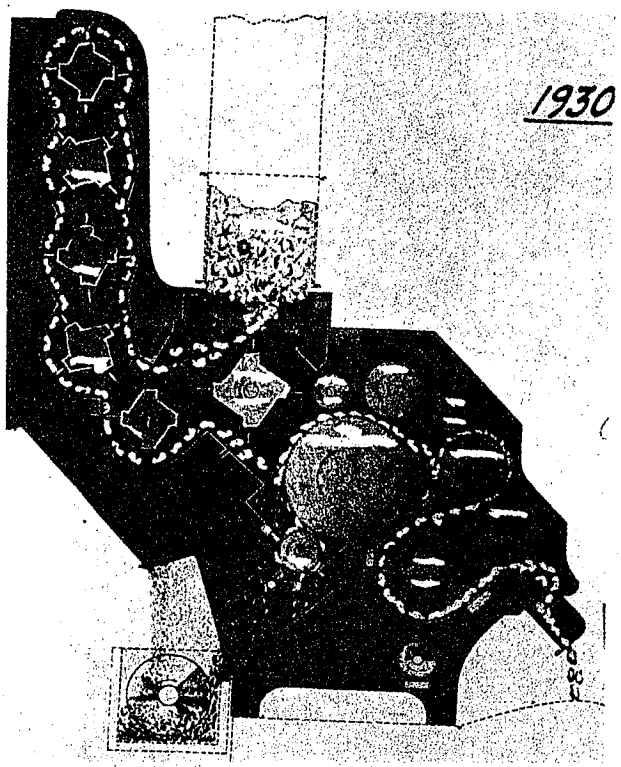


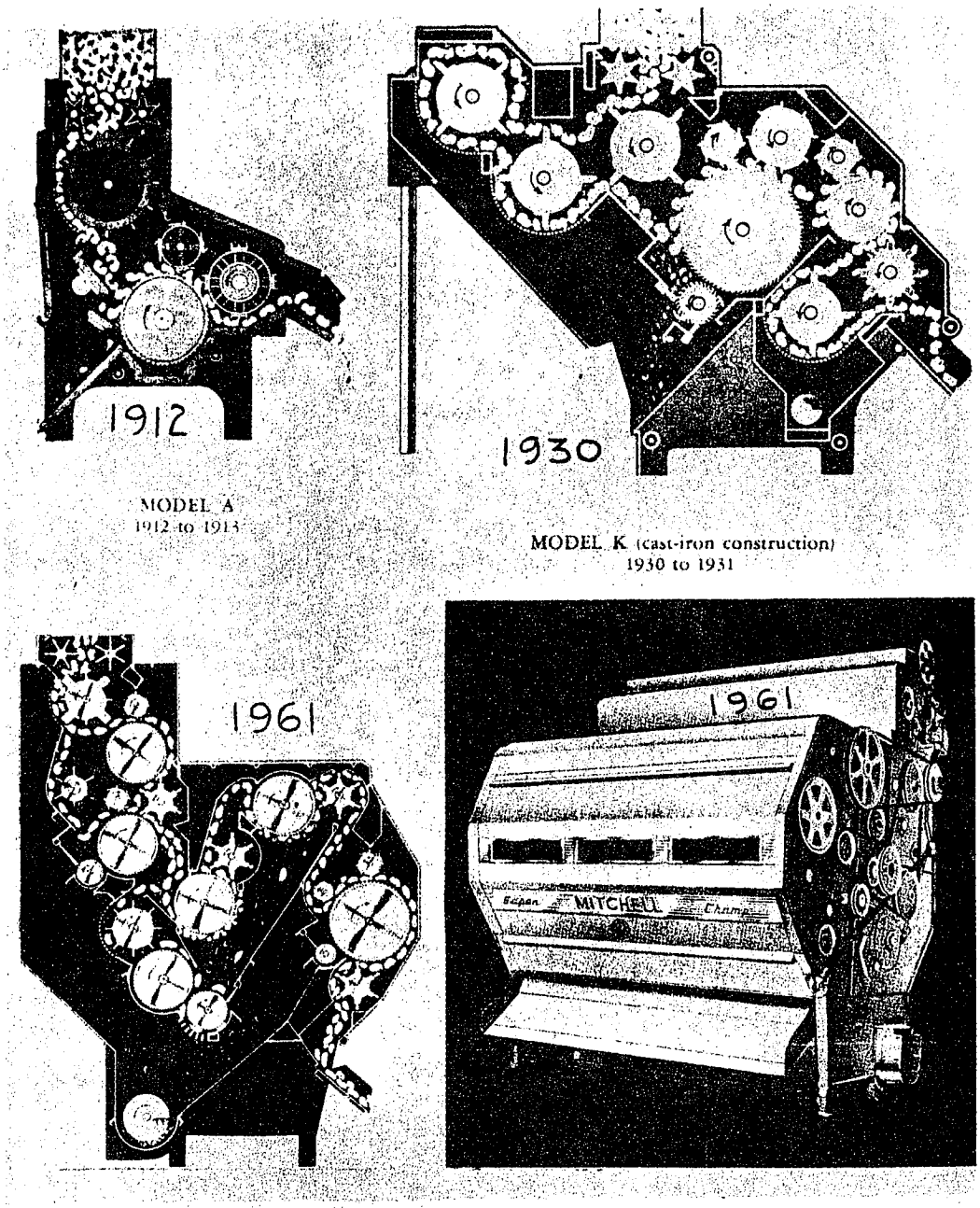
Figure 54.

Improved feeders, 1920-1930. Mitchell 1930 F.E.C. feeder.

In 1912 the late John E. Mitchell, Sr., developed the first of a long line of cotton gin feeders that introduced extracting elements as well as improved cleaning into the feeder action. This development stimulated competition among the machinery manufacturers. From that date to 1961, several hundred patents were granted to Mitchell, his sons, and factory associates. Three of these feeders (Figure 55) were patented between 1912 and 1939.

Figure 55.

Examples of the Mitchell patented extractor feeders: 1912 Model A "Alsop"; 1930 Model "K"; and 1961 Model "Super Champ".



MODEL A
1912 to 1913

MODEL K (cast-iron construction)
1930 to 1931

A number of different makes of feeders are shown in Figures 56 to 59.

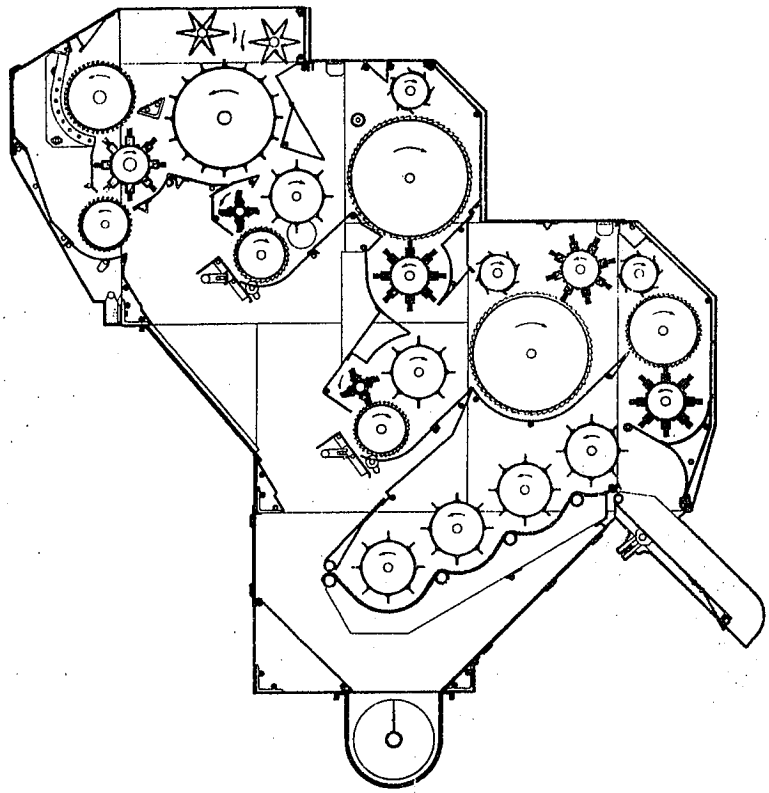
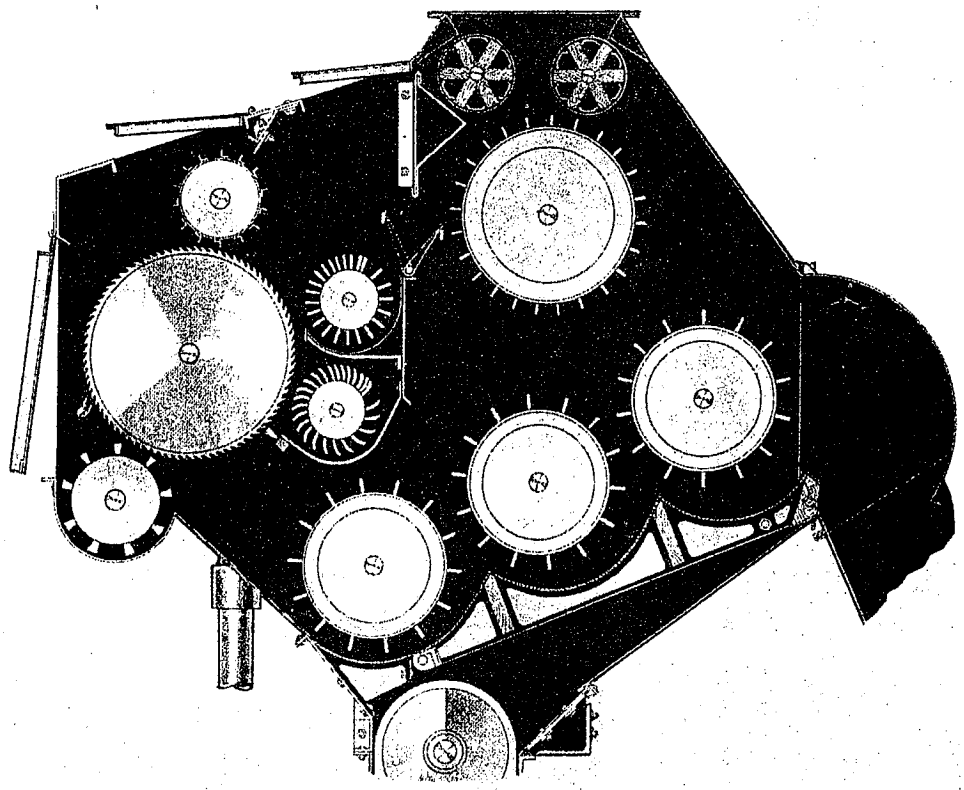


Figure 56.

Perfection feeder, 1960, with stick-remover-attachment. (Courtesy, Continental Gin Co.)

Figure 57.

Cen-Tennial extractor feeder. (Courtesy, Cen-Tennial Cotton Gin Co.)



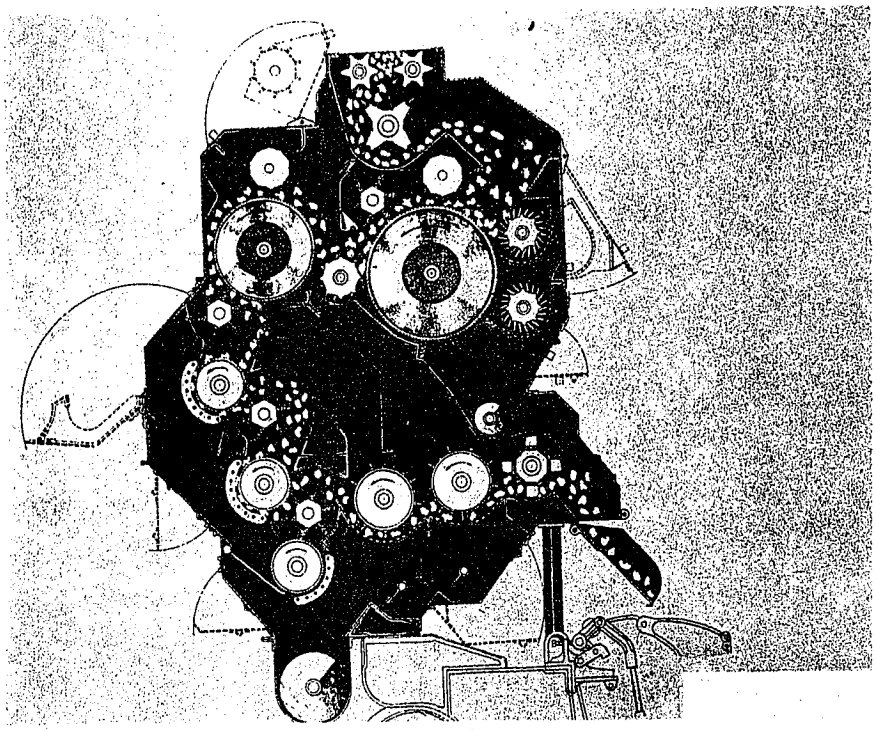


Figure 58.

Special Huller Feeder with stick extractor section. (Courtesy, Hardwicke-Etter Co.)

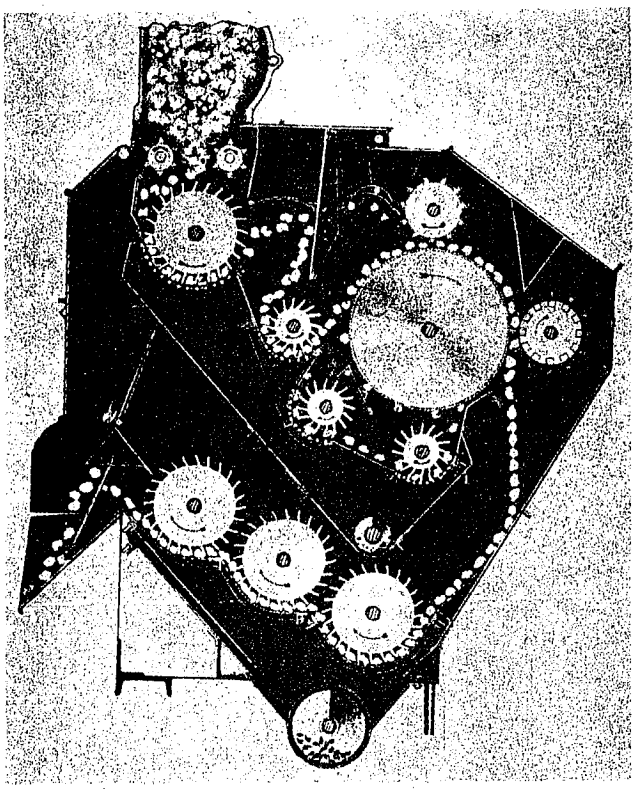


Figure 59.

Master Extractor Feeder. Type MEF. (Courtesy, Lummus Cotton Gin Co.)

The feeders shown in Figures 60 - 63 may not be the latest equipment made by the manufacturers, but are included for their historical interest and special design. No endorsement of the equipment as to quality or performance is intended.

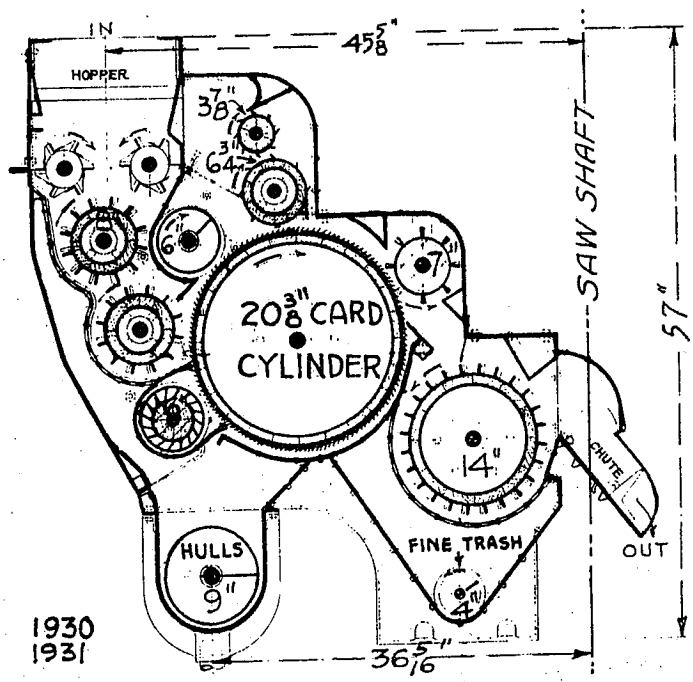


Figure 60.

The Blewett **Extractor** - Cleaner - Feeder of 1930-31. (Courtesy, The Murray Co. of Texas, Inc.)

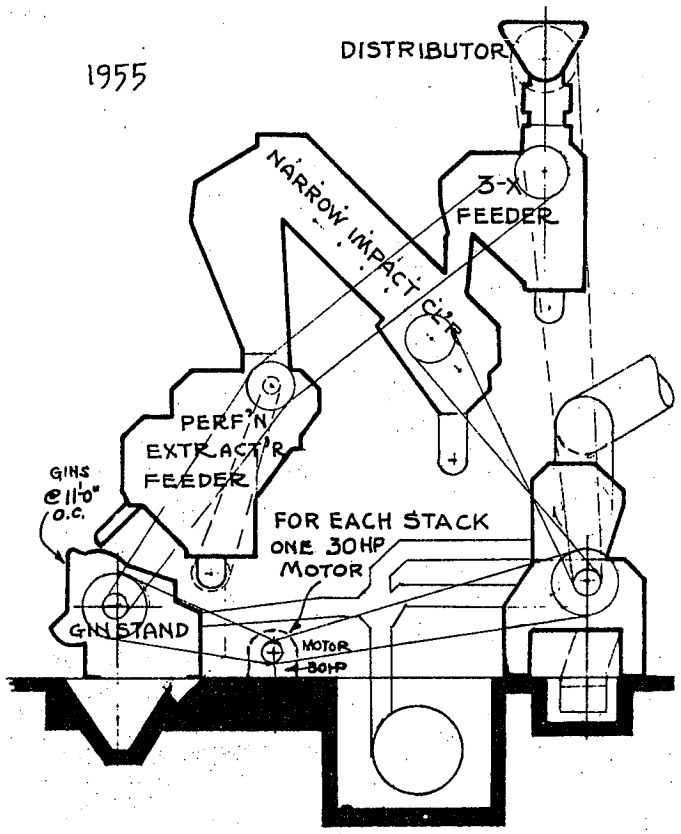


Figure 51.

A 1955 stack of three kinds of feeder-cleaner-extractors per gin stand. (Courtesy, Continental Gin Co.)

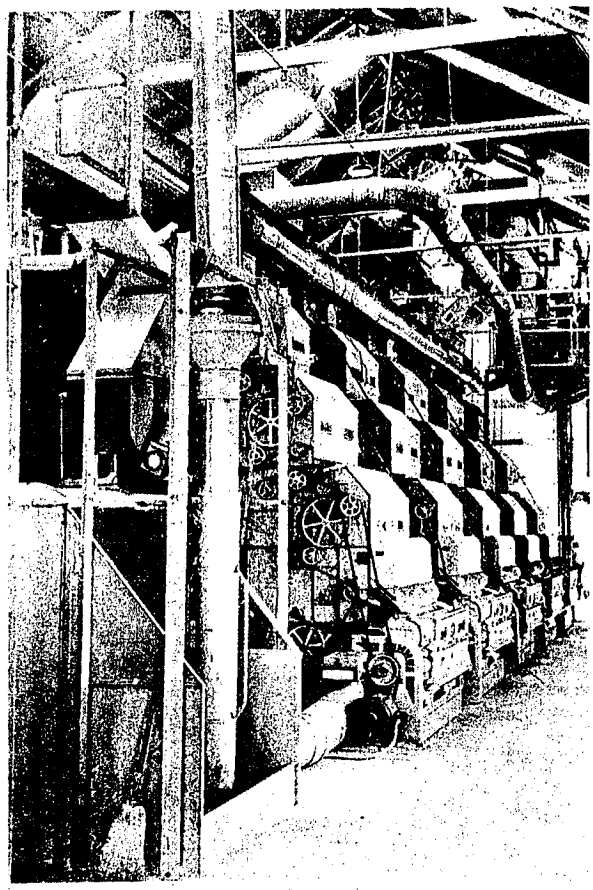


Figure 62.

Stack of extractor feeder units in a 5-stand gin, 1956. (Courtesy, Lummus Cotton Gin Co.

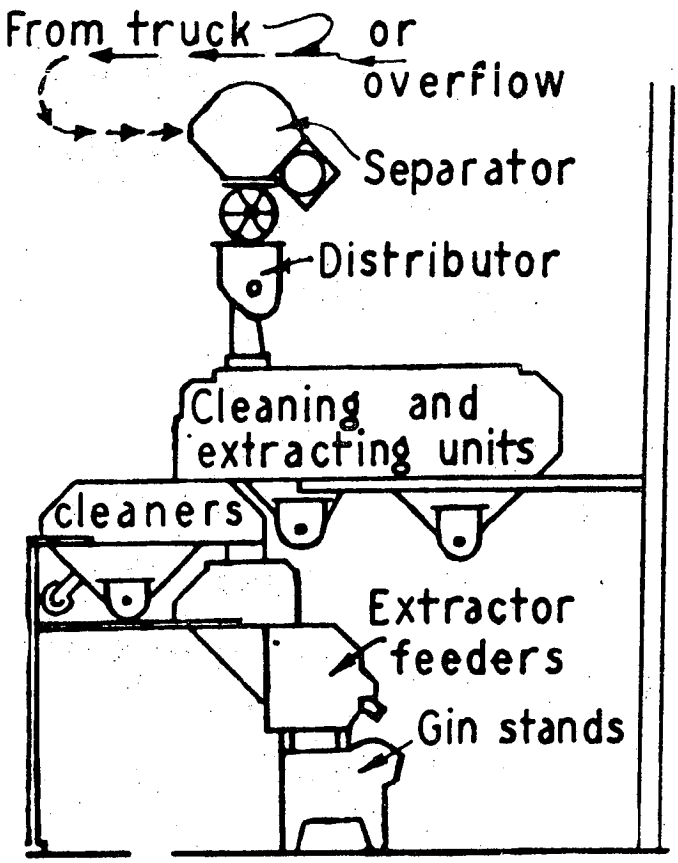


Figure 63.

Stack of unit extractor-cleaner feeders of 1956. (Courtesy, The J. E. Mitchell Co.)

Selected references and a tabulation of a few U. S. patents covering gin stand feeders are given at the end of this chapter.

In addition to the references listed, cotton trade literature in the form of brochures, catalogs, and special folders issued by the cotton ginning machinery manufacturers of the United States are available.

Selected References

1. Bennett, C. A. Modernizing Cotton Gins. U. S. Dept. Agr. Handbook 99, 45 pp., illus. 1956.

2. Bennett, C. A. Cotton Ginning. U. S. Dept. Agr. Farmers' Bul. 1748, 32 pp., illus. 1956.

3. Bennett, C. A. Roller Cotton Ginning Developments. Texas Cotton Ginners' Journal and the Cotton Gin and Oil Mill Press. 90 pp., illus. 1959.

4. Bennett, C. A. Saw and Toothed Cotton Ginning Developments. Texas Cotton Ginners' Journal and the Cotton Gin and Oil Mill Press. 80 pp., illus. 1960.

5. Bennett, C. A., Baggette, T. L., and Gerdes, F. L. Modernizing Cotton Gins. U. S. Dept. Agr. Farmers' Bul. 1802, 51 pp., illus. 1939.

6. Bennett, C. A., and Gerdes, F. L. Ginning Cotton, U.S. Dept. Agr. Farmers' Bul. 1748 (revised). illus.

7. Johnston, T. J. Cotton Ginners' Handbook. Arkansas - Missouri Cotton Ginners' Association. 159 pp.

8. Meloy, G. S. Cotton Ginning. U. S. Dept. Agri. Farmers' Bul. 1465, 27 pp., illus. 1925.

There are many patents on feeders issued since 1826. The following list, selected from many that were examined in the U. S. Patent Office is, submitted as historically important mileposts from 1826 to 1929. No attempt has been made to list feeder patents since 1929.

Partial List of Significant U. S. Patents

Issued on Cotton Gin Feeders, 1826 - 1929

Year	Number	Inventor	Remarks
1826	None	Barnes	Beaufort, S. C., Gin feeder
1830	None	Simmons	Cotton whipper and cleaner
1854	12,091	Clark	Cotton gin feeder and seed cleaner
1860	29,968	Hall	Belt and spike drum gin feeder
1860	30,435	Thorn	2-cylinder gin feeder
1868	74,776	Thorn	...(see Text, Figure 46)...
1871	117,074	Haggett	Hooper and claw-cylinder feeder
1872	131,163	Hall	Horizontal basket feeder
1875	162,371	Flynn	Horizontal basket feeder
1876	176,601	Craven	Horizontal basket feeder
1876	176,680	Wright	Horizontal basket feeder
1876	177,199	Brown	Horizontal basket feeder
1876	179,908	Webb	Horizontal basket feeder
1877	186,804	Crowson	Horizontal basket feeder
1878	202,238	Crowson	Horizontal basket feeder
1879	220,336	Brown	Horizontal basket feeder
1880	235,414	Crowson	Horizontal basket feeder
1887	362,041	Sailor	...(See text, Figure 30)...
1891	464,483	Smith	...(See text, Figure 48)...
1892	472,607	Murray	...(See text, Figure 47)...
1912	1,030,913	Mitchell	...(See text, Figure 54)...
1923	1,473,059	Streun	...(See text, Figure 49)...
1926	1,610,222	Streun	...(See text, Figure 49)...
1929	1,732,550	Blewett	...(See text, Figure 60)...

CHAPTER IV

BULK CLEANING, EXTRACTING, DRYING, AND CONDITIONING AND MOISTURE MEASURING

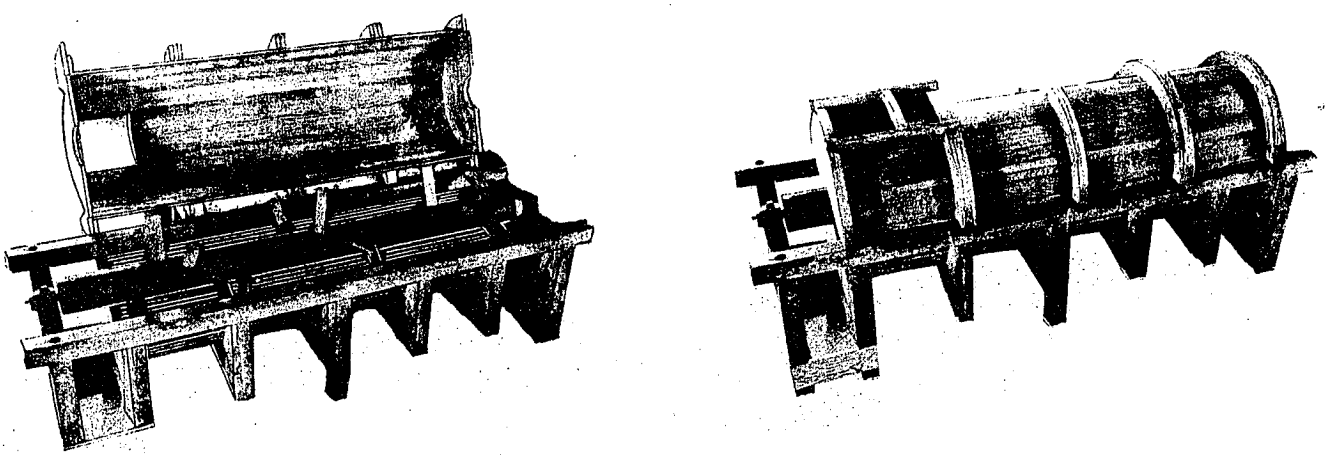
Prior to 1884, the cleaning processes for seedcotton were confined largely to hand sorting and primitive whipping. Some cleaning of fine trash also resulted from the use of mechanical feeders, from the roll box, and from moting. Beginning about 1860, improvements made in the gin breasts, or fronts, helped in removing some leaf parts, sticks, stems, and hulls, especially after single and double rib stands had come into use. "Extracting" removed coarse foreign matter by toothed carding processes that do not require the use of screens or grids.

As shown previously, the 1884 introduction of "system" or battery ginning with mechanical delivery of seedcotton to all stands resulted in the development of apparatus to supplement the limited overhead grid or screen cleaning by the separators and the small feeders. The 1868 model of the Thorn feeder, first called a cotton picker, comprised two beater cylinders with concave screens and ratchet feeding devices to regulate the flow of the cotton. Following this development, beater cylinders became known as cleaners.

According to U. S. patent records, the cotton cleaning and extracting principles were first developed with bulk treatments in mind, but the ginning industry made its earliest advances in feeder improvements. Thereafter, the bulk cleaning and extracting improvements progressed to the point where they now precede the feeders in the line of cotton flow through the ginning system.

Figure 64.

The Blakely, Miss., power-driven, wooden cleaner for seedcotton now at the U. S. Cotton Ginning Research Laboratory at Stoneville. It was loaned to the Laboratory by the Major Blake family in 1930.



Bulk Cleaning

Roller and saw gins utilized whipper or beater cleaners with concave grids long before "system" ginning began. In 1840, at the Blake Plantation a few miles north of Vicksburg, Miss., a negro ginhand constructed the beater shown in Figure 64 on the preceding page. It was driven by steam engine and may be the oldest power operated cotton cleaner in existence in this country.

For system ginning, beater cleaners of air-sealed construction early came into use in the air line through which the seedcotton was conveyed from the bins or telescopes to the separators. Types developed and used between 1900 and 1950 are shown in Figure 65.

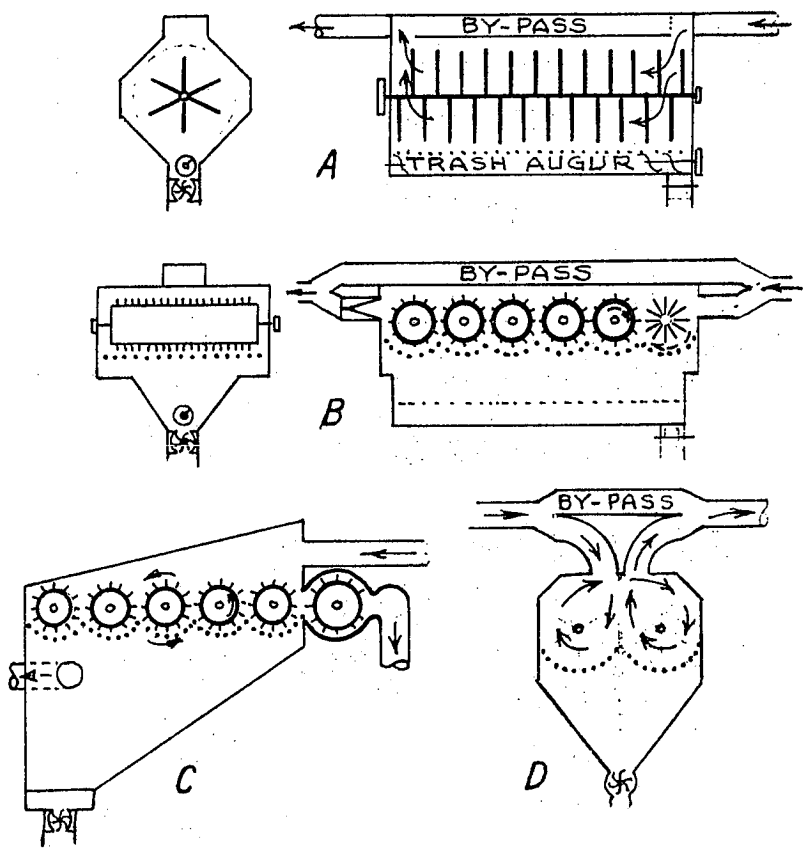


Figure 65.

Diagram of air line bull- cleaners. In some instances, as seen here, the air line cleaner and separator were combined. (Courtesy, U. S. Department of Agriculture).

An interesting invention in this field that was never extensively used was that covered by U. S. Patent No. 1,011,015, issued to C. R. Benefield of Memphis, Tenn., in 1911. (See Figure 66 on following page).

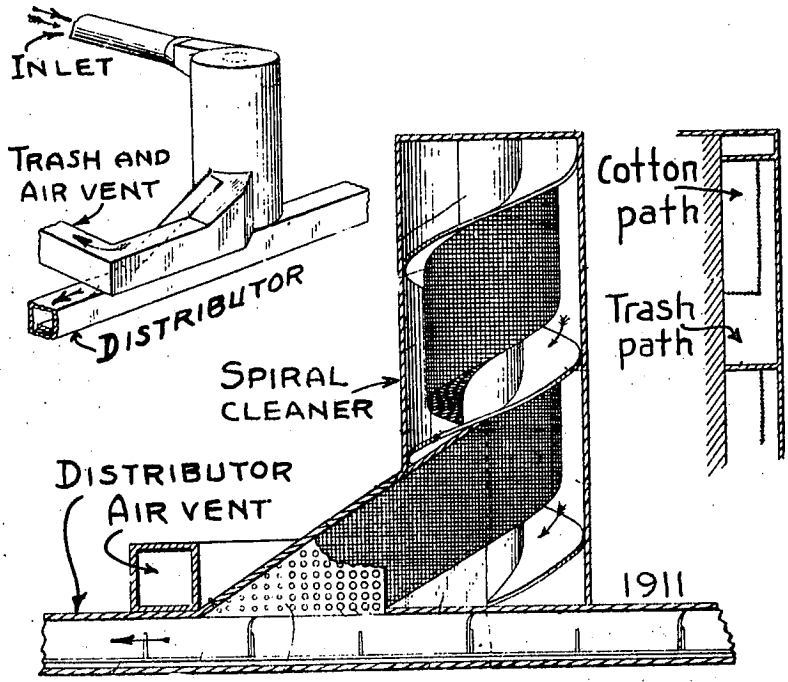


Figure 66.

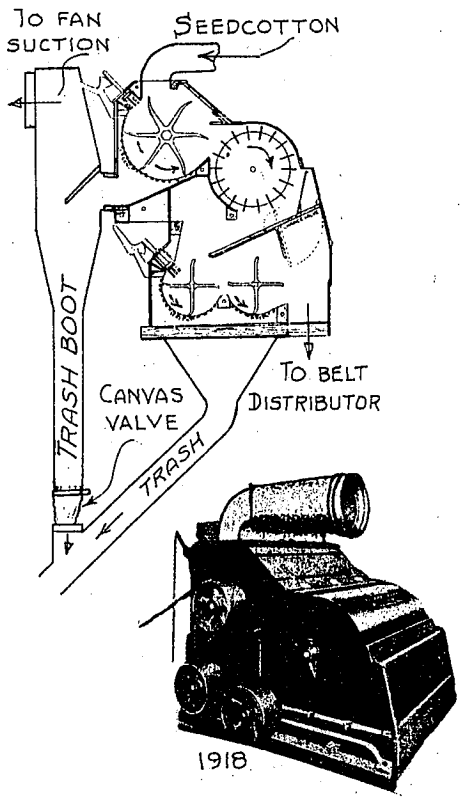
The 1911 invention of C. R. Benefield. This was a spiral duct, downflow, air line cleaner and separator which used the belt distributor as its air seal. Vertical grids were used in lieu of screen.

Another type of air line cleaner, the Rodgers cleaner, came into popular use in Mississippi about 1918. (Figure 67.)

Figure 67.

Rodgers 1918 overhead bulk cleaner, boll-breaker, and separator, with a spider-arm, sealed air line cleaner cylinder, vacuum wheel, and second cylinder.

Seedcotton cleaners positioned outside the air line became known as gravity cleaners, since they did not obtain air current assistance. By 1911, gravity type overhead bulk cleaners began to be developed to satisfy the demand for more cylinders than were then used in the air line units. Heretofore, the cylinders had usually been single and in axial line with the flow of the suction currents. As gravity cleaners became popular, air line cleaners were improved by placing their cylinders at right angles to the line of airflow.



THE RODGERS COTTON CLEANER

Examples of the 1911-1927 gravity cleaners patents are shown in Figure 68.

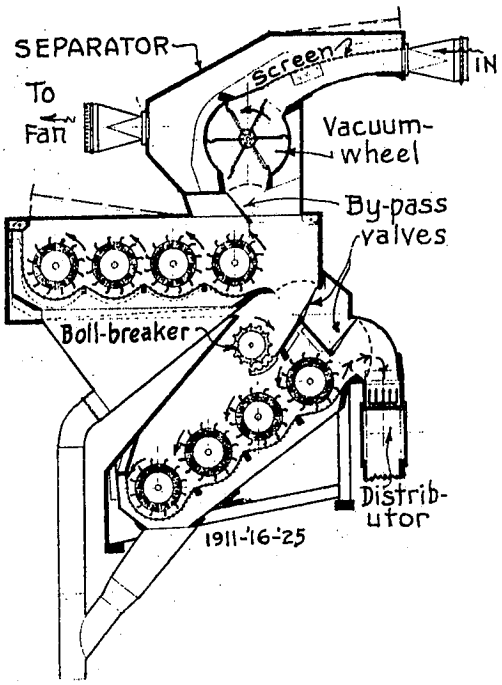


Figure 68.

1927 model gravity cleaner assembly with separator and horizontal and inclined units. (Courtesy, The GullettGin Co.).

Figure 69 illustrates the end views of the cleaning cylinders, in use or developed between 1927 and 1957.

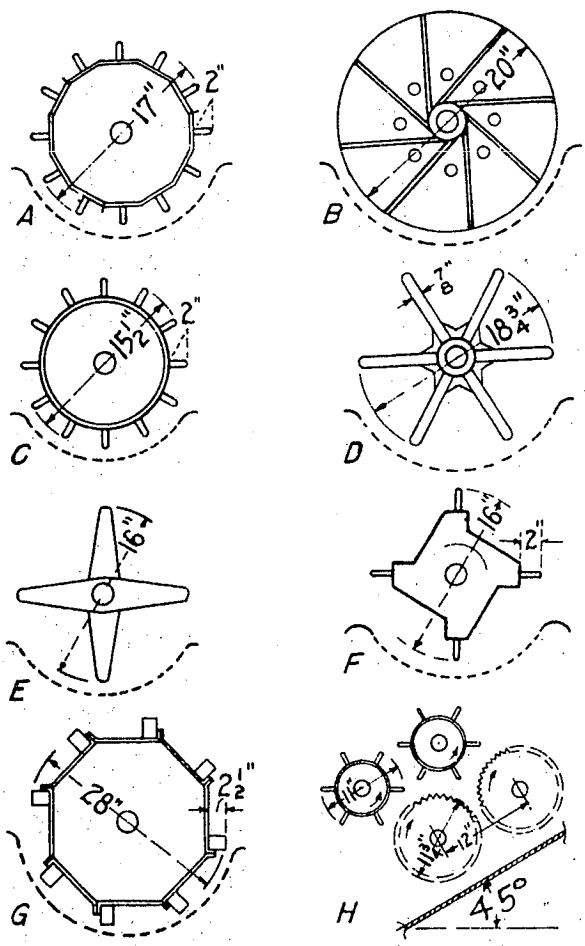


Figure 69.

Diagrams of end views of typical bulk seedcotton cleaner cylinders, some of which are still in active production. (Courtesy, U. S. Department of Agriculture.)

There were many different designs of the cylinders and spikes. "Spider" cylinders with forward pitched, backward pitched or straight tips, and fan-type cylinders with straight blades have been successful. In areas where harvesting is rough, cleaners have employed a spider-arm type of cylinder in the first position to break up and open the locks. Other designs of cylinders are used to complete the job.

In the United States, the working widths of gravity cleaners and the approximate spiked surface lengths of the cylinders that are at right angles to the lines of flow vary from 36 to 108. Cylinder tip speeds range from 1,300 to 2,600 feet per minute; and the number of cylinders per cleaner range from 1 to 24.

Other devices, known as traps, are placed in the suction line ahead of cleaning equipment to remove rocks, tramp iron, and green bolls for protection of the machinery. So-called rock traps have been used in the American gins since the introduction of pneumatic methods of conveyance in air ducts. Manufacturers of ginning machinery have from time to time brought out variations in forms of gravity traps. Some have been dead-end receptacles in the form of tees; others placed at the lower bends in the piping have been pockets across which light materials could be airborne while rocks and metals were trapped.

Magnets in modern gins are positioned to collect damaging ferrous materials during air flow, and the above mentioned rock traps are used to remove heavy nonmagnetic articles. In 1955, G. N. Franks and A. Clyde Griffin at the U. S. Cotton Ginning Research Laboratory made a contribution toward devising a satisfactory trap for green bolls. This method, and that of magnetic devices, are shown in Chapter VI.

Some significant inventions in the art of bulk cotton cleaning and extracting between 1875 and 1950 are listed at the end of the chapter for historical reference. The term "separator" in the patent nomenclature is somewhat confusing because it implies cleaning rather than dropping.

Before considering the development of bulk extracting, it should be noted that certain hybrid types of machines have been invented that combine cleaning and extracting principles very effectively in the bulk handling of seed-cotton before the feeders begin their work. Two examples of these combined cleaner-extractors are shown in Figures 70 and 71.

Following extensive research and tests by Wright, Merkel, and Franks at the U. S. Cotton Ginning Research Laboratory, an important public patent (No. 2,580,451, Jan. 1, 1952) was granted to Gerald N. Franks. It was promptly referred to as a "stick remover", and its principles were freely adopted by the machinery manufacturers. Its "sling-off" principles were applicable in many ways, and issuance of a number of private patents followed.

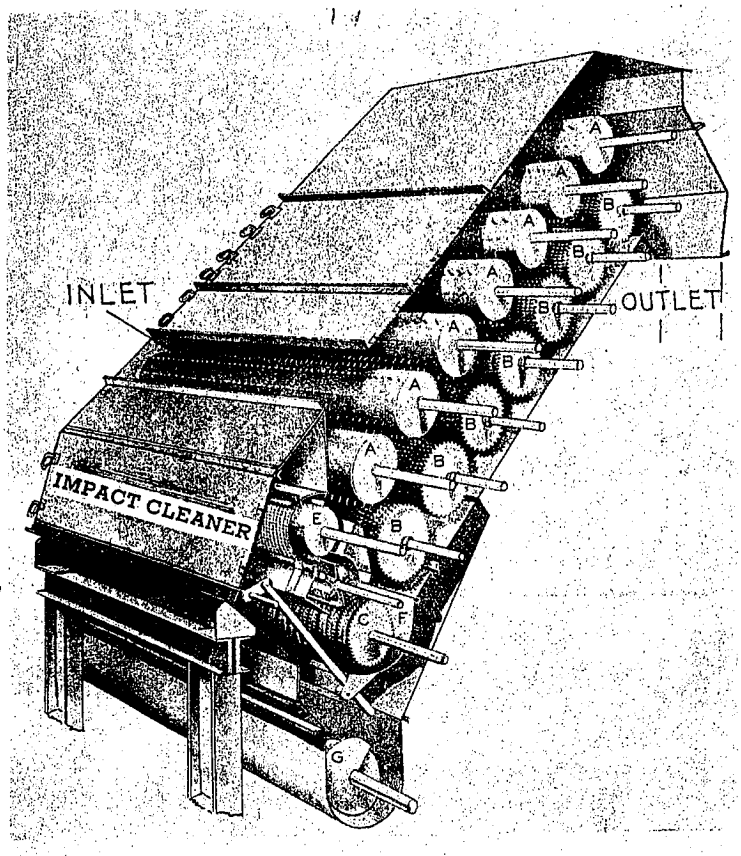


Figure 70.

The 1944 Deems - McDaniel "Impact Cleaner". A, spiked drums; B, serrated disks; C, reclaimer saws; D, reclaimer brush; E, return roller; F, adjustable hull pan; and G, trash conveyor.(Courtesy, Continental Gin Co.).

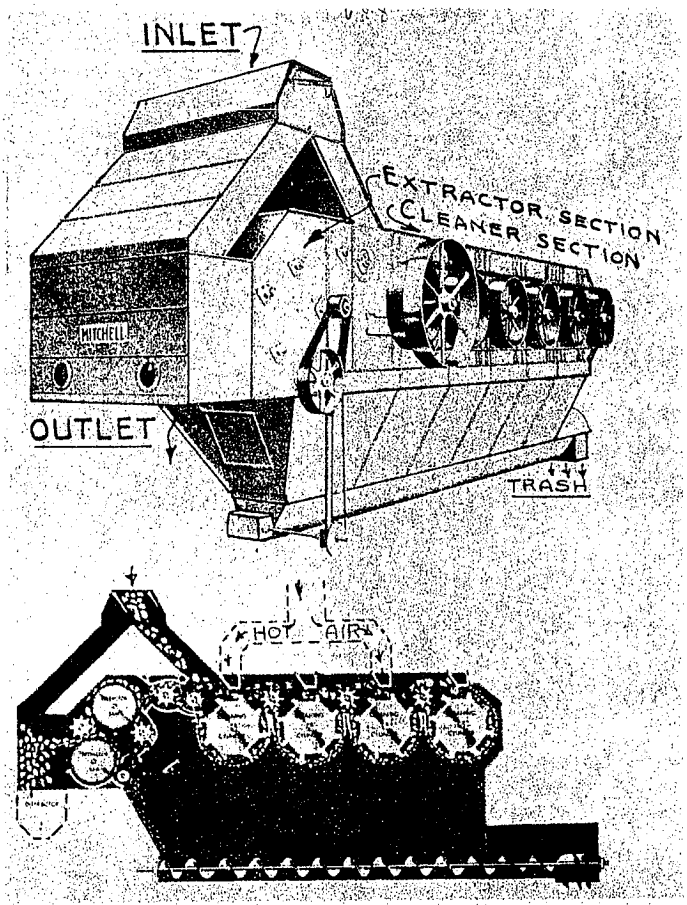


Figure 71.

The 1945 Mitchell "Jembo", bulk cleaner - extractor. This type of unit employs very large (30-inch diameter) cleaning cylinders, and 2 final extracting saw cylinders. (Courtesy, John E. Mitchell Co.).

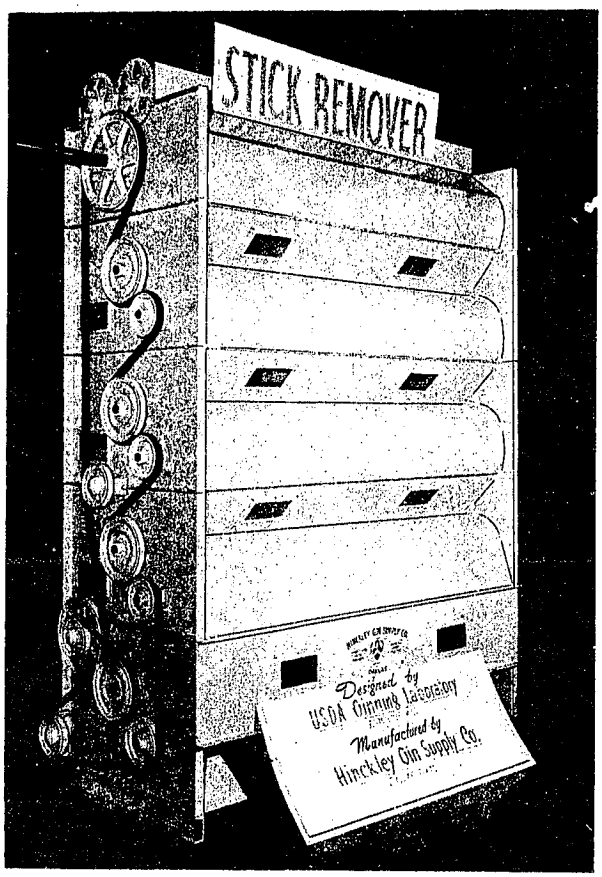
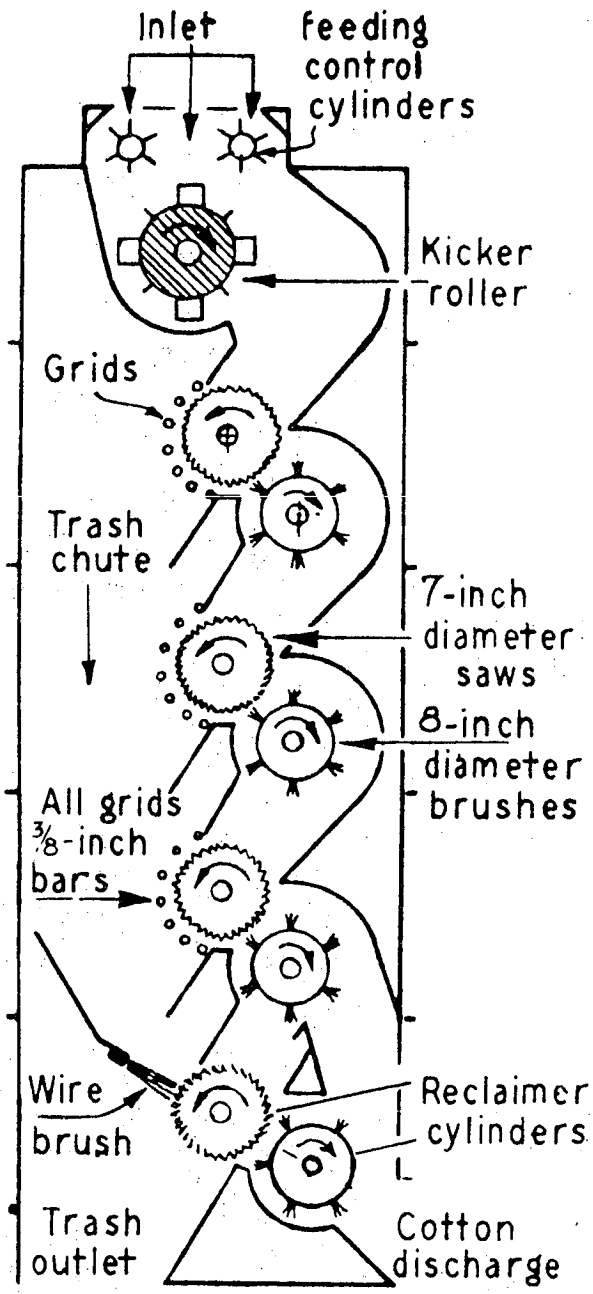


Figure 73.

The Franks "Stick Remover", section of a single unit.

Figure 72.

The Franks "Stick Remover" an external view. (Courtesy, The Hinckley Gin Supply Co.



Extracting

Patents show that ideas for extracting were as old as those for cleaning. The historical development, however, was much slower because construction in the factory shops was more complicated and the machine required higher adjustment precision. Another reason was that rough harvesting methods were first used in Arkansas, Missouri, and Texas, where system gins handled the largest annual volumes. Until about 1926, the Central and Southeastern States had few large gins, and the harvests were usually handpicked. As rough harvestings increased, the gins across the Cotton Belt changed from simple to elaborate.

Improvements of the gin stand feeders since 1912, and the use of seed-cotton dryers at the gins since 1932, were contributing factors to the widespread development and use of large bulk cleaners and extractors.

Figures 73 and 74 show excellent examples of extracting machines,

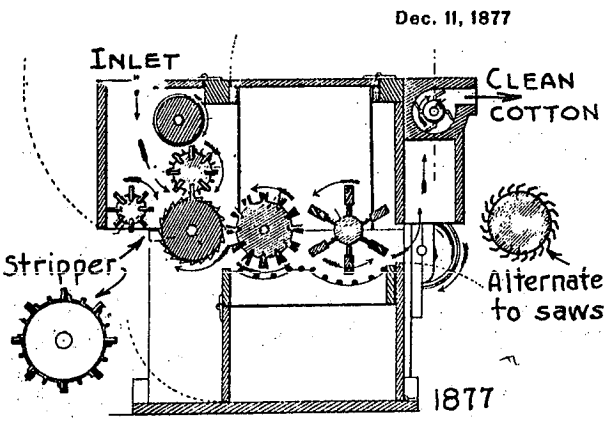


Figure 74.

Cross section of the 1877 Cotton Separator and Cleaner of R. R. Gwatheny, Louisville, Ky. (U. S. Patent No. 198,105.)

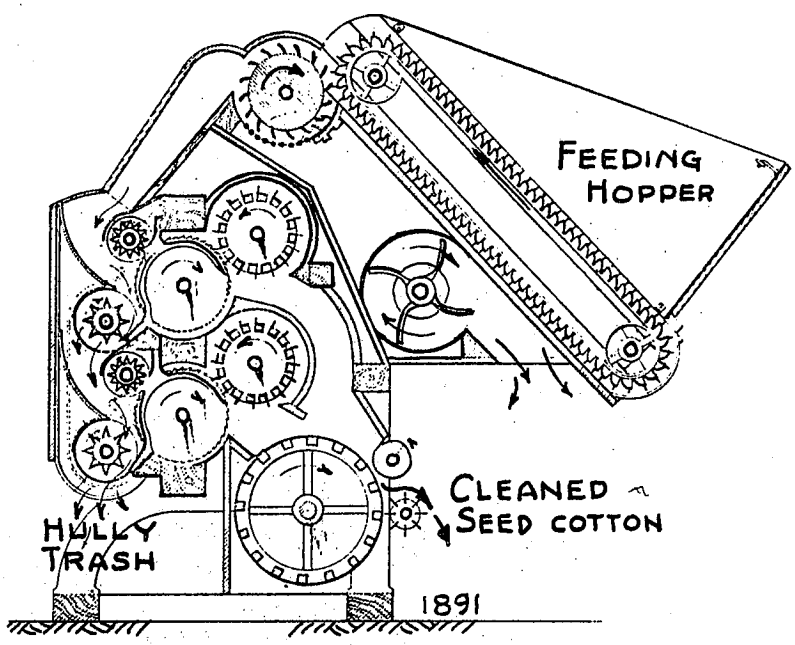


Figure 75.

Cross section of the 1891 machine for bolling and hulling cotton of J. M. Gardner, Nashville, Tenn. (U.S. Patent No. 458,339)

In the Gardner machine, as in the Gwatheny unit, the seedcotton locks were fed to carding teeth that held them (without ginning) while stripper and picker rollers dislodged coarse foreign matter. By 1927, through use of those general principles, both horizontal and vertical types of large bulk-extracting machines for cotton gins had been developed. The Lokey horizontal and the Evans vertical bur machines are examples.

Two out of several other excellent examples are the vertical Hancock Picker (Figure 76) and the Streun Big Bur machine (Figure 77).

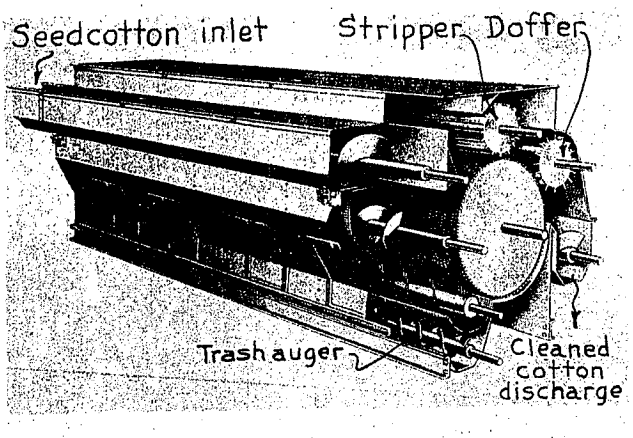
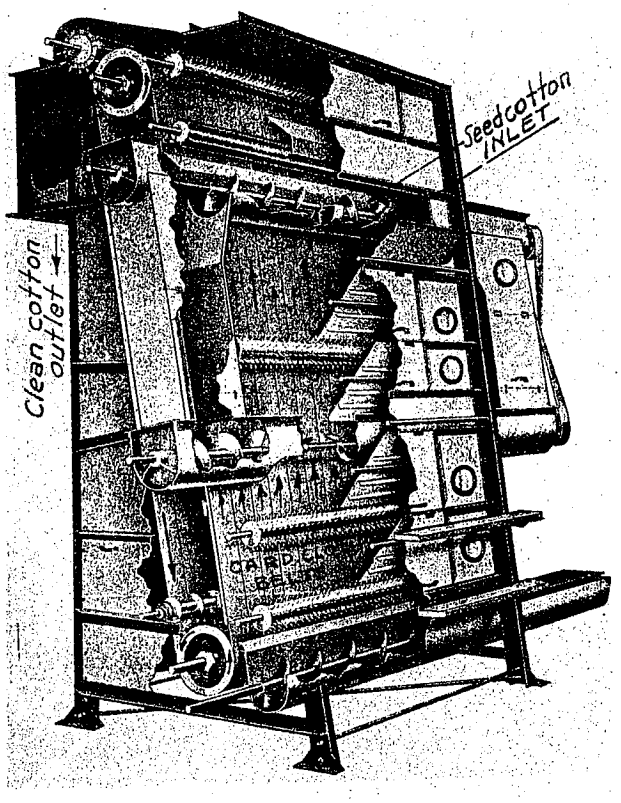


Figure 76.

Cross section of the Streun Big Bur extractor, which was adopted widely by the manufacturing trade when the patents expired. (Courtesy, Hardwicke-Etter Co.)

Figure 77.

The 1925 Hancock Picker, a vertical bur extractor, that employed card cloth belting for grasping cotton locks while foreign matter was stripped and brushed.(Courtesy, The Murray Co. of Texas, Inc.).



Several ginning machinery manufacturers adapted the Franks patented stick-remover principle to these machines. Two examples of such adaptations made in 1957 are given in Figures 78 and 79.

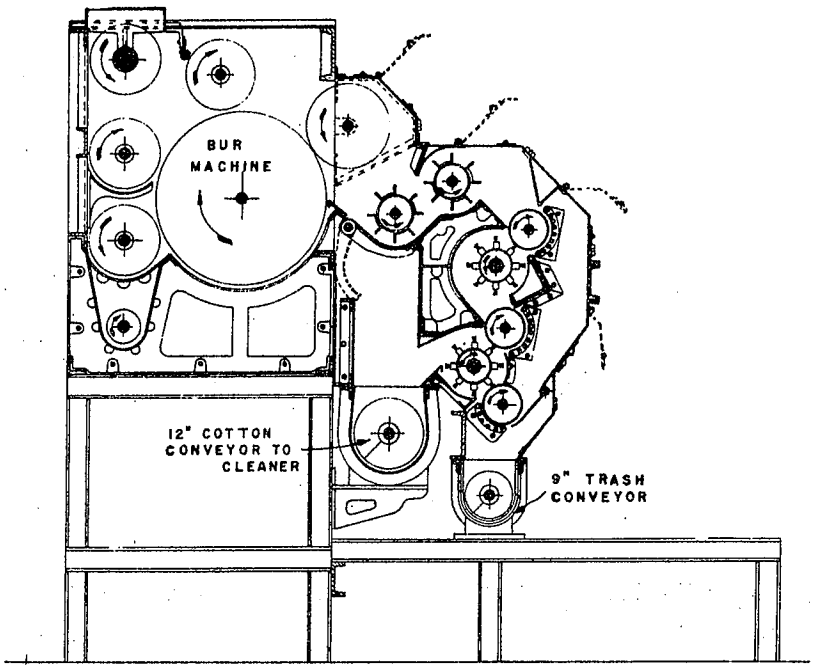


Figure 78.

Cross section of bulk extracting units with stick-removers added. (Courtesy, Hardwicke-Etter Co.)

Additional designs and improvements in extracting have been made concurrently with drying developments and are mentioned later in this chapter.

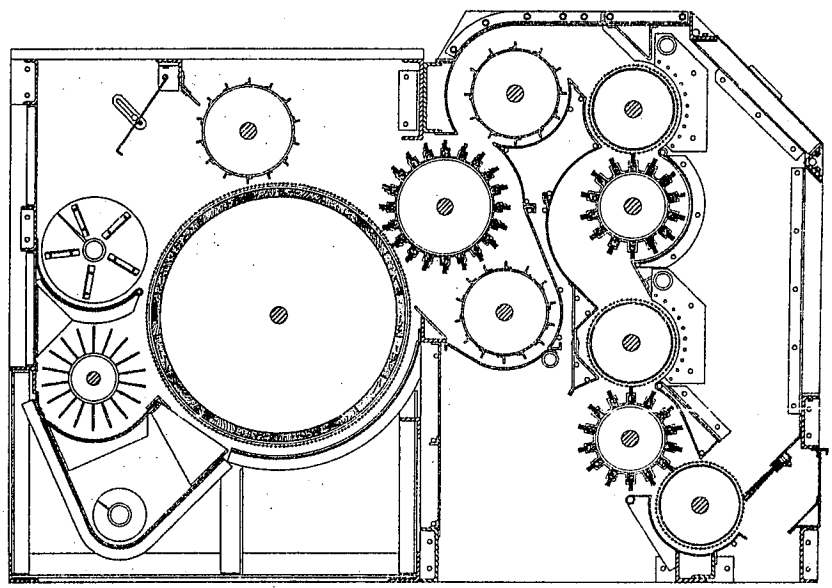


Figure 79.

Section of bulk extracting unit with stick-removers added. (Courtesy, Continental Gin Co.)

Drying and Conditioning

In 1926 the Secretary of Agriculture authorized the late Samuel H. McCrory, Chief Agricultural Engineer of the U. S. Department of Agriculture, Bureau of Public Roads, to undertake engineering investigations to develop practical artificial drying methods for seedcotton to decrease the heavy annual losses from ginning of damp cottons. To this end, the writer was assigned to the project at Tallulah, La., where the Delta Station of the departmental entomologists were working on cotton insect problems.

By 1930 a number of public patents had been granted on drying apparatus and processes, Some of these patents have enjoyed worldwide acceptance. Three of them resulting from the Louisiana work between 1926 and 1930 are shown in Figures 80 - 82. In addition, a nonpatented drag-bar drier (Fig. 83) is shown that was used first at the Mitchener Olive Dell Plantation in Louisiana and later at Stoneville, Miss., until it was superseded by the Tower Drier.

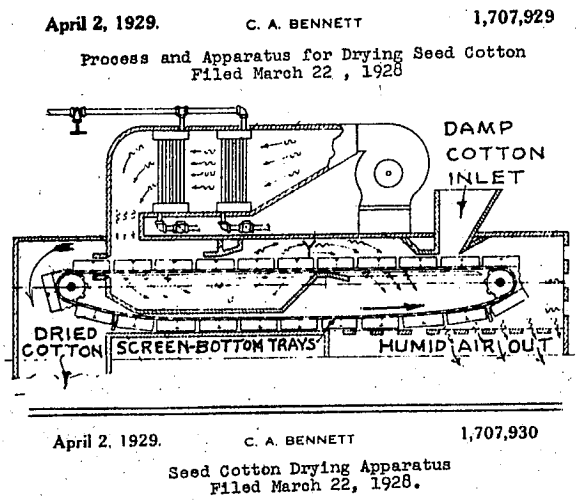
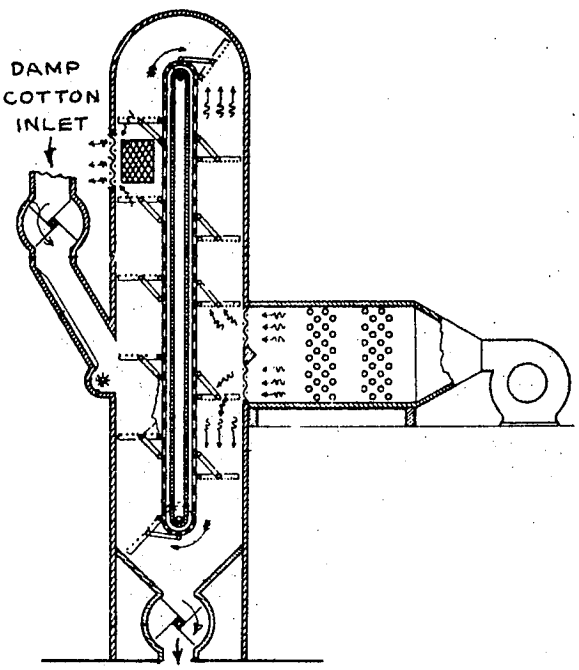


Figure 80.

Horizontal, tray-type drier, first of gin size research equipment.

Figure 81.

Vertical tray-type drier, second of gin size units.



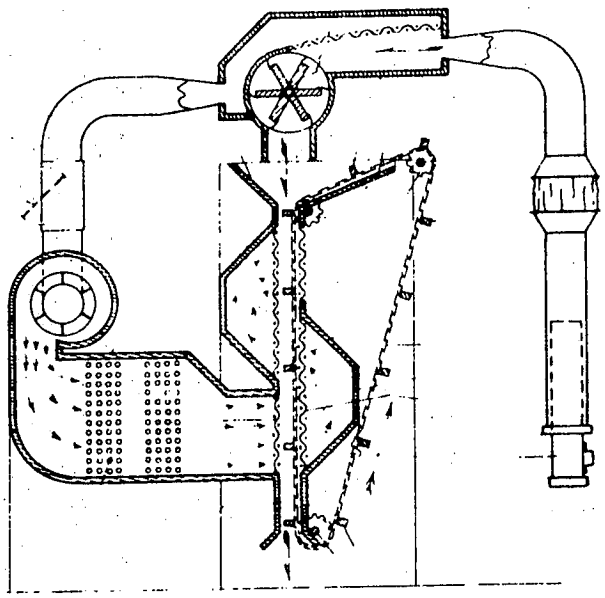
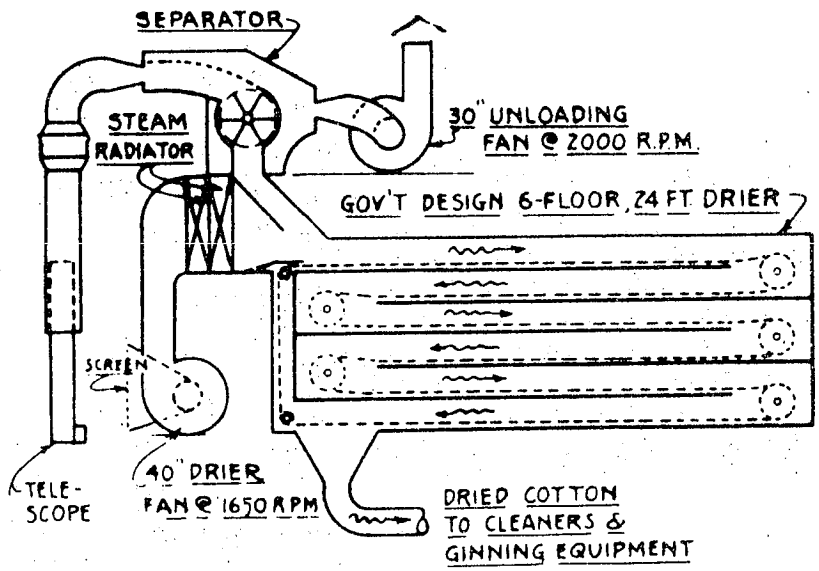


Figure 82.

Vertical drag-type dryer, third of gin size units.

Figure 83.

Horizontal drag-type dryer, not patented but developed by Governmental research.



The three patented types of dryers were developed and tested at Transylvania, La., in cooperation with C. E. Hester, manager of several plantations.

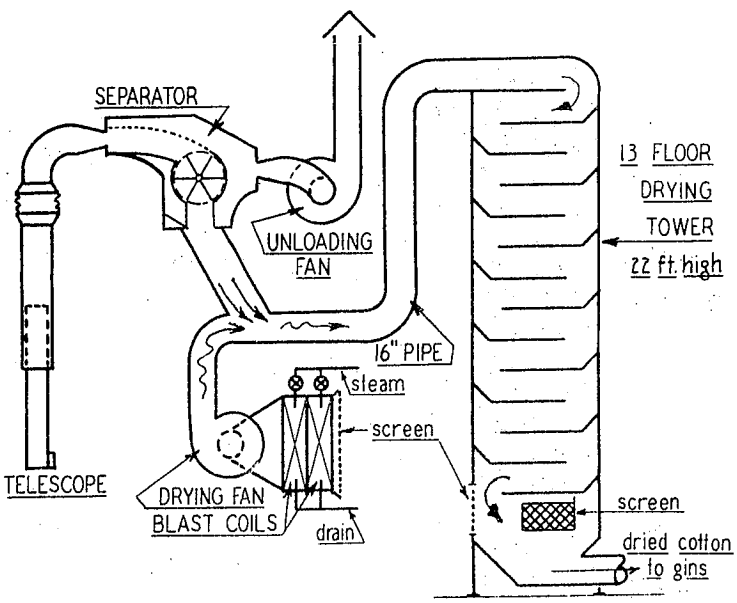
The patented dryer shown in Figure 80 was the first gin-size unit. It was developed from several test-tube models that were operated in the shops of the entomologists at Tallulah, La., on the 1926 and 1927 crops. The horizontal conveyor drier, patent No. 1,695,991 (Figure 81), in full gin-size is believed to have been the first in this country to artificially dry a bale of machine picked cotton at a cotton gin. The cotton was harvested in the fall of 1928 by Hugh Gamble of Greenville, Miss., with a Charles Berry mechanical picker.

The cotton was trucked to Transylvania, La., where it was dried and ginned immediately.

In 1930, Congress approved the establishment of a Federal Cotton Ginning Laboratory, located at the Mississippi Delta Branch Experiment Station on land ceded by the State to the Government. There, agricultural engineers, under the leadership of the late S. H. McCrory worked in cooperation with cotton technologists of the Department under the leadership of Arthur Wheatley Palmer.

During the development period of the Tower drier, the drier shown as Figure 83 was used in Stoneville on the 1931 crop. Bennett's invention, which became the well-known "Government Tower-Drier", was used on the 1932 crop (Figure 84). It was first used with steam coil heater, then with several types of natural gas burners. It was also used with fuel oil and heat from internal combustion engines.

AUG. 16, 1932 C. A. BENNETT 1,871,773



U.S. COTTON GINNING INVESTIGATIONS
VERTICAL DRIER, 1931 TESTS
(ALSO 1932)

Figure 84.

The 1932 "Government Tower Drier".

The Government Tower Drier was adapted in both full length andshort or stub forms to many ginning systems by the leading manufacturers of ginning equipment and accessories.

A split suction air-line cleaner-drier (Fig. 81) was developed in 1936-37 during Departmental research at Stoneville, by the writer, working in cooperation with the Knowlton family at Perthshire, Miss., Public Patent No. 2,078,309. Split suction was also applied to Tower driers.

Between 1932 and 1961, ginning systems grew into complicated layouts of several stages, as indicated in Figure 86.

In addition to drier developments resulting from Government research, many important contributions were made by private individuals and companies A chronological list of some of these contributions appear on the following page.

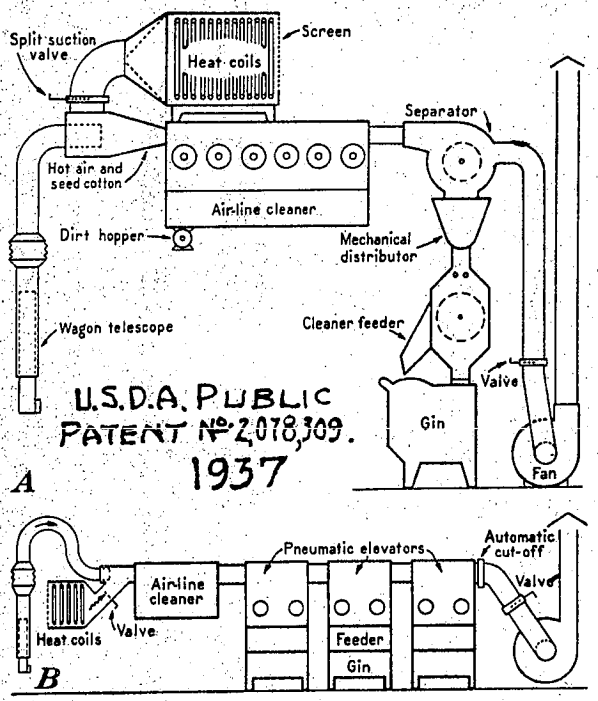
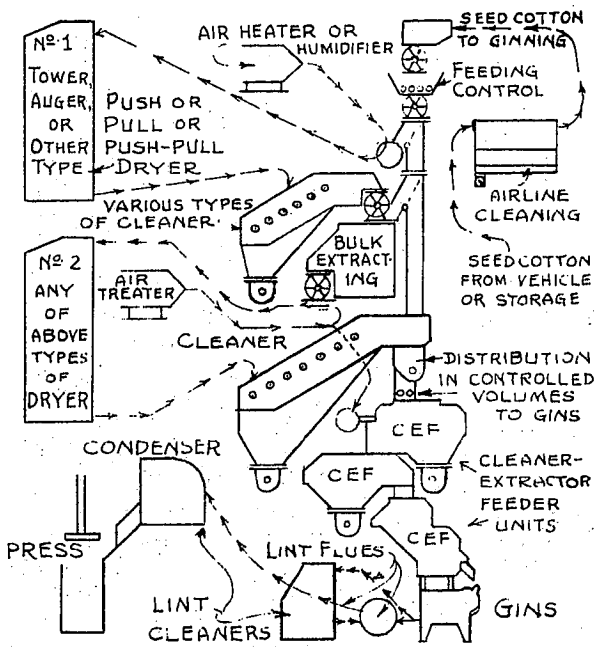


Figure 71.

Diagram of modern ginning system arrangements.

Figure 85.

Air-line cleaner drier with split suction.



Approximate date of development or operation	Name and Description	
1924.....	Lawson	Horizontal zig-zag belt drier supported on rollers.
1926.....	Roberts	Chemical, calcium-chloride heatless drier method, used in Tennessee and Missouri.
1928.....	Hancock	Horizontal distributor-drier, set up at the Dallas Murray Plant.
1929.....	Purcell	Government-type drag drier with special heating coils, set up at Scott, Miss.
1930.....	Lawson	Roller drier (improved 1924 design) set up at Greenwood, Miss.
1931.....	Messer	Vertical, conical drier, with heater.
1932.....	Harris	Twin rotary tubular units, 3 ft. in diameter and 10 ft. long, used at Scott, Miss.
1932.....	Mitchell	Unit distributor - driers over each extractor feeder, Boyle, Miss.
1934.....	Mitchell	Feeder-extractor-cleaner-drier, used across the Cotton Belt.
1934.....	Hagler	Continental conveyer - distributor - drier used across the Cotton Belt.
1936.....	Mitchell-Murray	Stub tower, cleaner, and feeders, two stage drying, used across the Cotton Belt.
1936.....	Streun	1935 and 1936--3 types with hot air in cleaner, and a fourth type with stub tower and cleaner. Extensively used.
1936.....	Mindrup-Stacy	16-cylinder spider-arm cleaner with concurrent hot air flows.
1936.....	Henry-Lummus	Thermo - Cleaner drier. Also combined with one or two Government Tower units for multi-stage drying.
1937.....	Rylander-Murray	Big-Reel cleaner drier.
1937.....	Murray Co.	Multiunit Tower Dryer; upper section with plain shelves; and lower sections with beaters.
1938.....	John Davis, Robt. Joyce, and others.	Began the manufacture of various type of Government tower driers.

Although not listed above, credit is due Preston Gaddis, the Boardman Company, and The Reichman-Crosby Co. and their staffs for valuable assistance during the basic development of the Tower Drier designs, tests, and fabrications.

Figures 87 and 88 show a number of driers used across the Cotton Belt.

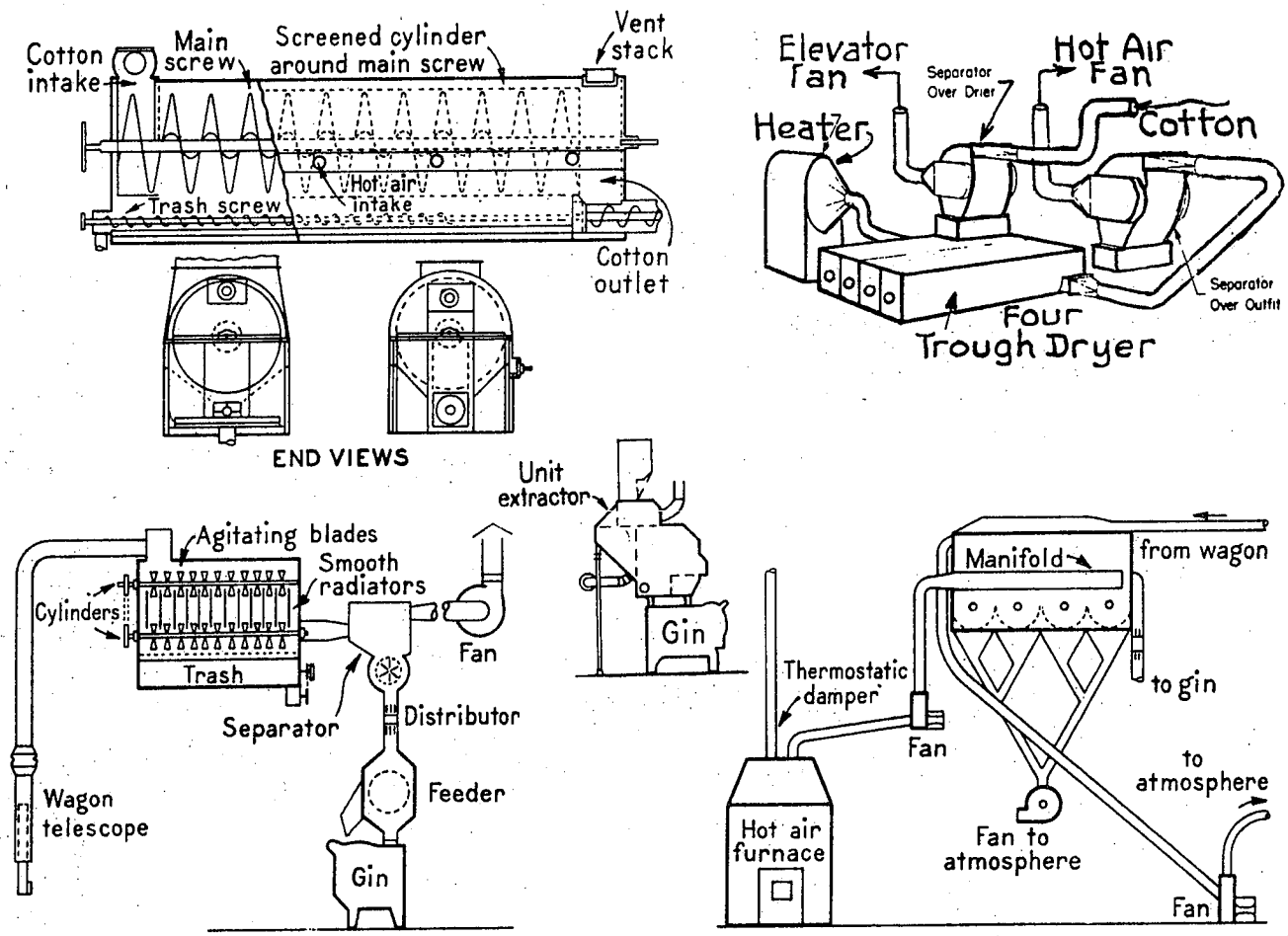


Figure 87.

Commercial seedcotton driers combined with cleaning or extracting.

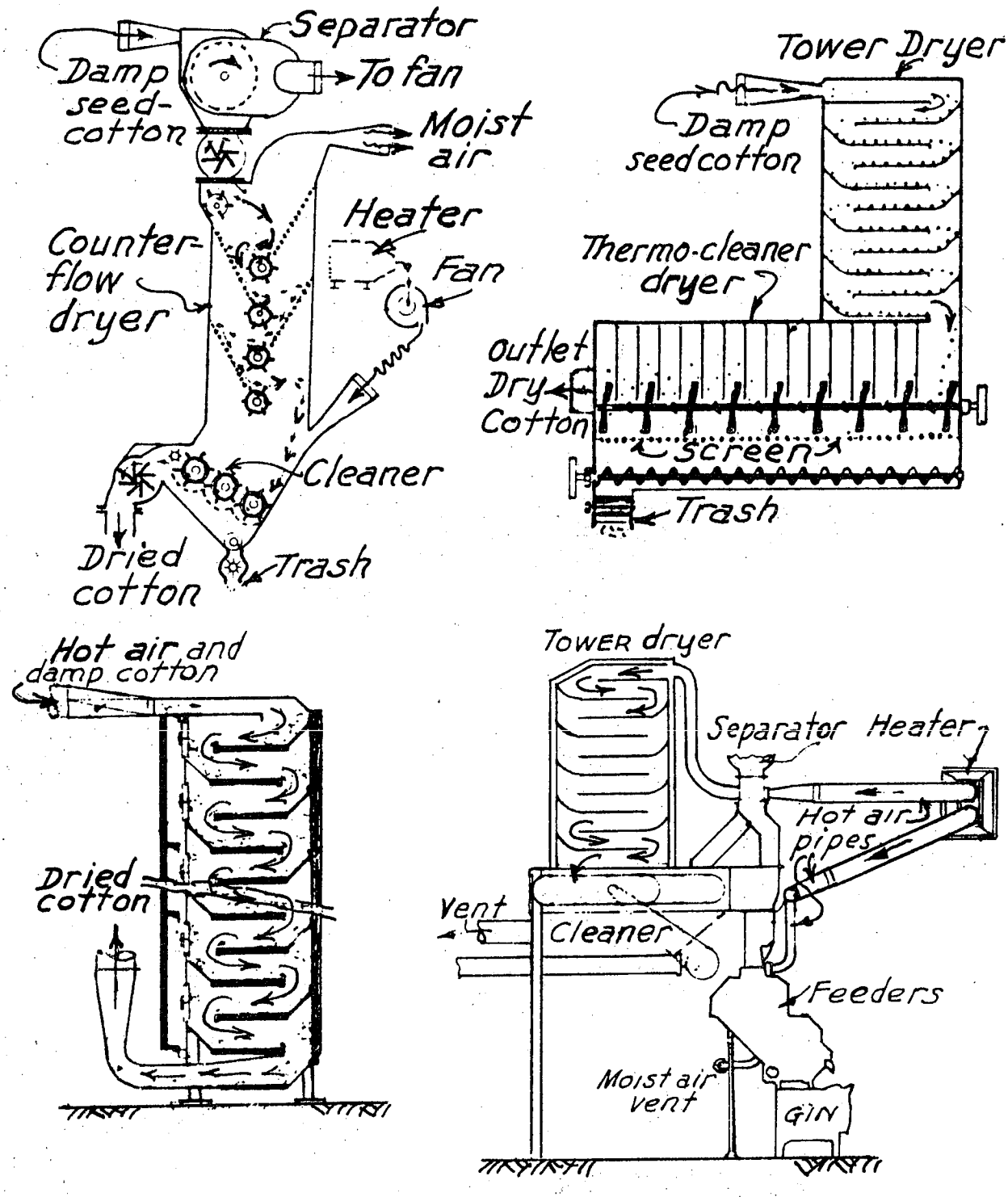


Figure 88.

Adaptations of the Tower Drier and a vertical conical flower drier.

In 1940, with the assistance and advice of Robert Douglas Williams of Memphis, Tenn., the writer obtained U. S. Public Patent No. 2,189,099, on Feb. 6, 1940 (Figure 89). This form of Government Tower drier eliminated the necessity for an extra fan, separator and power unit in many gins. The dried cotton could be blown to several types of blow-boxes or overhead units.

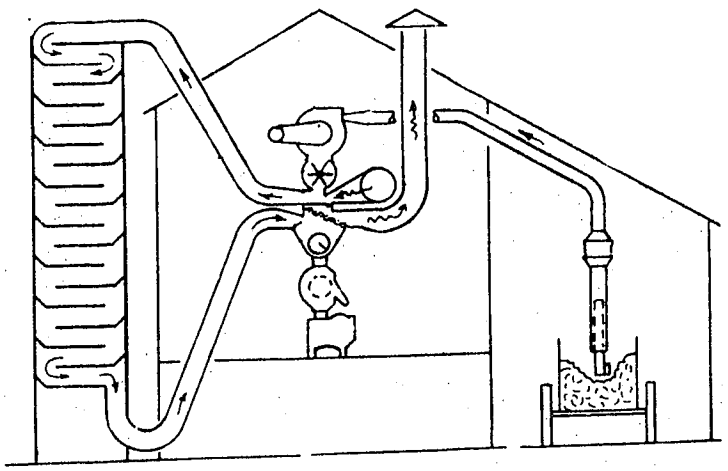


Figure 89.

1940 patent diagram with reference symbols deleted. this equipment permitted drying and return of the seed-cotton to distributors with one fan, for full length Towers.

After making extensive tests at Stoneville., Miss., Charles Speakes and Clyde Griffin of the U. S. Cotton Ginning Research Laboratory obtained in 1956 and important public patent covering a method of moisture restoration or drying for public ginning systems. (Figure 90).

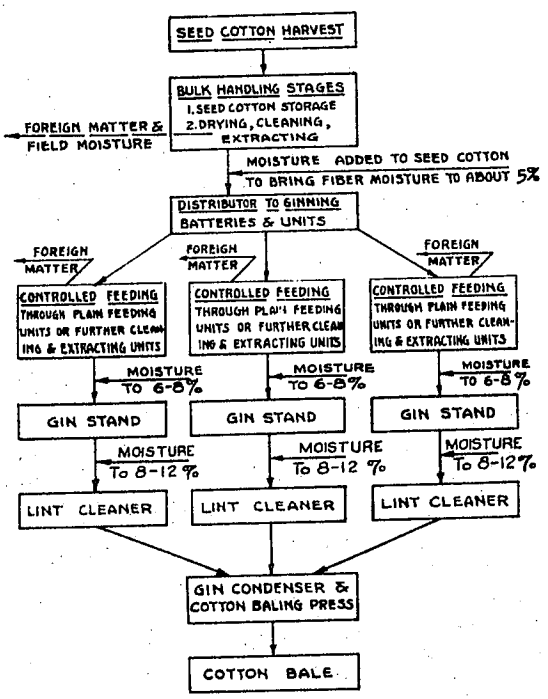


Figure 90.

Speakes-Griffin Public Patent diagram of method of moisture restoration to cotton during ginning.

From 1959 to 1961, Franks and Shaw made progress (Figure 91) in the development of a drier which would lend itself to automatic control. 2/

2/ Gerald N Franks and C. Scott Shaw. Multi-path drier development. Progress Report, Cotton Gin and Oil Mill Press, June 24, 1961.

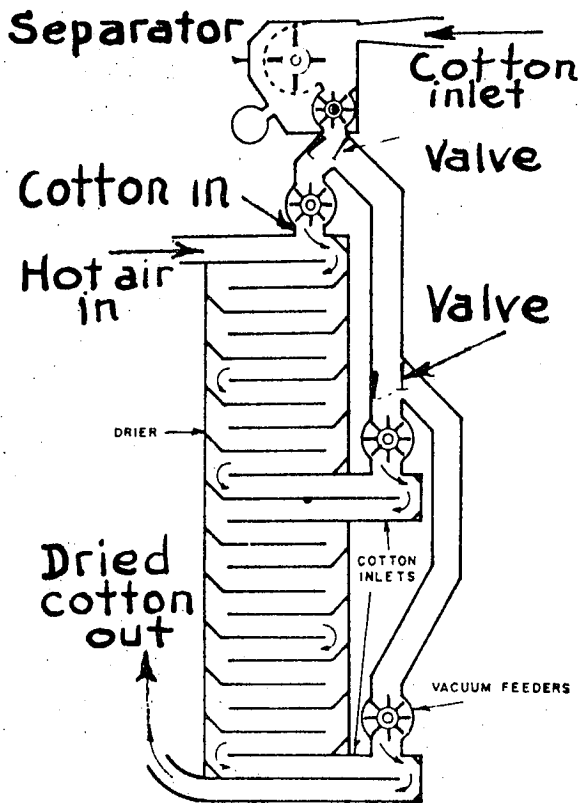


Figure 91

Multiple-path Tower Drier at Stoneville, Miss.

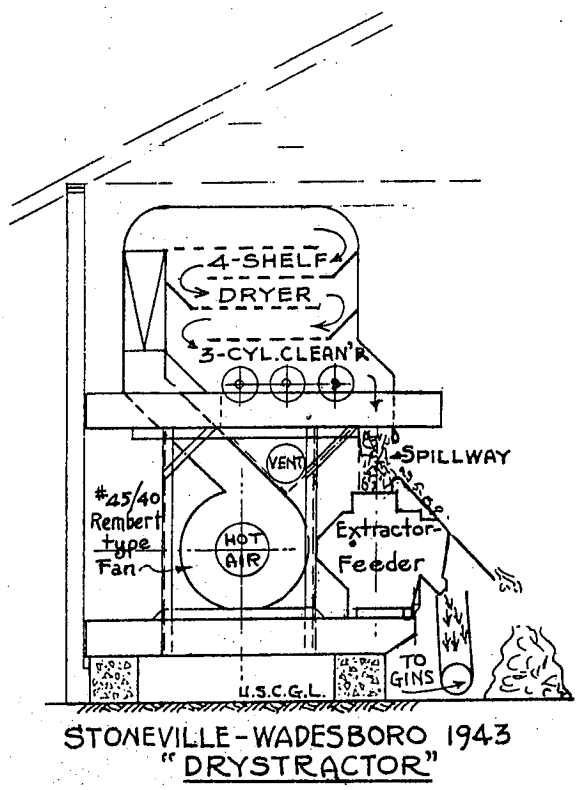
2/ Gerald N. Franks and C. Scott Shaw. Multi-path drier development. Progress Report, Cotton Gin and Oil Mill Press, June 24. 1961.

In research work on combined drying, cleaning, and extracting at cotton gins, the staff of the U.S. Cotton Ginning Research Laboratory fabricated a special unit (Figure 92). This unit was tested at Wadesboro, N. C. in 1942-44.

The John E. Mitchell Co., loaned one of their 1936 all-steel model feeders; and W. C. Hall loaned his ginning outfit, a pneumatic elevator Liddell 2-stand ginning system, in which Government specialists McWhirter and Kimbrell set up the "drystractor." From Drystractor to a 1955 ginning setup (Figure 93) was but a step in ginning progress.

Figure 92.

Diagram of a research "drystractor," a combined drier, cleaner, and extractor for small cotton gins. This test tube outfit gave much valuable information for ginners



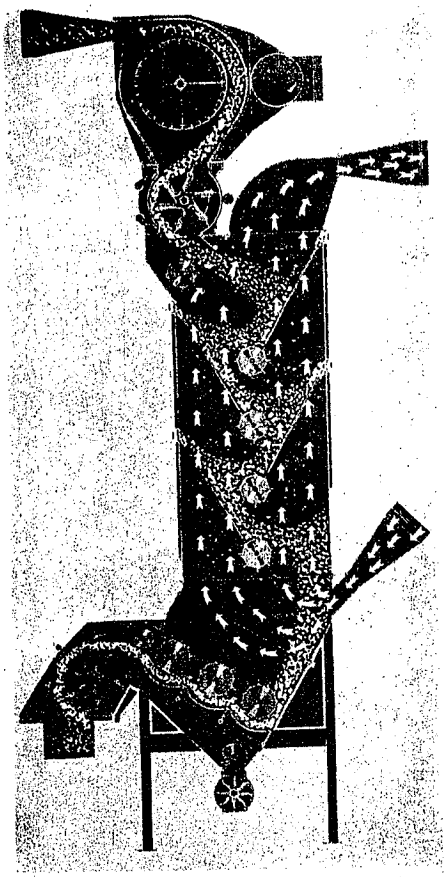


Figure 93.

Counterflow Drier - Cross-Section with Cotton. (Courtesy, Continental Gin Co.)

In 1958 the Lummus Cotton Gin Co. brought to the market a combination drier-conditioner-cleaner (Figure 94), known to the trade as a super volume cotton conditioner. This equipment is a good example of American ingenuity and development in promoting flexible apparatus for regions needing a variety of treatments, ranging from drying on the one hand, to cleaning, extracting, and humidifying on the other.

Sources of heat for cotton gin driers have ranged from steam radiation to gas- and oil-burning furnaces, and to waste heat recovery systems. Fuels have included butane, propane, cotton gin trash, wood, coal, and natural gas.

Since this subject has been thoroughly documented in numerous publications, two examples only will be shown here, (Figures 95 and 96), on the following pages.

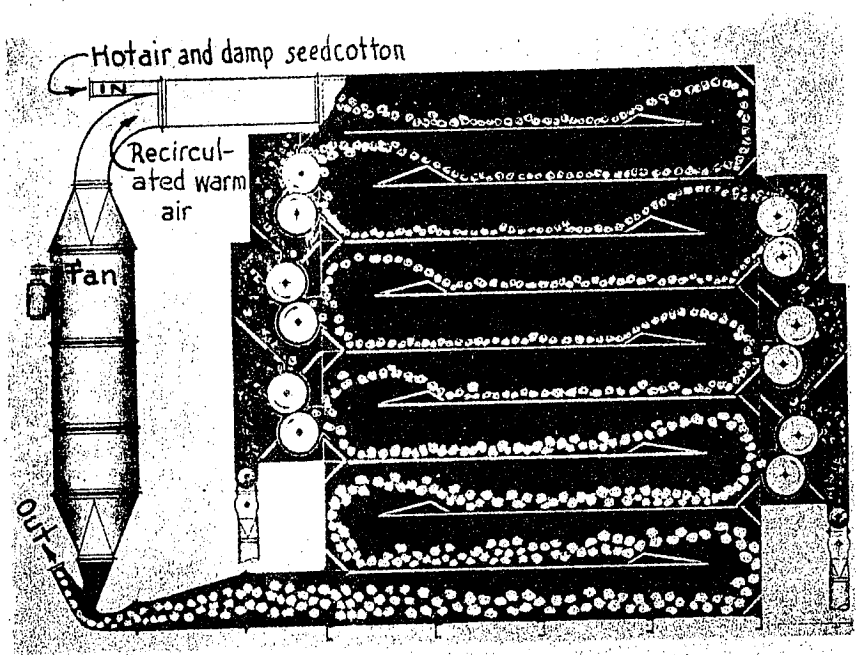


Figure 94.

Super volume cotton conditioner, in cross section diagram. (Courtesy, Lummus Cotton Gin Co.)

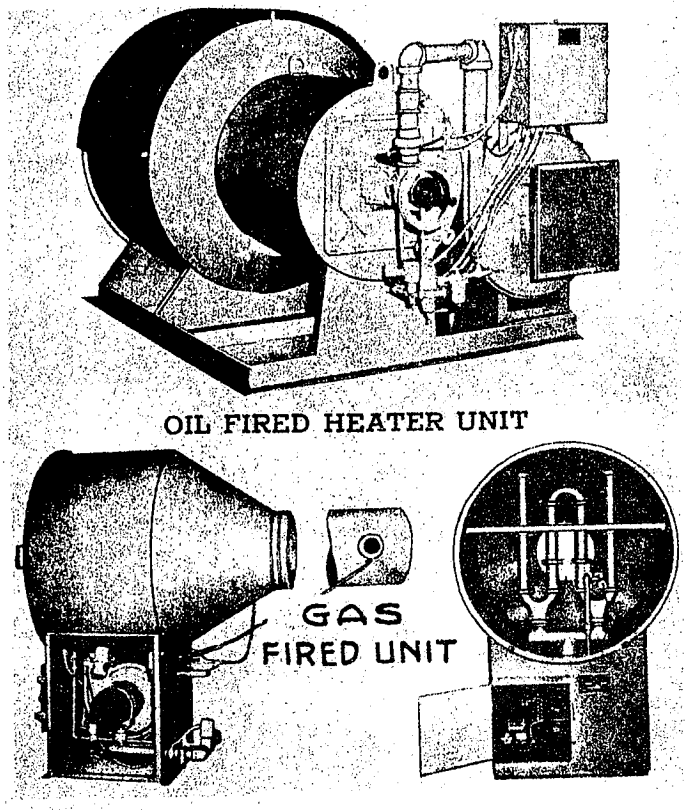


Figure 95.

Thermostatically controlled oil- and gas-fired heater units for cotton gin driers. (Courtesy, Continental Gin Co.

Dependable sources of heat and temperature controls for use with improved driers have made the ginners of the United States world leaders in the art of drying seedcotton at the gin.

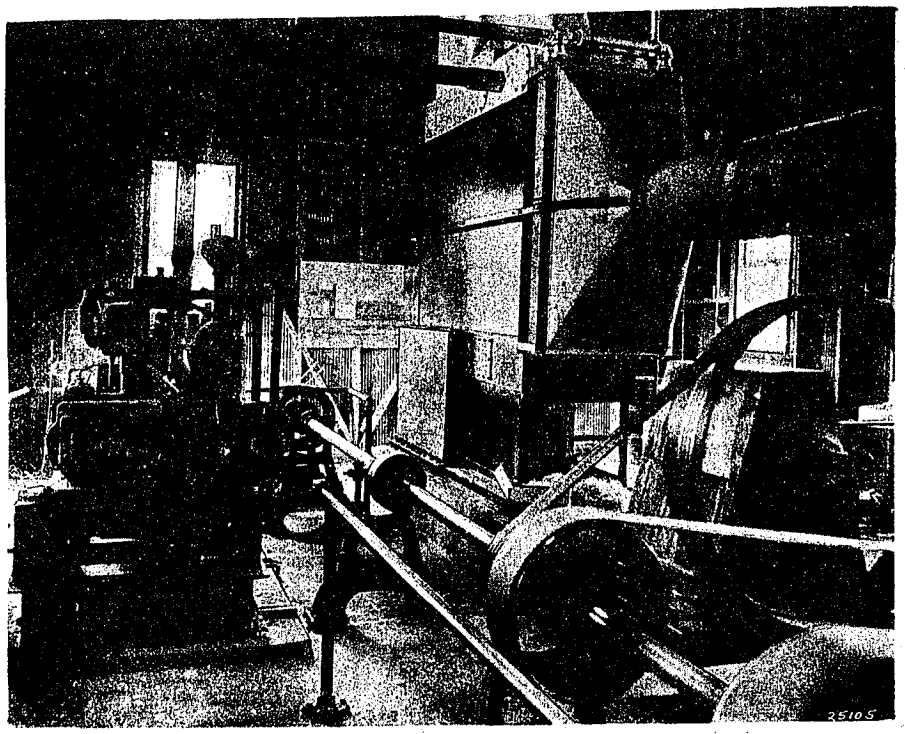


Figure 96.

Diesel furnace and waste heat recovery unit for cotton gin driers. (Courtesy) Caterpillar Tractor Company.)

Collateral work on problems associated with ginning extremely dry seedcotton coming into the gins has led to contributions in humidification for moisture control.

For restoring moisture to seedcotton or ginned lint during the ginning stages, a number of different methods have been used since 1945. The U. S. cotton ginning research laboratories developed a steam spray and wetting-agent solution spray, with nozzles, for the lint slide to the cotton press (Figure 97), to aid in pressing and the control of static electricity. The Samuel Jackson Mfg. Co brought out a moisture control system which automatically supplies warm humid air to the feeders (Figure 98).

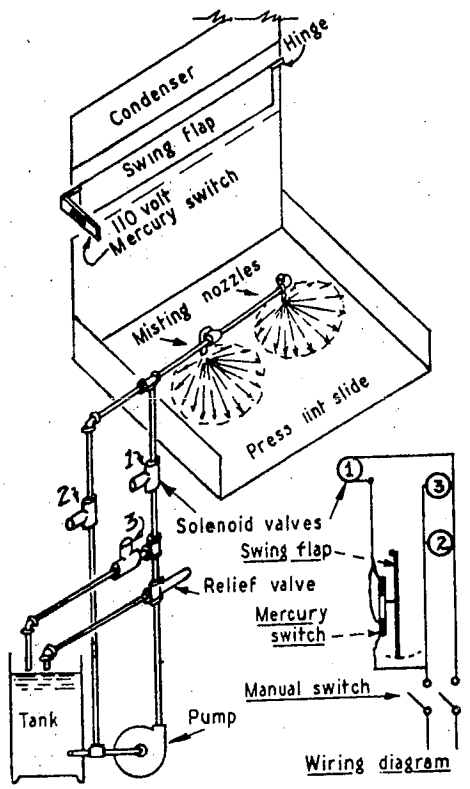


Figure 97.

Diagram of apparatus developed by the U. S. Cotton Ginning Research Laboratory for applying moisture to cotton on the lint slide.

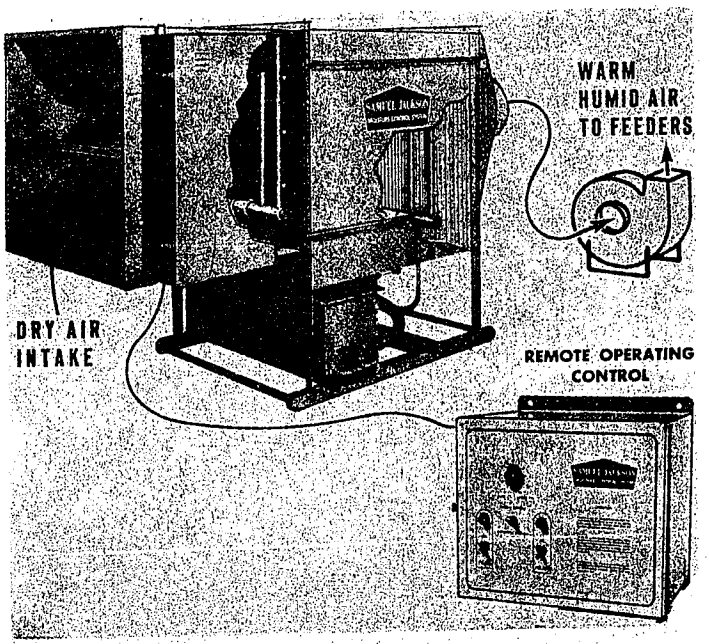


Figure 98.

Samuel Jackson moisture control system. (Courtesy, Samuel Jackson Mfg. Co.)

Where static electricity disturbances interfere with cotton ginning, it has long been the custom to introduce steam or mist into the cleaning feeders and airblast fans. In the late 1930's, Earl M. Heard devised a gin building humidification system in cooperation with ginners of the Lubbock, Tex., area and the USDA ginning engineers, who were trying out wetting-agent solutions and other methods for introducing moisture to the cotton and to the air used for conveying the cotton.

Research at the Southwestern Cotton Ginning Research Laboratory during the 1955 and 1956 crop season showed that antistatic agents had possible applications in controling static during ginning. Tests made later at commercial gins in the Mesilla Valley of New Mexico show that, in that area, static electricity can be controlled at saw and roller gins by antistatic chemicals (13).

Moisture Measuring

Concurrently with the increased use of driers at the cotton gins, a demand arose for adequte methods of measuring the moisture content of seed-cotton, ginned fiber, and seed. Extensive investigations and research resulted. In 1932 George E. Gaus designed and built a pilot-model hygrometric moisture indicator, using wet- and dry-bulb thermometers in conjunction with a portable vacuum cleaner fan for suction. C. S. Shaw and George Pfeiffenberger made seasonal tests from 1932 to 1939 on the Gaus hygrometer to establish the relation between relative humidity of air trapped in the materials and the percentage of moisture content. Waldo H. Kliever, physicist at the U.S. Cotton Ginning Research Laboratory, also developed improved calculators and direct indicators for this instrument.

Public Patent No. 2,151,404 was issued to George E. Gaus and Chas. A. Bennett, March 21, 1939, about two years after application was filed, covering a dry- and wet-bulb hygrometric moisture meter. Public Patent No. 2,365,496 was issued to Charles S. Shaw, Dec. 19, 1944, for a moisture measuring instrument based on the resiliency of lint cotton, which varies with its moisture content. Another public patent on this subject is No. 2,975,361, issued to C. E. Holiday in 1961.

During the 1949-59 decade, several moisture meters for the cotton trade were developed by commerical firms. Some are portable, others are for office or laboratory use by buyers, mills and testers.

Three examples of 1960 model moisture meters and a ginning fiber moisture control for drying, all on the market at the time of this writing, are shown in Figure 99 on the following page.

Figure 99.

Moisture meters and a ginning drier control for moisture. (Courtesy, Raymond S. Hart, Inc; Samuel Jackson Mfg. Co; United States Testing Co; and Murray Co. of Texas, Inc.)

Selected References

U. S. Department of Agriculture Publications

1. Bennett, C. A. Driers for Seed Cotton, 10 pp. 1931. (Mimeo).

2. Bennett, C. A. The Vertical Seedcotton Drier. Misc. Pub. 149, 8 pp. 1932.

3. Bennett, C. A. Modernizing Cotton Gins. Agr. Handb. 99, 45 pp. 1956.

4. Bennett, C. A. and Gerdes, F. L. The Vertical Drier for Seed Cotton. Misc. Pub. 239, 8 pp. 1939.

5. Bennett, C. A. and Shaw, C. S. Overhead Cleaner-Dryer Systems. Misc. Pub. 314, 20 pp. 1938.

6. Bennett, C. A., Stedronsky, V. L., and Martin, W. J. Sources of Heat for Cotton Drying. Misc. Pub. 383, 23 pp. 1940.

7. Franks, G. N. and Griffin, A. C. Foreign Matter Trap for Cotton Gins. Cir. 973, 12 pp. 1955.

8. Franks, G. N. and Shaw, C. S. Stick Remover for Cotton Gins. Prod. Res. Rpt. 22, 39 pp. 1959

9. Gaus, G. E., Shaw., C. S. and Kliever, W. H. A. Practical Seedcotton Moisture Tester for Use at Gins. Circ. 621, 25 pp. 1941.

10. Gerdes, F. L., Martin, W. J., and Bennett, C. A. Drying Seed Cotton. Leaflet No. 181, 8 pp. 1939.

11. Griffin, A. C. and Harrell, E. A. Effects of Moisture added at the Lint Slide on Lint Quality and Bale Weight in Humid Cotton Production Areas. Prod. Res. Rpt. 14, ARS, USDA. 16 pp., illus. 1957.

12. Griffin, A. C. and McCaskill, O. L. Seedcotton Input Control for Gins. Prod. Res. Rpt. 29, 12 pp. 1959.

13. Leonard, C. G. Controlling Static Electricity in Cotton During Ginning With An Antistatic Agent. ARS 42-39. 16 pp. 1960.

14. Moore, V. P. and Merkel, C. M. Cleaning Cotton At Gins And Methods of Improvements. Cir. 922, 50 pp. 1955.

Selected reference list of U. S. Patents that have contributed significantly to the development of equipment for bulk removal of foreign matter from seedcotton at the gin.

Year	Number	Inventor	Title of Invention
1875	35,586	Ralston	Cotton cleaner
1877	192,393	Smiley	Cotton boll or hull separator
1877	198,105	Gwathény	Cotton separator and cleaner (Fig. 74)
1878	206,097	Etheridge	Cotton gin boll stripper and cleaner
1882	266,972	Coleman	Seedcotton cleaner
1883	282,057	Coleman	Separator and cleaner
1885	310,315	Ralston	Cotton cleaner
1889	400,002	Montague	Machine for opening, cleaning, and ginning
1890	432,921	Young	Cotton huller (with card clothing)
1891	458,339	Gardner	Machine for bolling and hulling cotton (Fig. 75.)
1891	463,330	Cunningham	Cotton cleaner
1896	556,179	Gardner	Cleaner for bolls and cotton

Year	Number	Inventor	Title of Invention
1900	661,949	Boyd	Cotton cleaner and boll huller
1904	765,874	Bain	Cotton thresher and cleaner
1906	822,864	Patterson	Cotton separator
1907	854,905	Park	Cotton cleaner and separator
1908	884,671	Lamb	Cotton boll thresher and cleaner
1908	888,396	Gardner	Cotton cleaner
1908	907,802	Holtby	Cracked boll and cotton cleaner
1911	994,609	Shields	Apparatus for treating snapped bolls
1911	1,006.594	Postelwait	Cotton boll huller and cleaner
1911	1,011,015	Benefield	Cotton cleaner (Fig. 66)
1912	1,030,913	Mitchell	Cotton extractor and feeder (Fig. 55)
1912	1,039,402	Houghton	Trash and leaf remover for machine picker. (Note: Houghton obtained several patents in 1910 to 1912 that were applicable in principles to gins and pickers.)
1913	1,081,594	Elliott	Cotton extractor and cleaner
1917	1,220,952	Cary	Hull and cleaning machine
1919	1,310,304	Simmons	Boll separator and cleaner
1920	1,332,425	Cassell	Cotton treating machine
1920	1,351,858	Lokey	Cotton boll cleaning machine
1925	1,524,239	Hancock	Cotton hull separator (Fig. 76)
1927	1,630,638	Streun	Hull and cotton separator and cleaner
1929	1,707,664	Hancock	Huller and opener
1930	1,757,762	Williams	Hull extractor
1930	1,786,904	Evans	Extractor and cleaner (vertical)

Year	Number	Inventor	Title of Invention
1945	2,384,383	Deems-McDaniels	Impact cleaner
1952	2,580,457	Franks	Stick remover

CHAPTER V

LINT CLEANING, SAMPLING, WEIGHING, AND INPUT CONTROLS

Lint Cleaning

Prior to 1947, the bulk of the cleaning in gins was done on the seed-cotton. However, there were pioneers in the early days of the ginning industry such as James in 1842, Carver in 1844, and Withers in 1858, who dreamed of turning out ultra clean lint at their gins by the use of lint cleaning equipment.

Theodorick James, of Shirt Tail Bend, Washington County, Miss., introduced fiber cleaning in the gin stand immediately behind the ribs, and with a series of brush sticks removed pin and pepper trash before the doffing from the saws took place. A. Q. Withers, of Tunica, Miss., succeeded in removing a large amount of lint from cotton by his multicylinder gin stand. This machine transferred the ginned lint from gin saws over screens to doffer and then to high-speed second saws to final doffer.

On Dec. 4, 1894, U. S. Patent No. 530,458 was issued to Henry Rembert of Willis, Tex., on a cotton cleaner for lint. Rembert's invention, partly shown in Figure 100, was suitable for use at either cotton gin or cotton mill and was made in two styles, single and double cylinder.

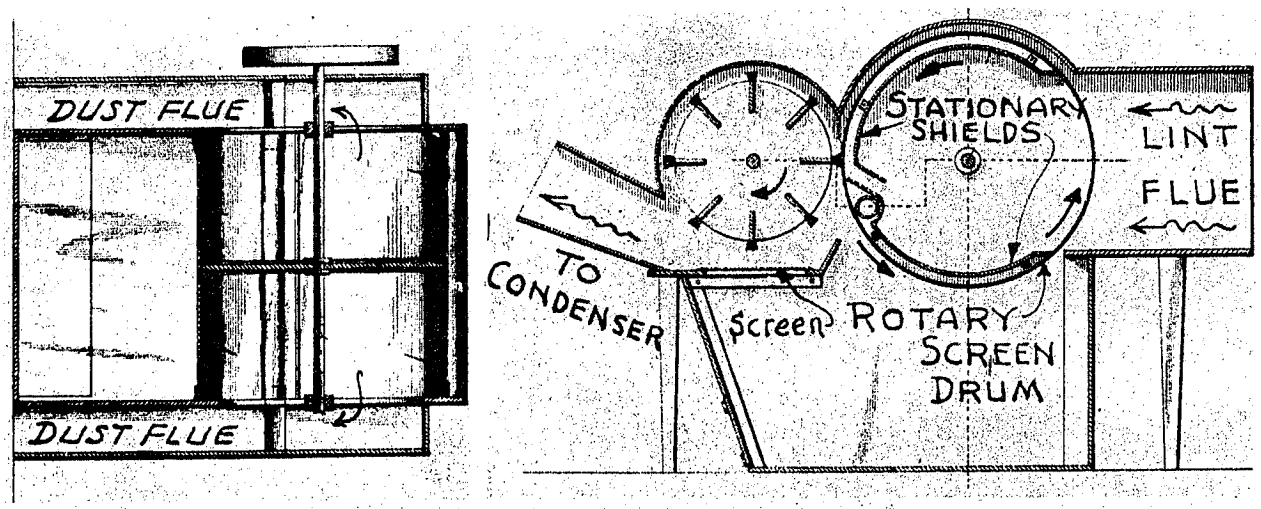


Figure 100.

The lint cotton cleaner features of Henry Rembert's invention. A special receiving cylinder of course mesh, with interior stationary shield, permitted the conveying air to move fine trash.

U. S. Patent No. 1,574,384 on a flotation lint cleaner issued on Feb 23, 1926, to John Garner; and U. S. Patent No. 1,723,531 on a special lint flue with herringbone grids issued on Aug. 6, 1929, to George Spencer, were both adaptable to either cotton mill or gin. The features of the Spencer patent are shown in Figure 101.

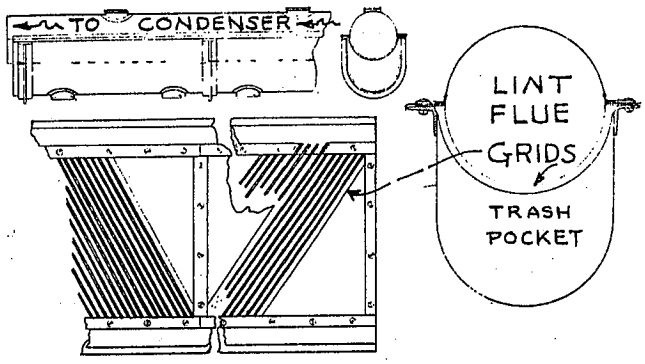


Figure 101.

Spencer's flotation trunk with grids along lower half for trapping dirt dislodged during air conveyance.

In 1938 this writer made a trip to the Whitin Company shops at Uxbridge, Mass., to study its cotton mill Spirawhirl Lint Cleaner and to ascertain if it would be adaptable to cotton gin use. It was adaptable, and the company loaned one to the U. S. Cotton Ginning Research Laboratory at Stoneville for tests.

The laboratory then began a series of studies to utilize principles of existing cotton mill fiber-cleaning equipment at the cotton gins. The goals were to do as much additional cleaning at the gin on the lint as could safely be accomplished without nepping or damaging the fiber, and to improve the grade sufficiently to more than pay for the process so that producer and ginner might profit alike. Three possibilites were studied. (1) The feasibility of using single lint-cleaning devices behind each gin stand; (2) the use of a larger capacity master unit in the main lint flue system; and (3) the possibility of combining the two.

The engineers and fiber technologists at the laboratory conducted many tests during the next ten years. Stedronsky, Harmond, Merkel, Hall, Moore, McWhirter, Martin, Shaw, and others tried out a broad range of apparatus, in addition to the Whitin Spirawhirl Lint Cleaner. Research on adapting lint cleaners to roller gins was carried on at the Southeastern Cotton Ginning Research Laboratory from 1954 to 1957.

On Oct. 2, 1951, U. S. Public Patent No. 2,569,501 was granted to Victor Stedronsky and C. Scott Shaw (5) covering the "Flow Through Lint Cleaner" Figure 102), which was manufactured thereafter by several companies.

The work on lint cleaning by the U. S. Cotton Ginning Research Laboratories became an incentive to the entire industry, and a number of private patents were issued a few years after the Government research began. Among

these were units for each gin stand, and the Moss-Gordin Master Lint Cleaner (Figure 103) to operate between the stands and the condenser.

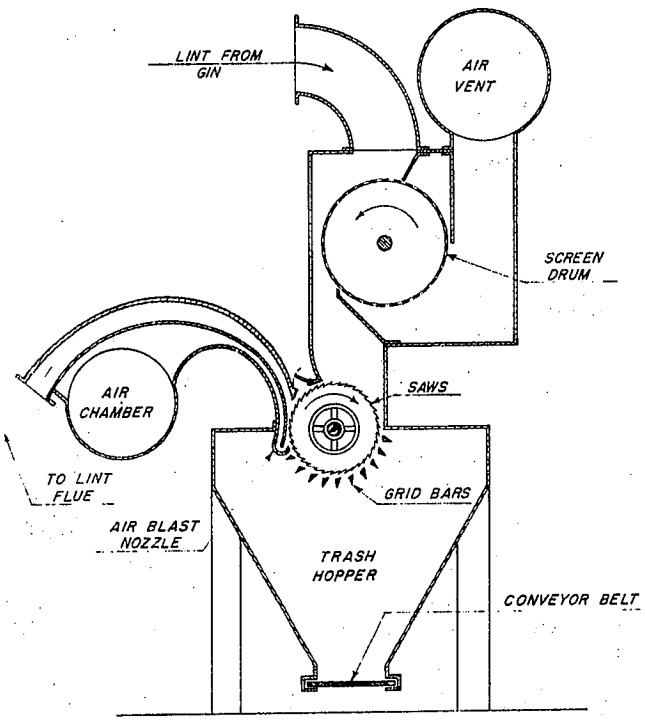


Figure 102.

Diagram of U. S. Department of Agriculture public patent on Flow Through Lint Cleaner.

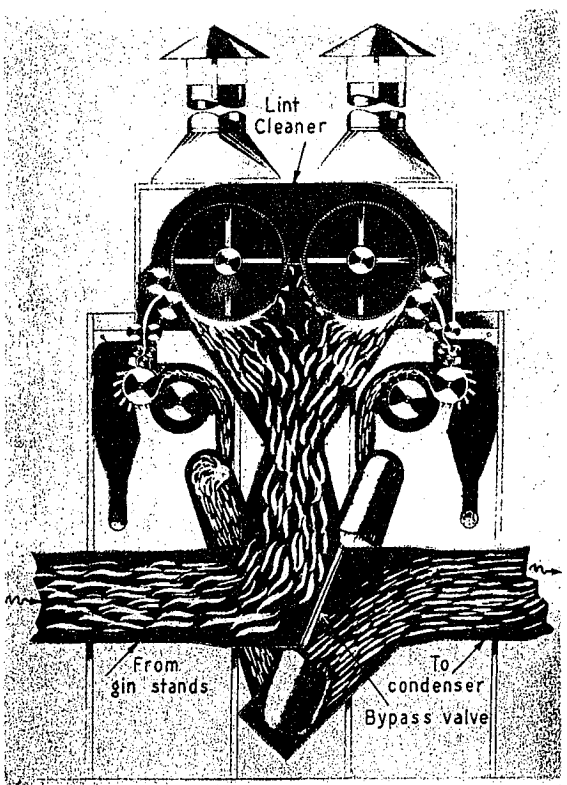


Figure 103.

The Moss - Gordin patented Master Lint Cleaner for cotton gins. As of 1961, this is made for single-, double-, and triple-lint cleaning. (Courtesy, Moss - Gordin Co.)

Another form of master lint cleaner, known as "DFB", was developed by the Continental Gin Co., about 1958, (Figure 104).

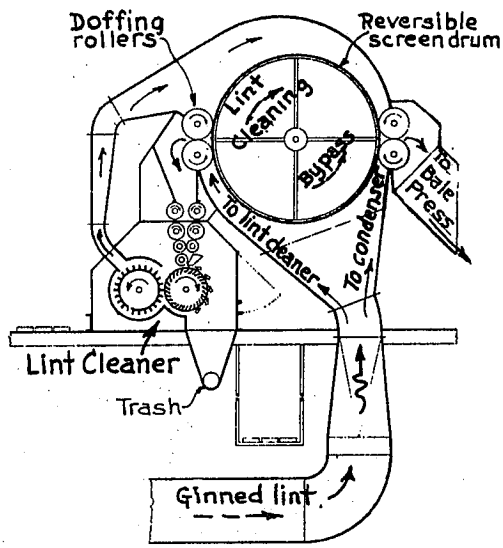


Figure 104.

Diagram of combined Master Lint Cleaner and Condenser. The large cylinder is reversible; so that in clockwise rotation it cleans lint, and when reversed acts only as a condenser.

Diagrams of four of the many unit lint cleaners are shown in Figures 105 to 106, inclusive.

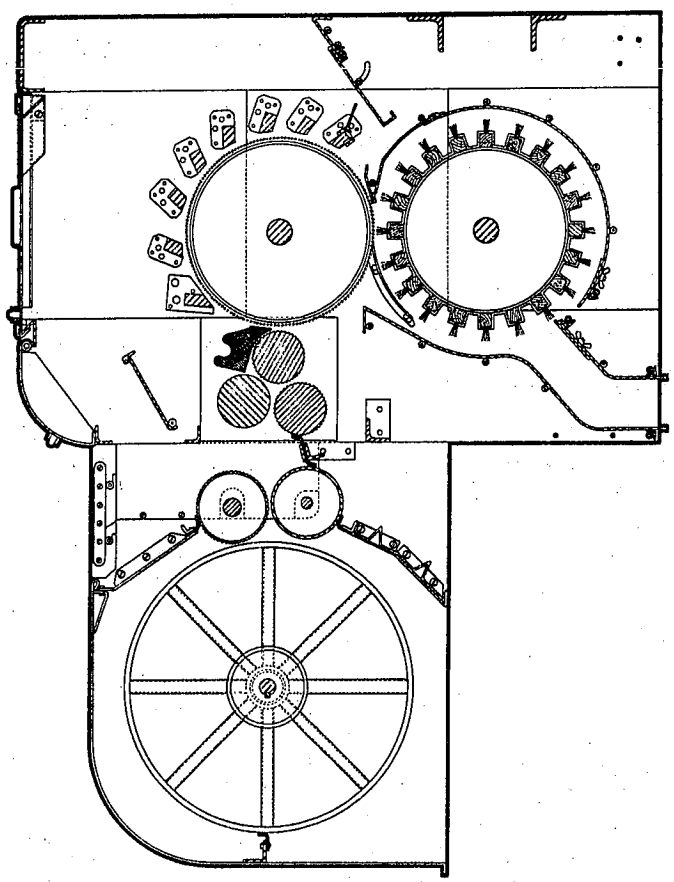


Figure 105.

Model 1961 high capacity saw-type lint cleaner for high capacity gin stands. (Courtesy, Continental Gin Co.)

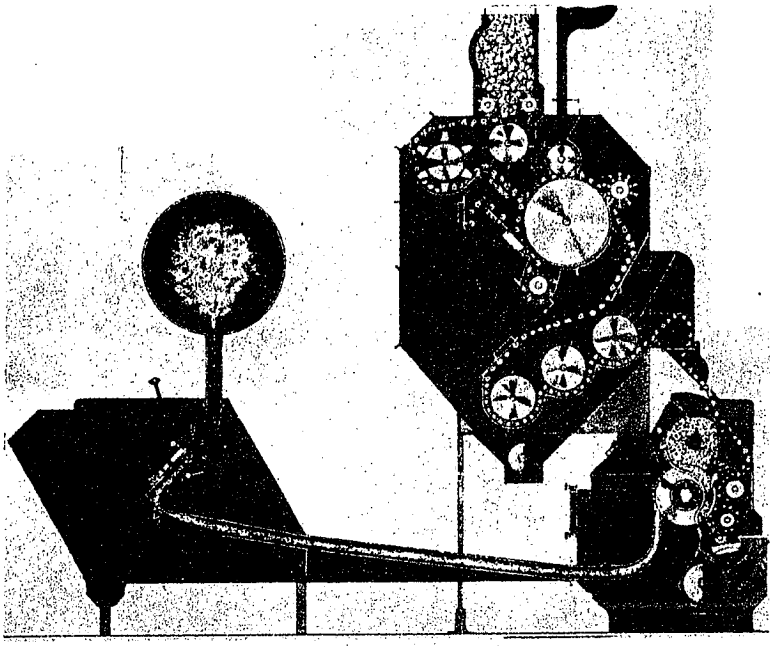
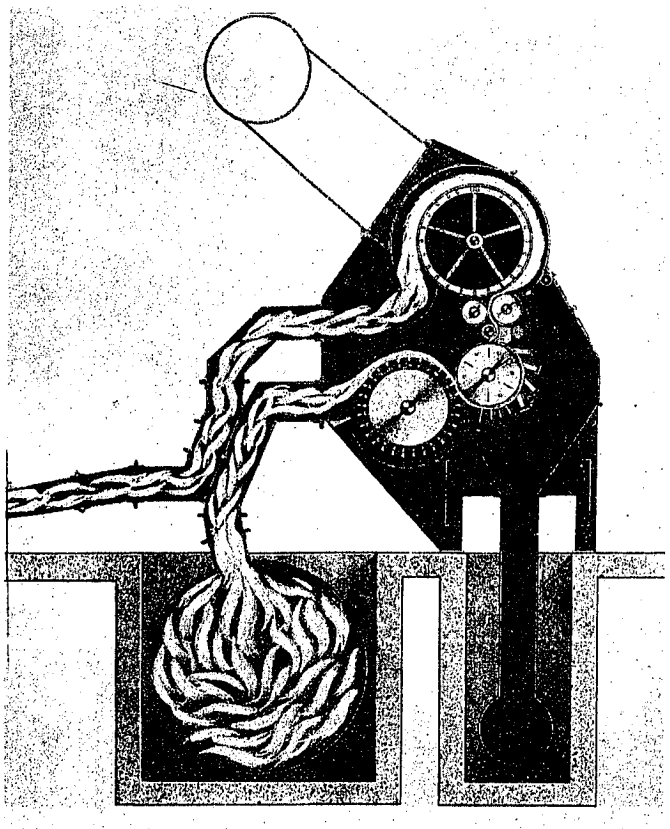


Figure 106.

Super-Jet air-centrifugal type lint cleaner. (Courtesy, Lummus Gin Co.)

Figure 107.

1961-62 Model Lint cleaner to serve high capacity gin stands. (Courtesy, Hardwicke-Etter Co.)



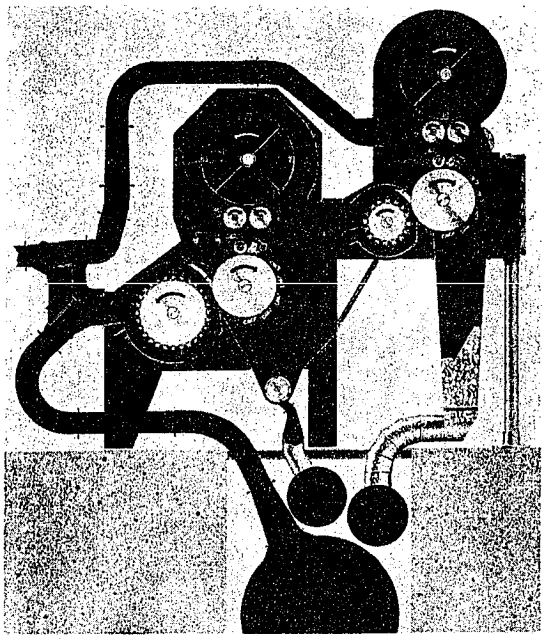


Figure 108.

1961 Model lint cleaner. (Courtesy, Murray Co. of Texas, Inc.)

Automatic Samplers for Ginned Lint

Research at the U. S. Cotton Ginning Research Laboratory at Stoneville, under the direction of John W. Wright, began in 1938 with George E. Gaus assigned as leader and Askew Ross as machinist. A series of public pattents were obtained by Gaus and others on various phases of cotton samplers. Some of these patents were:

Jan. 17, 1939	No. 2,144,306 - Gaus
May 12, 1939	No. 2,156,893 - Guas and Franks
May 12, 1939	No. 2,156,894 - Gaus and Stedronsky
July 18, 1939	No. 2,166,811 - Gaus
Sept. 12, 1939	No. 2,173,171 - Gaus and McWhirter
June 1, 1943	No. 2,320,544 - Gaus and Ross

Figure 109 is a diagram of the improved sampling system resulting from the last named patent, illustrates the sampling valve that operates at timed intervals to peel off a true sample from the main lint flue of the ginning system between the stands and condenser.

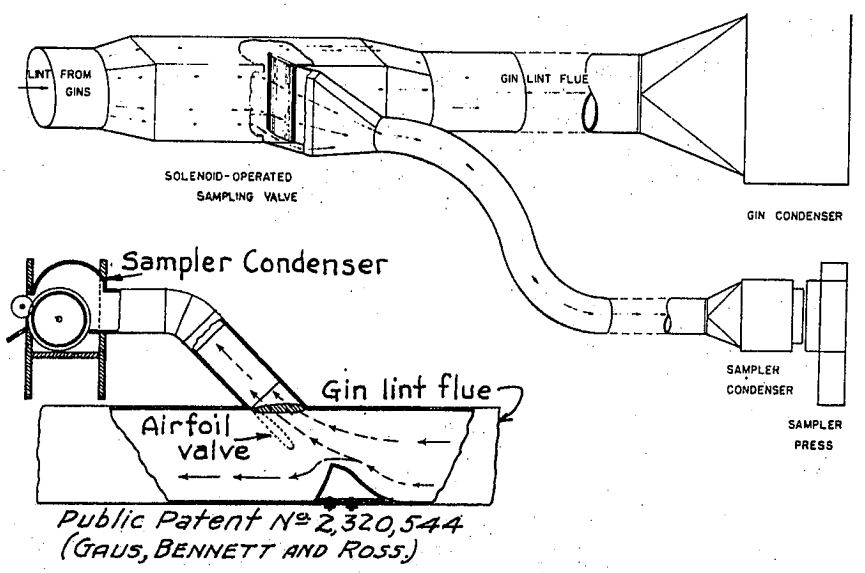


Figure 109.

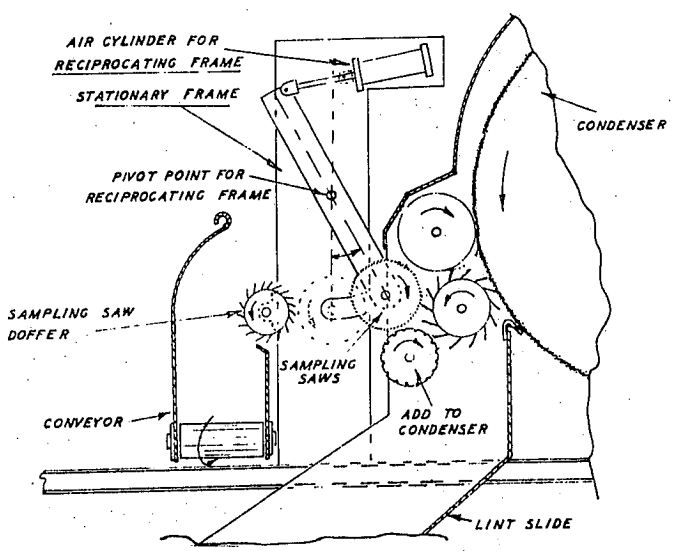
Diagram of mechanical sampling system, with vertical airfoil valve, to divert fiber to the sampler condenser and its press. (Courtesy, U. S. Department of Agriculture.)

During the first 5 years of the project, many different methods were tried before the one illustrated in Figure 109 was developed. Saw and smooth-edged slicers were tested for cutting through the batt as it left the condenser. Trap door and plunger methods were tried, as were suggestions from a number of independent inventors.

The problems were complicated by the need of determining (1) the pressures to be put on the samples to give an actual bale appearance of cut samples and (2) the positions of lint take off to the sampler condenser and press to avoid undue accumulations of pin and pepper trash. The publication of 1950 by Soxman and Gaus (14) is of special value to all who are interested in cotton samplers.

From 1950 to 1960 the adoption of mechanical samplers at cotton gins became more widespread. In the early part of the decade, further refinements and special improvements were made by cotton technologists Gaus, Ross, Fortenberry, Larrison, Cooke, Marble, Bartmess, and Davidson (18). These improvements included the timed operation of the sampling condenser and press concurrent with ginning press bale changes.

From 1955 to 1959, a new sampler was devised by G. N. Franks, on which he obtained Public Patent No. 2,859,485, Nov. 11, 1958. It was tested at Stoneville, Miss., and later at Mesilla Park, N. Mex., in cooperation with Marshall W. Thompson, cotton ginner. Figure 110.



(Figure 110).

Diagram of the 1958 automatic lint sampler designed by G. N. Franks. This unit differs from that shown in Figure 109 by taking the sample at the gin condenser outlet.

The packaging unit for the apparatus shown in Figure 110 does not require an individual condenser of the type necessary when the lint specimens are split from the lint flues, as shown in Figure 108. A photograph of such a unit taken at the Stoneville Laboratory is given in Figure 111.

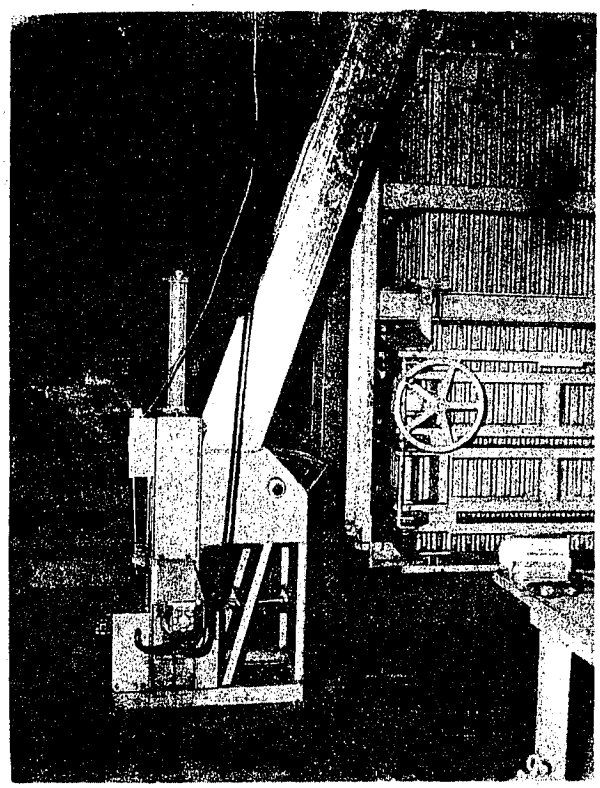


Figure 111.

Lint chute for discharge of sampling segments to packaging unit.

There probably is at present (1961) a greater proportion of cotton gins equipped with automatic samplers in Texas than there is elsewhere. Since about 1950 these units have been marketed by Geo. Haddigan, Delano, Calif., the Lab-Quip Engineering Corp., Shreveport, La., The Continental Gin Co., Birmingham, Ala., Moss-Gordin Cleaner Co., Lubbock, Texas, and others. Most of them have been of the type shown in Figure109.

Two other U. S. Department of Agriculture public patents for cotton samplers (Nos. 2,812,555, Nov. 12, 1957, and 2,859,485, Nov. 11, 1958) were issued to G. N. Franks.

So far as the writer is aware, Patent No. 1,428,978, Sept. 12, 1922, issued to Pitts and Haines, Memphis, Tenn., is the only one that preceded automatic sampler developments at the U. S. Cotton Ginning Research Laboratory.

Weighing

Lint Weights. -- To obtain more uniformity in bale weights, together with accurate information on seed weight per bale of lint, the ginning industry has made real improvements by installing weight indicating devices to supplement truck seedcotton and seed yard scales. However, ideas on lint weighing are not as recent as is their adoption. On May 7, 1907, U. S. Patent No. 852,825 was issued to DeRamus of Petronia, Ala., on a bale weight indicator attached to the press platen.

For many years the round-bale press of Anderson, Clayton & Co., has been provided with an indicator whereby the operator may turn out bales of uniform weight, Scales for square bales, attached to the cotton boxes on presses, were marketed in Texas before World War II, according to the writer's notes. A bale weight indicator is shown in Figure 112.

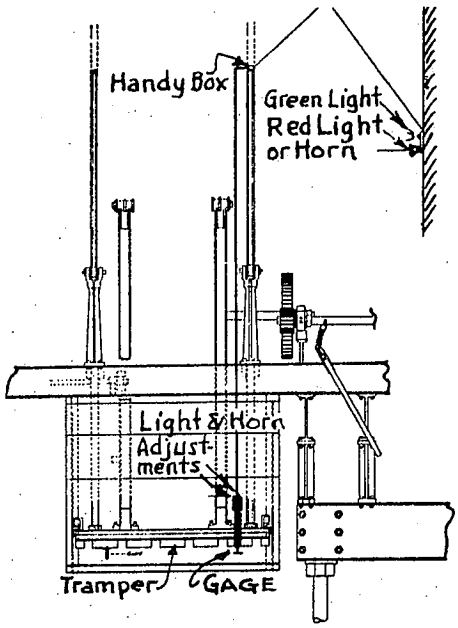


Figure 112.

Diagrams of Waller Bale Gage. This unit is provided with a green light that blinks when 450 lbs. of lint have been ginned; and a red light that blinks or a horn that blows when 500 lbs. of lint have been ginned. (Courtesy, Waller Bale Gage, Big Spring, Texas.)

Seed Weights. -- One method widely used since about 1910 has been to accumulate each bale lot of ginned seed in a dump-type scale hopper (Figure 113) located in a convenient position (such as at the end of the line of gin stands); so that, after weighing, it may be dumped into a disposal bin and then conveyed to a suitable place on the gin yard.

Figure 113.

Scale used for weighing bale lots of ginned seed, (Courtesy, Continental Gin Co.)

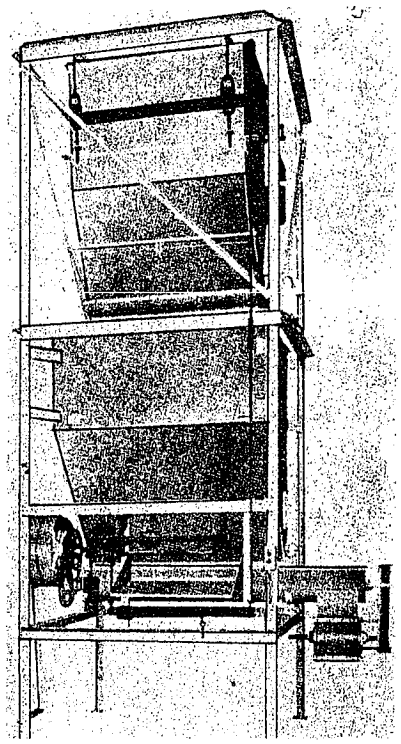
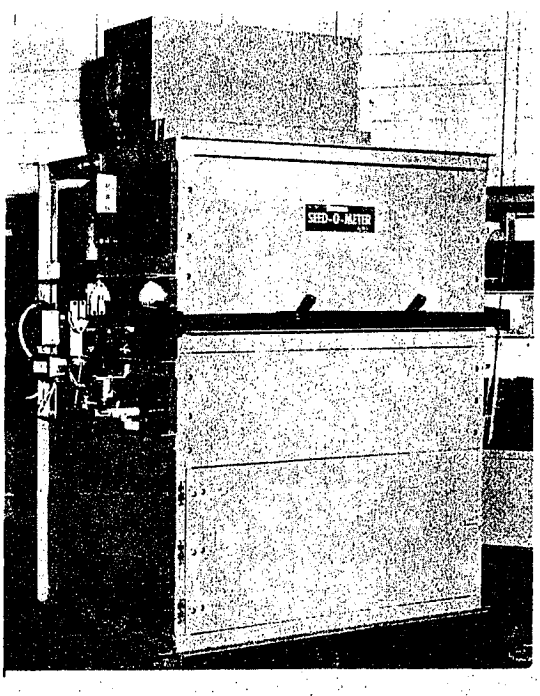


Figure 114.

Scale used for weighing bale lots of ginned seed. (Courtesy, Crowe Seed Scales Co., Inc.)



At the end of World War II, this older practice was augmented by new methods of continuous-flow weighing and disposal, plus signal devices to inform the ginner that the bale lot of seed had been weighed and recorded. A bulk seed scale is shown in Figure 113 and a continuous flow scale indicator in Figure 114. Adjacent to the press, many cotton gins have indicators and recorders for the seed from each bale of cotton. Customers' vehicles weighed empty and then with seed are frequently weighed at the gin office on its truck scale.

Input Controls

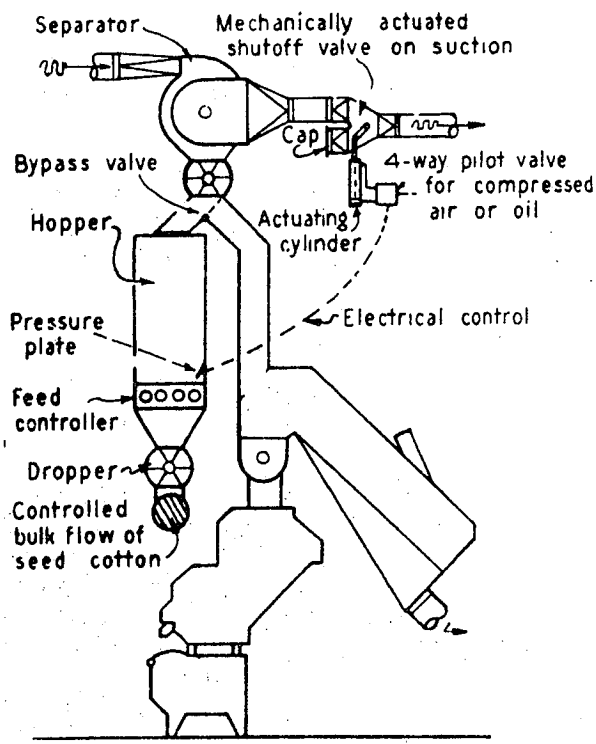
Research at the cotton ginning laboratories led to both governmental and private developments of seedcotton input controls, to promote close regulations of materal flow to the ginning system. These are becoming a regular feature in modern gins. They are superior to older methods by preventing an undesirable, large overflow and its attendant objectionable results. The flow is now regulated before any seedcotton moves to the overhead machinery or the feeders.

It had formerly been the custom for "sucker-pipe" men to endeavor to regulate the flow of seedcotton into the system at the wagon telescope. Consequently, when the suction operator was careless, cotton frequently returned to the overflow several times after overhead cleaning and extracting. Griffin and McCaskill (11) of the U. S. Cotton Ginning Research Laboratory prepared a report in 1959 that fully describes the development illustrated in Figure 115.

Figure 115.

USDA design of bulk seedcotton feed-rate controller. (Courtesy, U. S. Department of Agriculture.)

Leading cotton ginning machinery manufacturers make input controls somewhat similar to the above designs, although the location of the apparatus may not be overhead.



Selected References on Lint Cleaning

1. Bennett, C. A. Modernizing Cotton Gins. U. S. Dept. Agr. Handb. 99, 45 pp., illus. 1956. (Revised)

2. Bennett, C. A. Ginning Cotton. U. S. Dept. Agr. Farmers' Bul. 1748, 32 pp., illus. 1956.

3. Johnston, T. J. Cotton Ginners' Handbook. Arkansas-Missouri Ginners' Association. 159 pp.

4. Moore, V. P., and Merkel, C. M. Cleaning Cotton at Gins and Methods of Improvement. U.S. Dept. Agri. Cir. 922, 50 pp., illus. 1953.

5. Stedronsky, V. L., and Shaw, C. S. The Flow Through Lint Cotton Cleaner. U. S. Dept. Agri. Cir. 858, 30 pp., illus. 1950.

6. U. S. Dept. Agr., Agr. Marketing Service. Effect of Tandem Lint Cleaning. Marketing Res. Rept. 397, 20pp., 1960. illus. (Processed)

Selected References on Cotton Samplers

7. Bennett, C. A. Saw and Toothed Cotton Ginning Developments. Texas Cotton Ginners' Assn. and Cotton Gin & Oil Mill Press. 80 pp. 1960.

8. Cooper, M. R. Automatic Lint Sampler. U. S. Dept. Agr. Marketing Service. Marketing Activities. Vol. 18 (11); 14-16. 1955.

9. Gaus, G. E. and Larrison, J. F. Automatic Mechanical Equipment for Sampling Bales During Ginning. U. S. Dept. Agr. Prod. and Mktg. Admin. 29 pp. 1951. (Processed)

10. Gerdes, F. L. U. S. Production and Marketing Administration. Recent Technological and Economic Developments in Cotton Ginning and Marketing. 10 pp. 1948. (Processed)

11. Griffin, A. C. and McCaskill, O. L. Seed-Cotton Input Control at Gins. Production Research Report No. 29, ARS, USDA June 1959. 12 pp.

12. Martin, S. W. and Cleaves, F. Sampling American Cotton. U. S. Bur. Agr. Econ., Div. Cotton Marketing. 37 pp. 1936. (Processed)

13. Overby E. J. Automatic Sampling. Texas Cotton Ginners' Journal Yearbook. Vol. 29 (1): 43-46. 1961.

14. St. Clair, J. S. and Roberts, A. L. Effects of Cleaning Cotton at California Gins. U. S. Dept. Agri., Mktg. Res. Rept. 238, 35pp. 1958.

15. Shaw, C. S. and Franks, G. N. Automatic Sampling of Cotton. U. S. Dept. Agr. ARS 42-33. 25 pp. 1960.

16. Soxman, R. C. and Gaus, G. E. Sampling of Cotton Bales. U. S. Dept. Agr., Prod. and Mktg. Admin. 26 pp. 1950. (Processed)

17. U. S. Dept. of Agriculture. Prod. and Mktg. Admin. Automatic Cotton Bale Samples. Marketing Activities 8 (10): 14 pp. 1945.(Processed)

18. U. S. Dept. of Agriculture., Agr. Mktg. Service. Mechanical Sampling of Cotton. Marketing Res. Rept. 412, 35 pp. 1960.

19. Wright, J. W. Marketing Practices in Producers' Local Markets. U. S. Dept. Agr. Bur. Agr. Econ. 92 pp. 1938. (Processed)

20. Wright, J. W., Some Problems in Cotton Marketing. U. S. Dept. Agri. American Farm Bur. Fed. 7 pp. 1938. (Processed)

21. Wright, J. W. Reducing Costs of Distribution in Cotton. U.S. Dept. Agri. War Food Admin. Marketing Activities 7(10): 8-13. 1944. (Processed)

22. Wright, J. W. U.S. Production and Marketing Admin. The Place of Cotton as Textile Material. U. S. Dept. Agr. Prod. and Mktg. Admin. (An Address) 1946. (Processed)

23. Wright, J. W., Gerdes, F. L., and Bennett, C. A. Packaging of American Cotton and Methods for Improvements. U. S. Dept. Agr. Cir. 736, 62 pp. 1945.

List of Early U. S. Patents Which Included Ideas on Lint Cleaning

Year	Number	Inventor	Remarks
1842	2,608	James	Brushes behind gin ribs to clean and comb out trash.
1844		Carver	Special mote bars and splitters.
1858	21,714	Withers	Transfer brushes and saws behind regular ginning saws.
1888	394,640	Brott	Saw and Toothed Ginning Developments Brochure, 1960. (See Figure 52.)
1894	530,458	Rembert	(See text, Figure 99.)
1899	622,031	Archer	Spiked comb and keen angle grids.
1903	730,158	Rembert	Carding brush and second screen drum.
1914	1,111,761	Reardon	Screen trunk with corrugations.

In addition to the above list, there were some other patents that the U. S. Patent Office cited against inventors working on lint cleaners.

U. S. Patents Cited Against Inventors After 1938

Year	Number	Inventor
1886	339,464	Poston
1910	969,924	Turman
1912	1,042,395	Cheesman
1911	995,993	Washburn
1928	1,658,731	Mitchell
1932	1,886,713	Mitchell
1934	1,963,260	Conrad
1934	1,963,262	Deems
1937	2,100,112	Taylor
1938	2,129,312	Streun

List of Recent U. S. Patents on Lint Cleaners

Date	Number	Inventor	Remarks
1926	1,574,384	Garner	Flotation lint cleaner for spinning mills.
1940	2,219,402	Sanders	Airblast gin with hollow ribs and high pressure doffing.
1940	2,223,098	Farr	Brush cleaner cylinders, etc.
1941	2,258,928	Graham	Return lint flue with perforated corrugations.
1943	2,325,183	Hopper	Lint cleaning blow tubes at top of ribs.
1947	2,418,694	Brooks	Close saws, beaters, etc., with pinch-roll feeding.
1948	23,044	Brooks	Re-issue of patent.
1951	2,569,501	Stedronsky and Shaw	(See text, Figure 101.)
1958	2,827,667	Moss	Improvements in lint cleaning.

CHAPTER VI

POWER AND MISCELLANEOUS IMPROVEMENTS

Power

Many of the small gin stands, from the time of Whitney to the present (1961), have been hand cranked and have seldom exceeded 20 saws. The earliest units employed no condenser, but so-called export hand-powered gins with condensers have been popoular in foreign sales and also for laboratory use in this country.

Animal power, began to be used at commercial gins early in the 1800's, and many 2-story gins were equipped with sweeps and bull-gear drives for delivery of power to the overhead ginning machinery. A few water-powered gins have been used in the Southeastern States. With large water wheels, up to three stands were operated successfully between 1850 and 1910.

By 1840 steam power was used at public gins (Figure 116), and these power plants rapidly advanced from simple engines to large, Corliss-types.

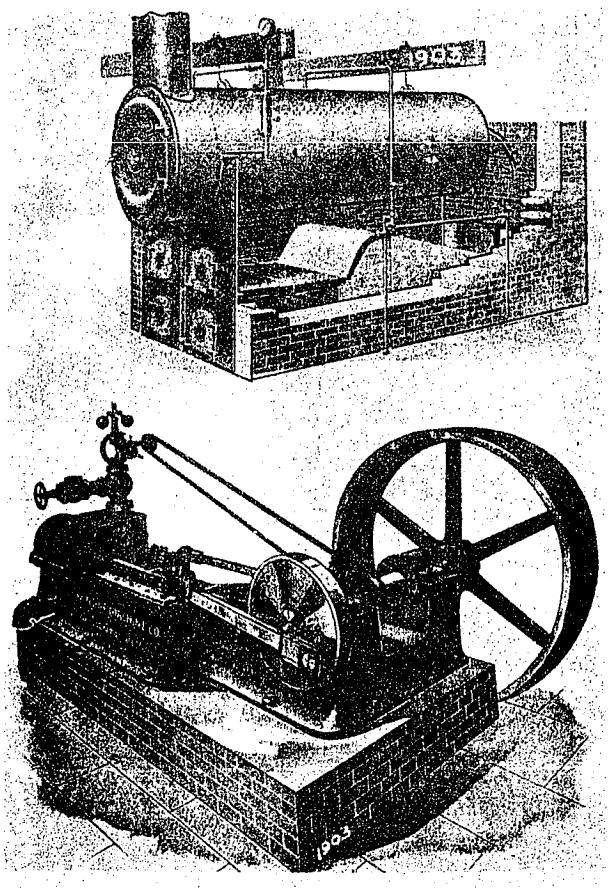


Figure 116.

A good example of the steam power equipment commonly used in many cotton gins from 1840 to 1920. Larger units continued in use after this period, especially in west Texas.

Although wood had been the first fuel employed for steamplants, the introduction of system gins made an auxiliary fuel available in the form of combustible foreign matter like sticks, stems, burs, and motes. Steam tractors were used in many smaller gins across the Cotton Belt, in lieu of the stationary boilers and engines. When gasoline and distillate fuel tractors became common, they supplanted some steam engines and steam tractors.

For larger gins the use of stationary diesel power increased after 1910 (Figure 117). When cotton drying systems were being developed, the U. S. Cotton Ginning Research Lab-

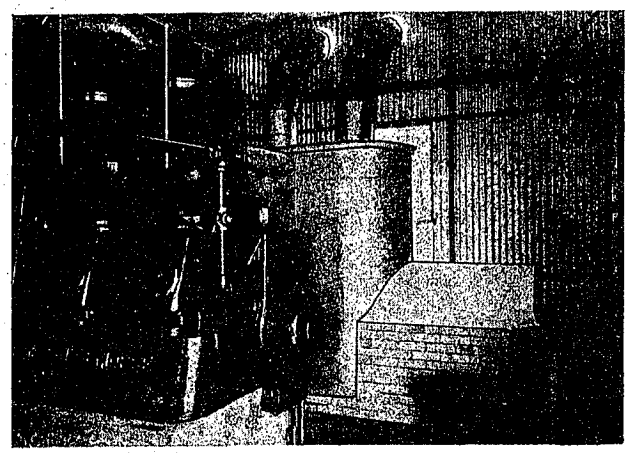


Figure 117.

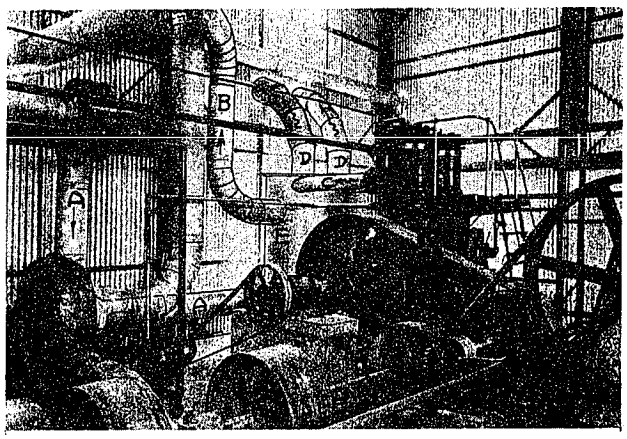
Diesel engine and waste-heat generator at Dockery, Miss., Plantation. (Courtesy, Fairbanks-Morse Co.)

oratory, in cooperation with such companies as Fairbanks-Morse and Caterpillar, worked on ways of developing waste-heat generators for their units. Figure 96 of Chapter IV showed one of these units, and Figure 117 shows another.

Another photograph, also taken at the Dockery Plantation, shows an all-metal waste-heat generator and diesel engine powered plant from a different view (Figure 118).

Figure 118.

Cotton gin power plant piping and waste-heat generator for dr ng. A. air from fan to waste-heat unit; B. heated air from unit; C. engine exhaust to waste-heat generator D. engine exhaust gases discharging to atmosphere after releasing much of their heat, while passing through tubes in exchange E.



Natural gas engines have been popular in areas served by the oil fields of the Central and Western States.

The main power plant at the Laboratory at Stoneville (Figure 119), is an example of use of natural gas power for cotton gins. The engine shown here develops about 350 horsepower and has 12 cylinders. Engines up to 600 horsepower are not at all uncommon at present-day gins.

The fourth source of power at cotton gins in the United States is electricity (Figure 120). Two systems have been in vogue for electric motors. The major system has employed one large motor for the ginning system proper, with auxiliary, smaller motors for the press pump and tramper drives. Such a system enabled the ginner to tie out bales without running the large motor.

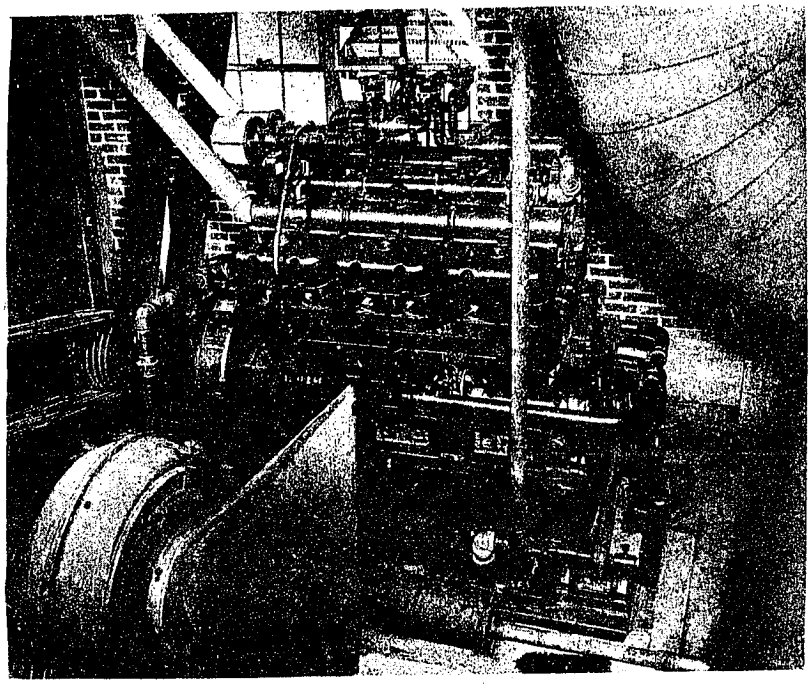


Figure 119.

Natural gas fuel engine used at the U. S. Cotton Ginning Research Laboratory, Stoneville, Miss. (Courtesy, The Roi Co.)

A recent trend in ginning is to replace the large motor with individual smaller motors, with one motor for each gin stand and feeder assembly being common. Other motors were then provided for overhead machines, press pump, fans, blowers, conveyors, and the like. Automation is readily adaptable to this latest system. Master switchboards with green and red flashes at end switch, automatic throwouts when chokage or nonfeed occurs, and other controls are all used today.

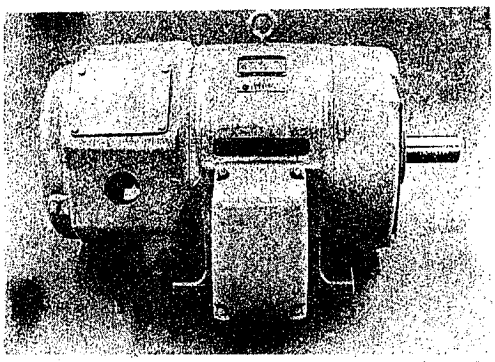


Figure 120.
Totally enclosed motor for cotton gin use. (Courtesy, General Electric Co.)

Briefly, then, the ginning power sources have varied from hand to animal, to waterwheel, to steam, to petroleum fuel engines, and to electric motors. The last three sources are now theprincipal powers used at American cotton gins.The history of cotton ginning has indicated a continual effort to obtain adequate power in an economical manner.

Miscellaneous Improvements

At the end of World War II, the manufacturers of cotton ginning machinery made numerous refinements and improvements in their equipment. Research was intensified in their own factories, and the Government and State Extension Services and Experiment Stations cooperated with the National and State Cotton Ginners' Associations in publicizing such major improvements and advances.

The widespread adoption of artificial drying and humidifying at cotton gins after 1938 led to multistage or series drying. Lint cleaning studies by manufacturers and by researchers at the Cotton Ginning Research Laboratories of the U. S. Department of Agriculture, led to improvements in lint cleaners and their use.

Miscellaneous improvements incorporated in ginning systems, in addition to those made in the gin stands, and major apparatus already described include:

1. Improved suction telescopes on overhead tracks.
2. Automatic alarms to warn of difficulties in operation of overhead and special apparatus.
3. Automatic throwouts for gin stand breasts, and special safety controls for presses and other machinery.
4. State regulatory safety measures, such as guards and other devices, to protect the life, health, and limb of operators.
5. Improved disposal methods for foreign matter and for ginned seed.
6. Dust elimination, better lighting, and better freeways around the equipment.

Storage facilities including all-metal fireproof collection bins and demountable trailers have improved gin yard operations. Shop and tool facilities greatly assist in maintenance and repair. Many gins have compressed air tools, motor-driven saw-sharpeners, vacuum cleaners, portable blowers, dust masks, and other accessories.

New Cleaners. Improvements in air line and inclined gravity type cleaners, as of late 1959 and 1960, were being made. Cleaners and driers are being combined in a single machine by some manufacturers.

Driers. In the chapter on drying, some types of driers were not shown that should be included. They are shown here in Figures 121, 122, 123 and 124.

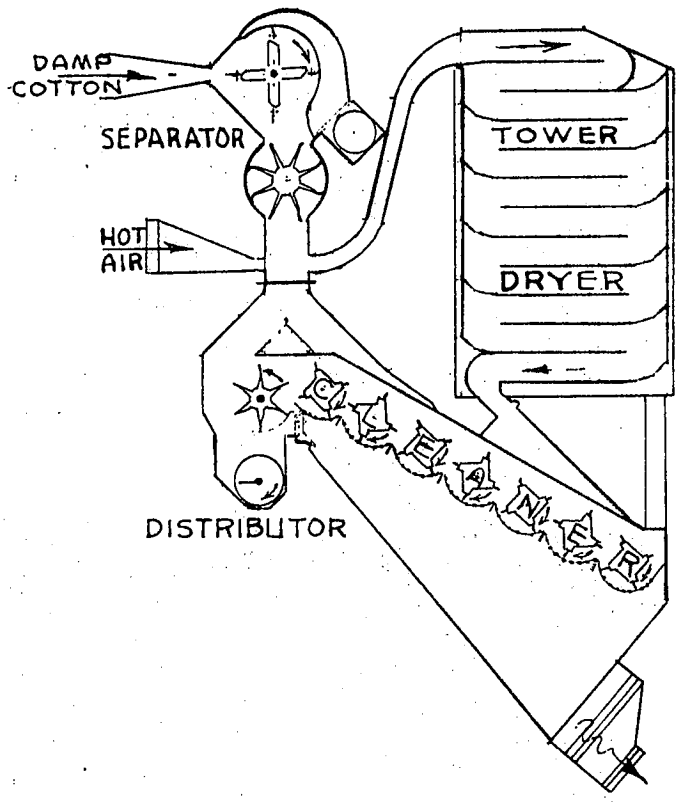


Figure 121.

Tower Dryer and inclined Cleaner, "push-pull" type. (Courtesy, The Murray Co. of Texas, Inc.)

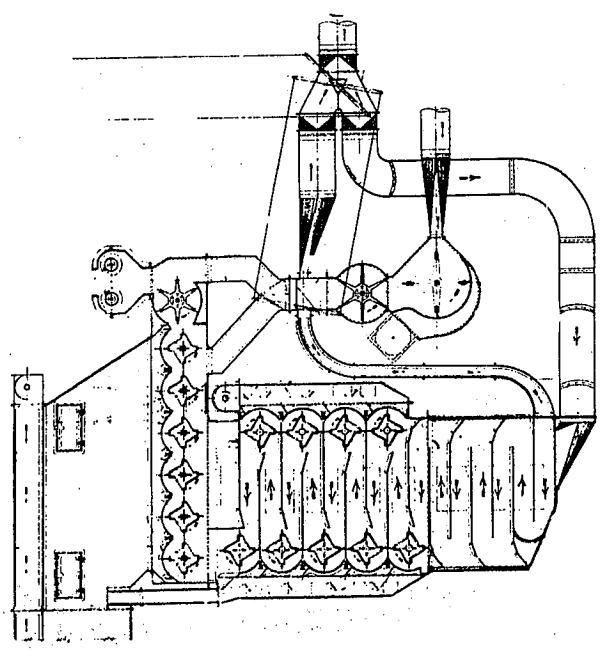


Figure 122.

Multiunit Dryer and Cleaner. (Courtesy, The Murray Co. of Texas, Inc.)

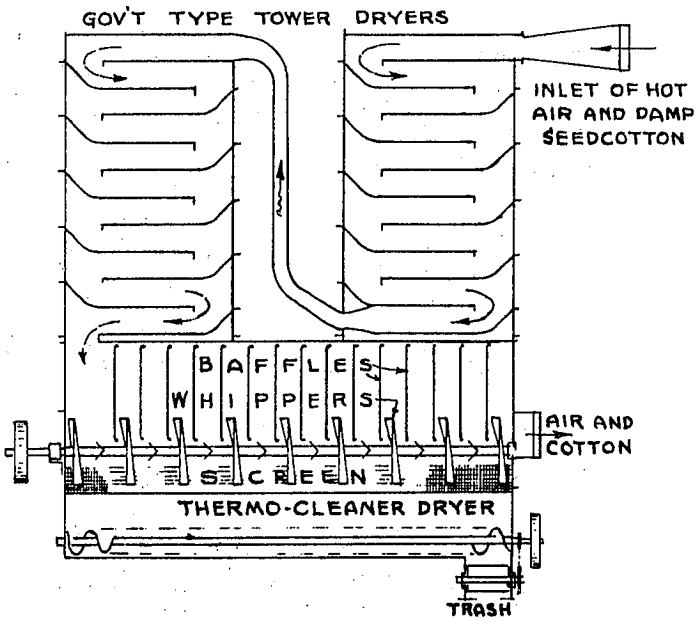
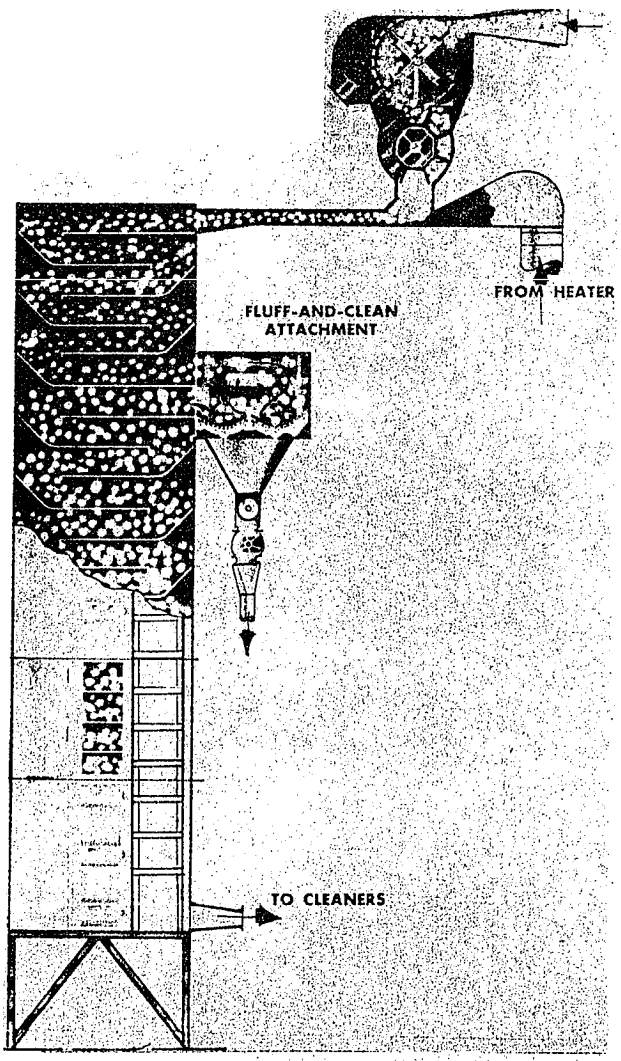


Figure 123.

Double tower and Thermo-cleaner-drier. (Courtesy, Lummus Cotton Gin Co.)

Figure 124.

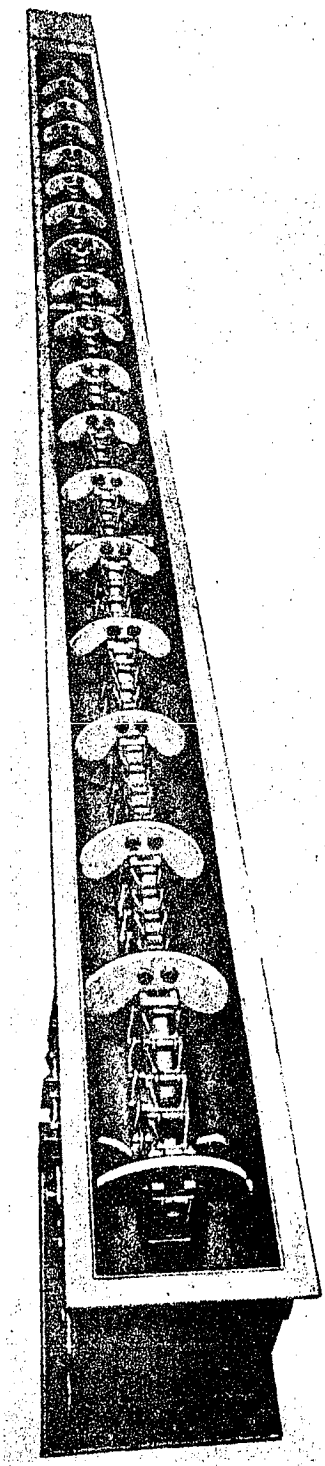
Standard Government Tower with special attachment. (Courtesy, Hardwicke-Etter Co.)



New Conveyors. In addition to the conventional auger and screw conveyors, a bulk material chain drag conveyor in a covered U-trough is of interest to ginning establishments (Figure 125).

Figure 125.

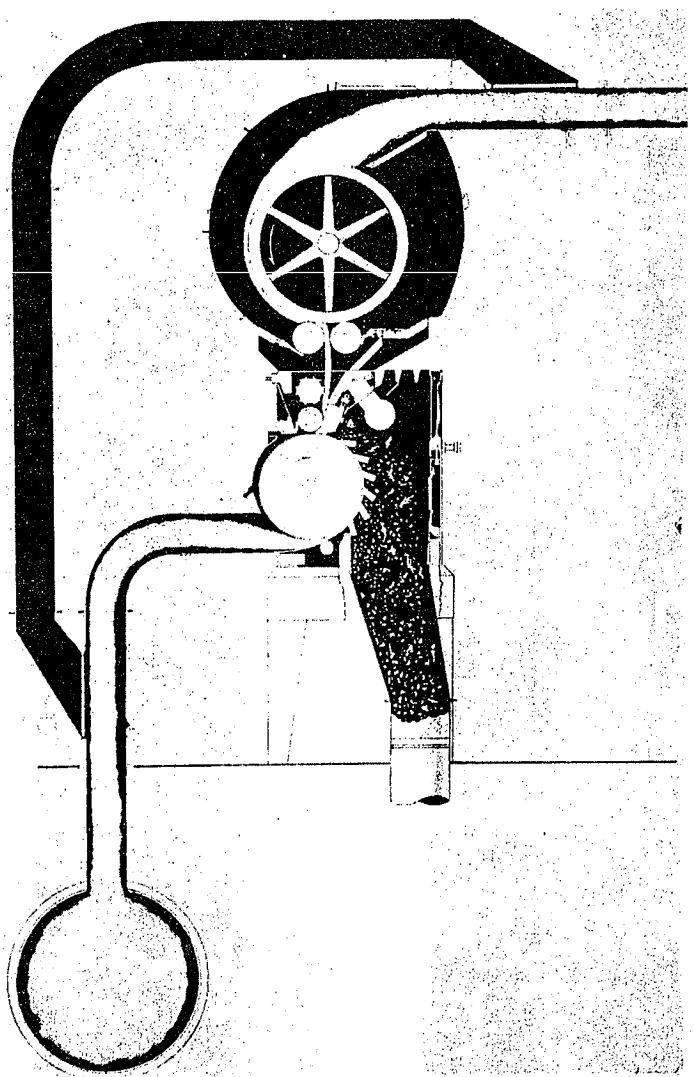
Horizontal or incline chain flight conveyor in single U-trough. (Courtesy, Screw Conveyor Corp.).



Condenser Lint Cleaners. In addition to the two forms of master lint cleaners, Figures 103 and 104. wherein the lint cleaning precedes the condenser discharge, a third form was devised as shown in Figure 126.

Figure 126.

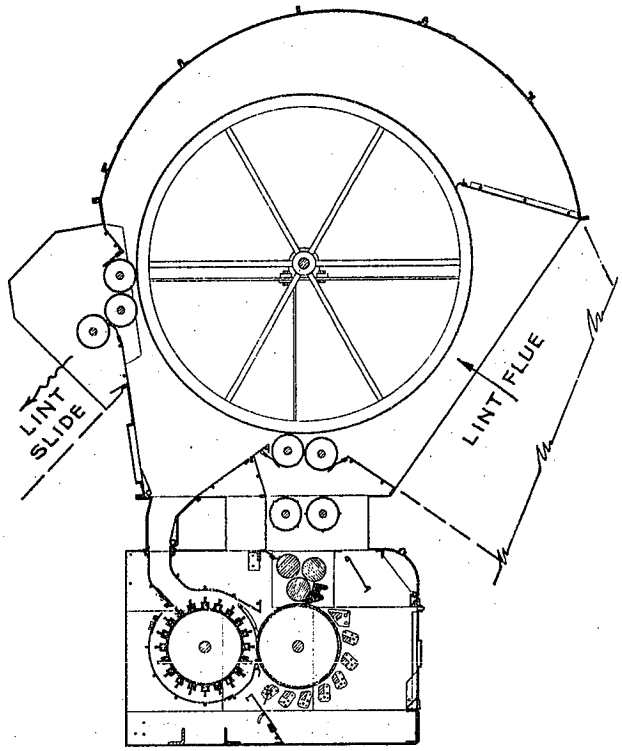
Lummus Comber.(Courtesy, Lummus Cotton Gin Co.)



The master lint cleaner construction used in Figure 104 was changed in 1961 to eliminate reversals of rotation in the condenser drum. This resulted in the design given in Figure 127. The examples shown in Figures 103, 104, 126 and 127 are not exclusive in the field, since other condenser-lint-cleaners in multistage form are coming into use.

Figure 127.

Continental Direct Flow unit of 1961. (Courtesy, Continental Gin Co.)



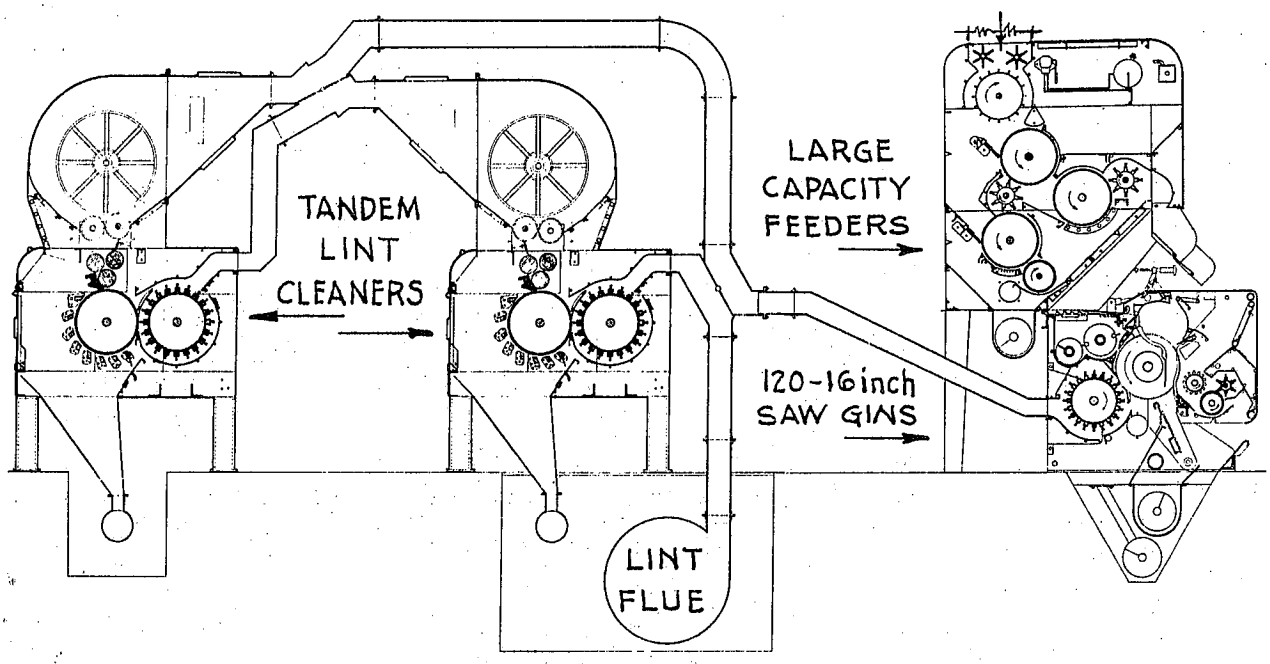
"New Cycle" Cotton Gins, 1959-61

In the late 1950's, ginning manufacturers provided more and larger saws per gin stand than had been the previous practice.

Some of the new gin stands developed during this period are shown in Figures 128, 129, 130, 131 and 132.

Figure 128.

A 1961 gin stand and feeder made for 79 and 119 saws of 16-inch diameter. (Courtesy, Continental Gin Co.)



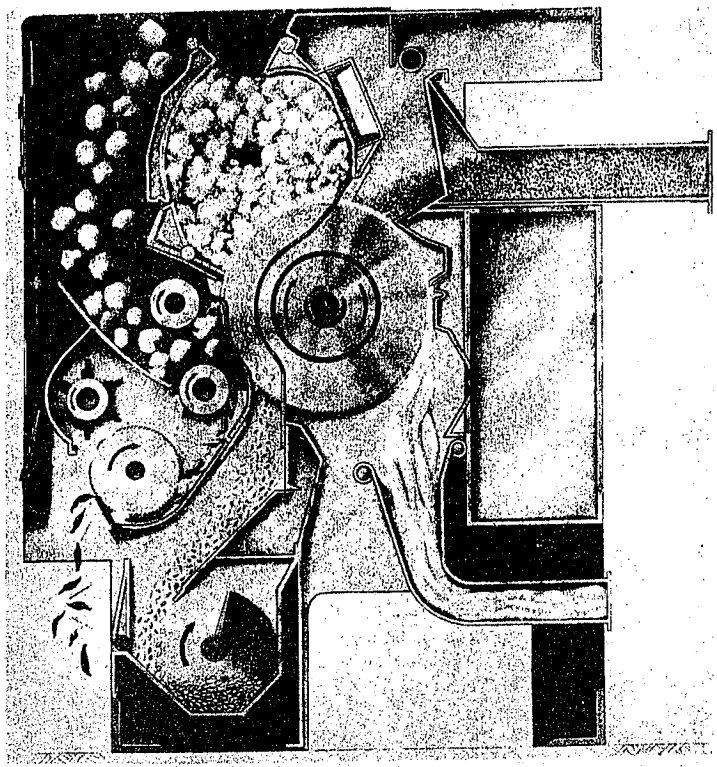
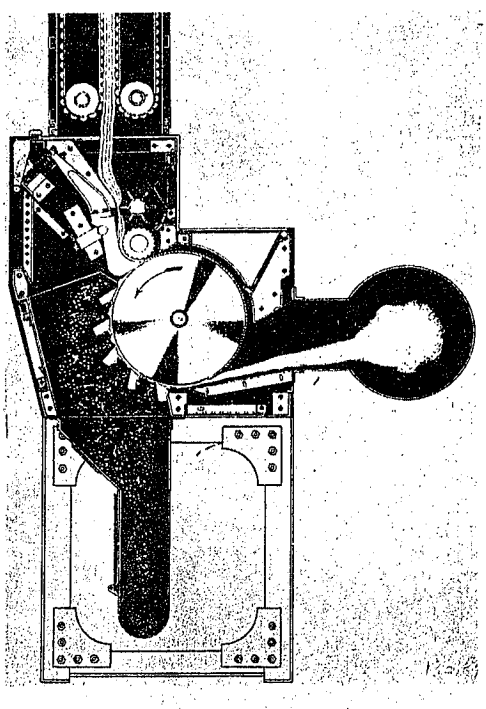


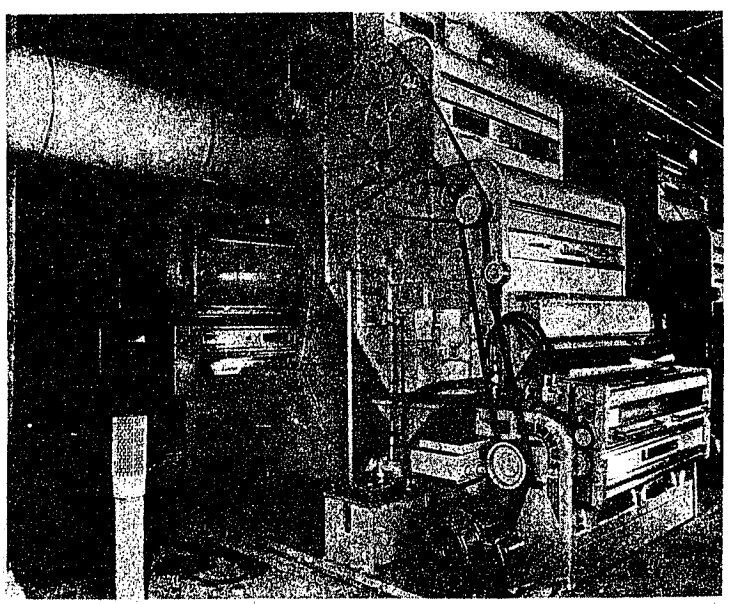
Figure 129.

A new gin stand with either 75 or 140 saws of 16-inch diameter. (Courtesy, Gordin Unit System, Inc.)

Figure 130.

Section view and photo of a gin stand with 88 12-inch diameter saws. (Courtesy, Lummus Cotton Gin Co.)





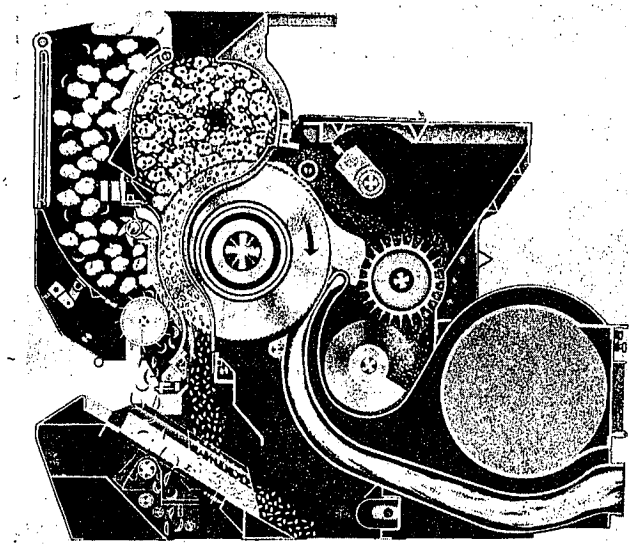
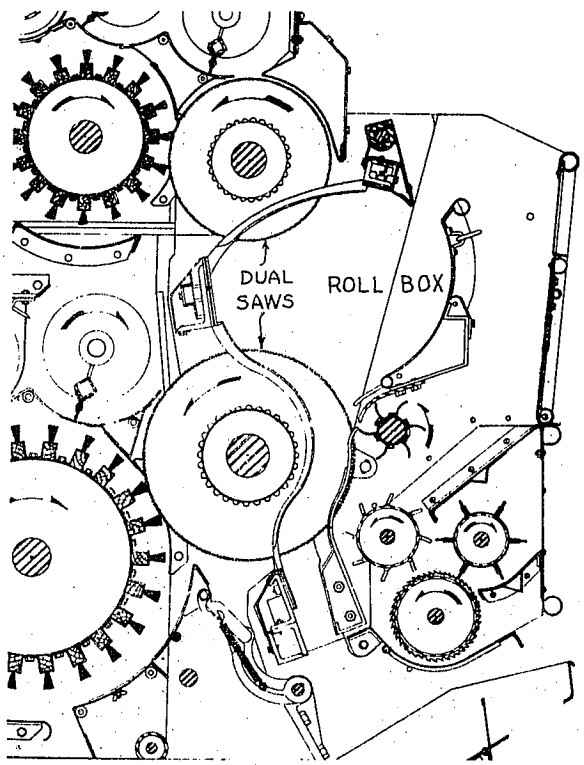


Figure 131.

1961 18-inch diameter saw gin made in 80- and 90-saw units. (Courtesy, The Murray Co. of Texas, Inc.)

Figure 132.

1961-62 high velocity dual saw-cylinder gin stand and feeder. The 2-cylinders provide a total of 177 saws of 12- and 11-1/2-inch diameters.



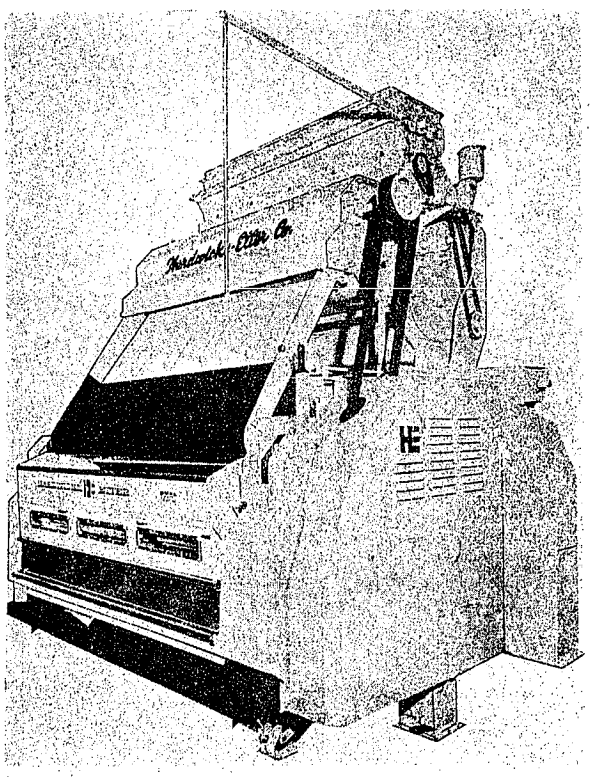
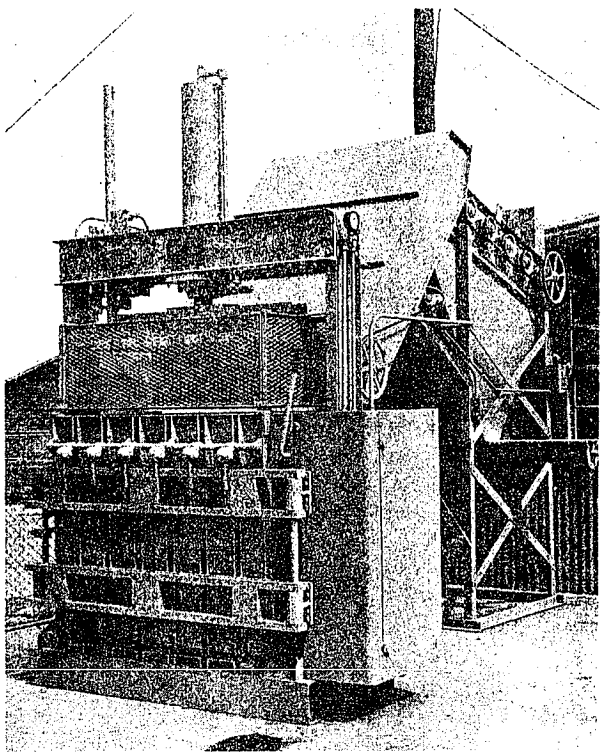


Figure 133.

A portion of factory cross-section to shown relative positions of the saw cylinders. (Left)

Mote Cleaner and Press. Large volume cotton gins often accumulate motes, fly lint, and fiber that required baling for the market. Figure 134 illustrates a 1961 Mote Cleaner and Press for such gins that may require a utility outfit for operations concurrently with ginning, or that may be used without requiring unnecessary idling of other machinery.

Figure 134



Inclined Mote Cleaner and Press of 1961. (Courtesy, Western Metals Division of Western Pipe & Steel, Inc.)

Spray Oils and Anti-Choke Agents.

In some sections of the Cotton Belt, ginners, have from time to time resorted to non-choking remedies, such as talcs and oils. Texspray, an anti-static oil is one of these. This extremely light oil has been applied at various locations in the ginning system and primarily in the suction line in an effort to overcome chokage due to dampness or static electricity. Ginners have used these agents with varying results.

Special Seedcotton Storage Devices

In addition to storage bins at gins, the cotton producers have made use of skeleton frame trailers and baskets with wire mesh sides as a timesaver at the gin, and also to benefit the grower. The Southeastern Cotton Ginning Laboratory in cooperation with the Clemson Agricultural College at Clemson, S. C. devised the baskets shown in Figure 135.

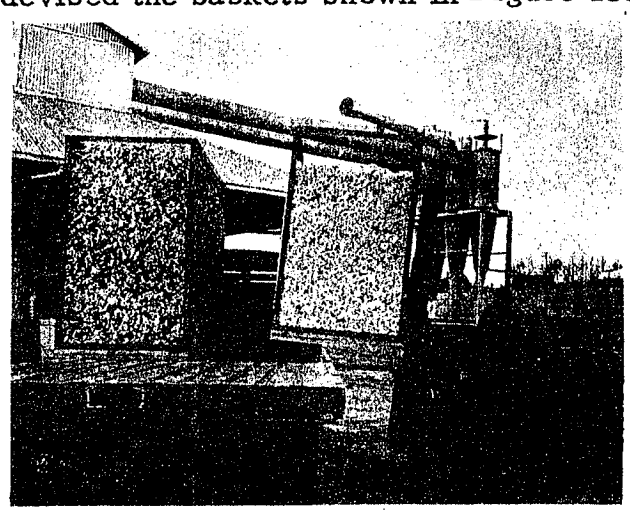


Figure 135.

Timesaver baskets devised by J. H. Anderson and Joseph H. Cocke at Clemson, S. C.

Utility Gin Yard Unloaders. Gin yard operations have been facilitated in large-volume gins by the use of portable pneumatic handling devices (Figure Figure 136). The materials are conveyed pneumatically.

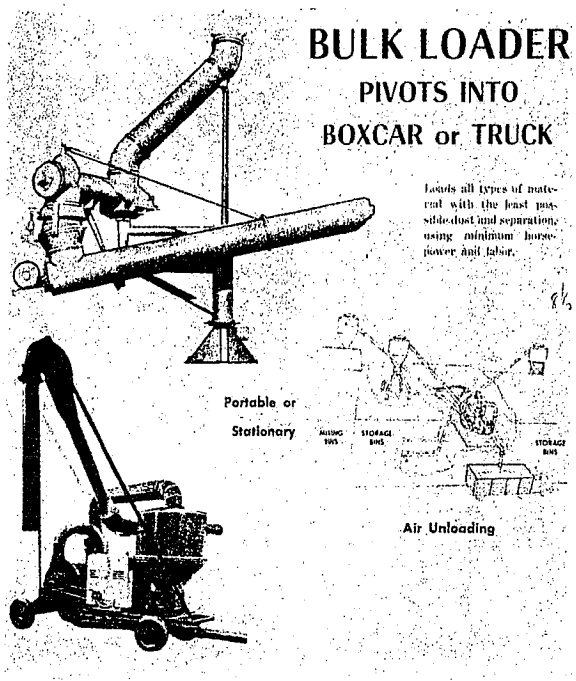


Figure 136.

Bulk loader for gin yard use. (Courtesy, Hubert-Phelps Machinery Co.)

Cotton Gin Separators. The manufacturers have made continuous efforts to improve their separators. Two current examples designed to prevent chokage and the accumulation of hazardous foreign material in the pneumatic systems that handle seedcotton are given in Figures 137 and 138.

Figure 137.

The Gordin self-cleaning nonchoke separator. (Courtesy, Gordin Unit System Co., Inc.)

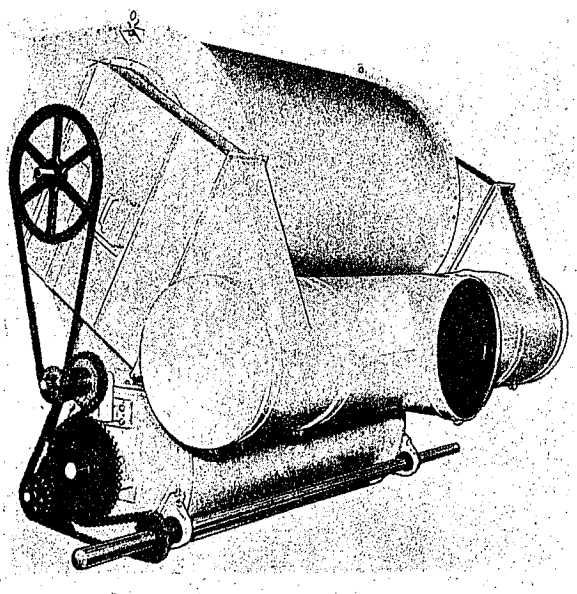
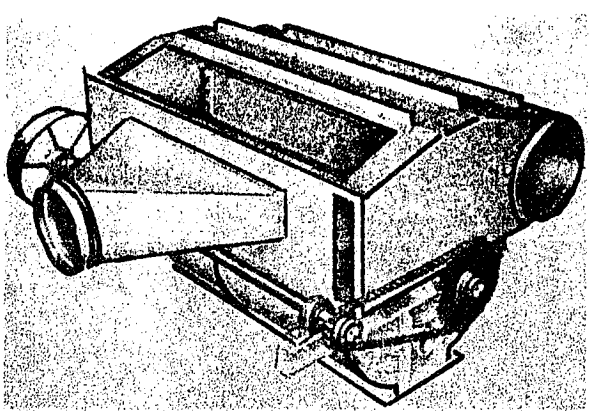


Figure 138.

The Stacy self-cleaning nonchoke separator. (Courtesy, The Stacy Co.)



Cotton Gin Tramper Improvements. Various designs of press packers or trampers have long been used in the United States. A 1961 model to facilitate smooth batts from condenser to press is that shown in Figure 139.

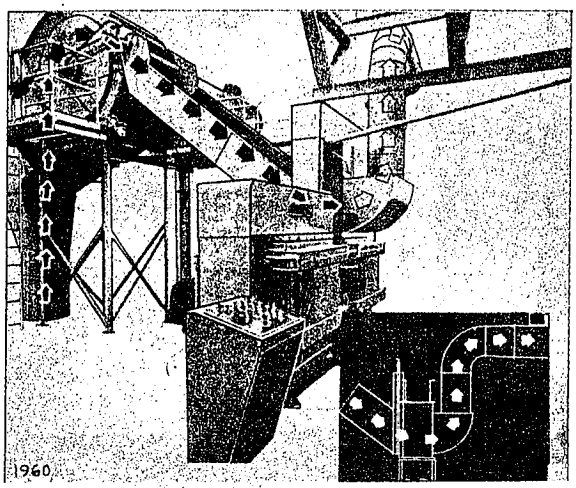


Figure 139.

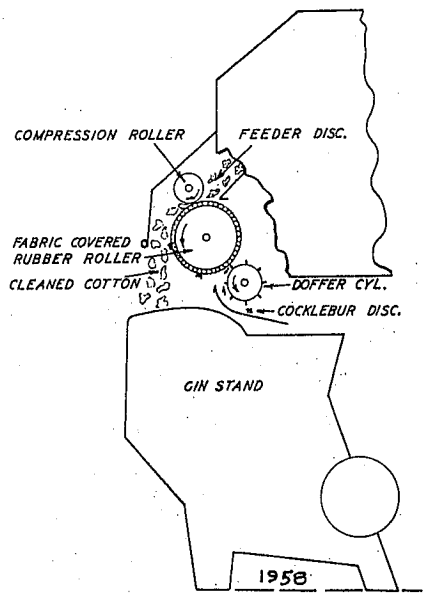
Pneumatic device for obtaining smooth batts of ginned lint from condenser to cotton box. (Courtesy, Continental Gin Co.)

Seed Treatments. In recent years, the cotton ginners' and seedbreeders' structures have housed such devices as damp-seed dryers, seed cleaners, sterilizers, treaters, and graders to protect planting seed. To this end, Franks and Shaw of the U. S. Cotton Ginning Research Laboratory, obtained U. S. Public Patent No. 2,735,226, Feb. 21, 1956 -- "Method and Apparatus for Treating Cottonseed;" and in 1958 they worked out special designs for a practical cocklebur remover. This engineering team has also performed outstanding research on handling and cleaning in conjunction with the safe drying of planting seed and the proper modes for cooling to preserve seed viability.

Cocklebur Remover. The presence of cockleburs in seedcotton and ginning seed has been troublesome in some regions and C. S. Shaw and G. N. Franks conducted extensive research on the removal of cockleburs from 1956 through 1958 at the Cotton Ginning Research Laboratory, Stoneville, Miss., Figure 140. 3/

Figure 140.

Diagram of cocklebur remover devised by Franks and Shaw at Stoneville, Miss.



3/ Shaw, G. S. and Franks, G. N., Cocklebur, a Solution. Cotton Gin and Oil Mill Press, May 3, 1958. 2 pp.

Boll and Rock Traps and Magnets.

These necessary proctections to ginning machinery have been previously mentioned but not illustrated. Figure 141 diagrams the Government design developed by researchers at the U.S. Cotton Ginning Research Laboratory at Stoneville.

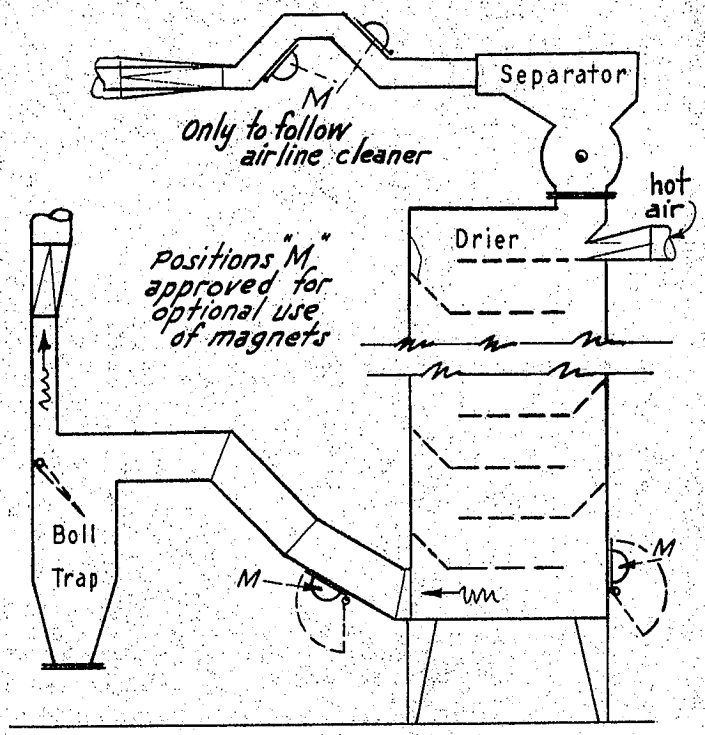


Figure 141.

Rocks and Boll trap and magnets for stray iron.

Figure 142 depicts the commercially adapted cross-section of the "Flight bar" type of roller gin, from the Williams' public patent which was developed at the U. S. Department of Agriculture's Southwestern Cotton Ginning Research Laboratory, Mesilla Park, New Mexico. (U.S. Patent No. 2,929,111, March 22, 1960. "Roller Cotton Gin", James M. Williams, Jr., State College, and Henry T. Montgomery, Mesilla Park, New Mexico).

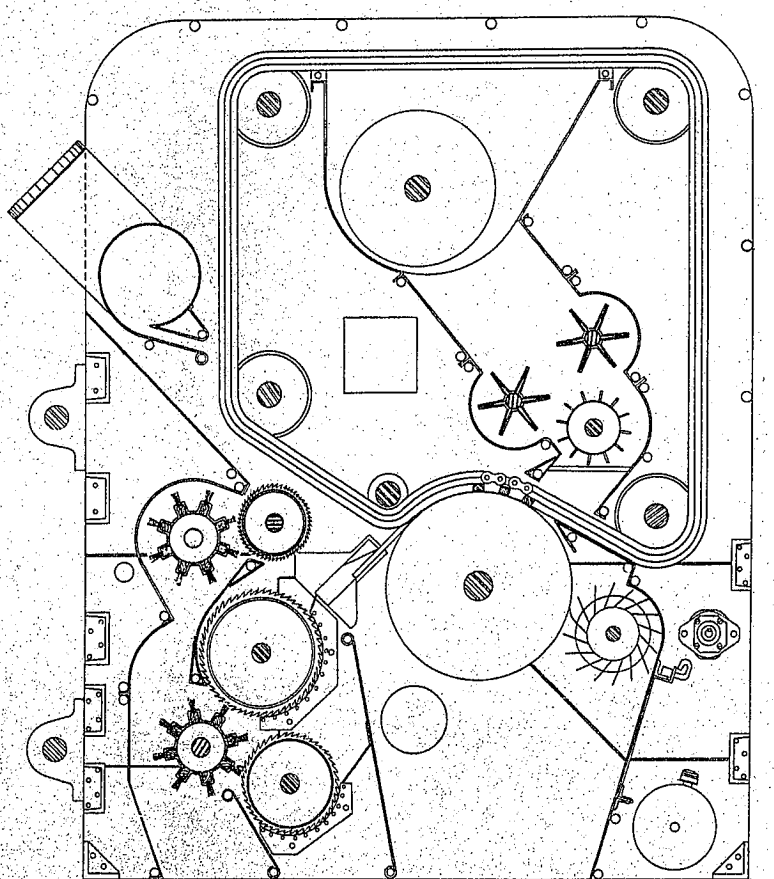


Figure 142

Cross-section of commercial 1962 model "Flight-bar" type of roller gin stand with 40-inch length roller. (Courtesy, Continental Gin Co.)

Figure 143.

Two 1960 model ginning outfits. Figures 143 and 144 shows a California six-stand outfit complete with 2-stage drying, stick and green-leav extracting, and tandem lint cleaning. (Courtesy, Continental Gin Co.)

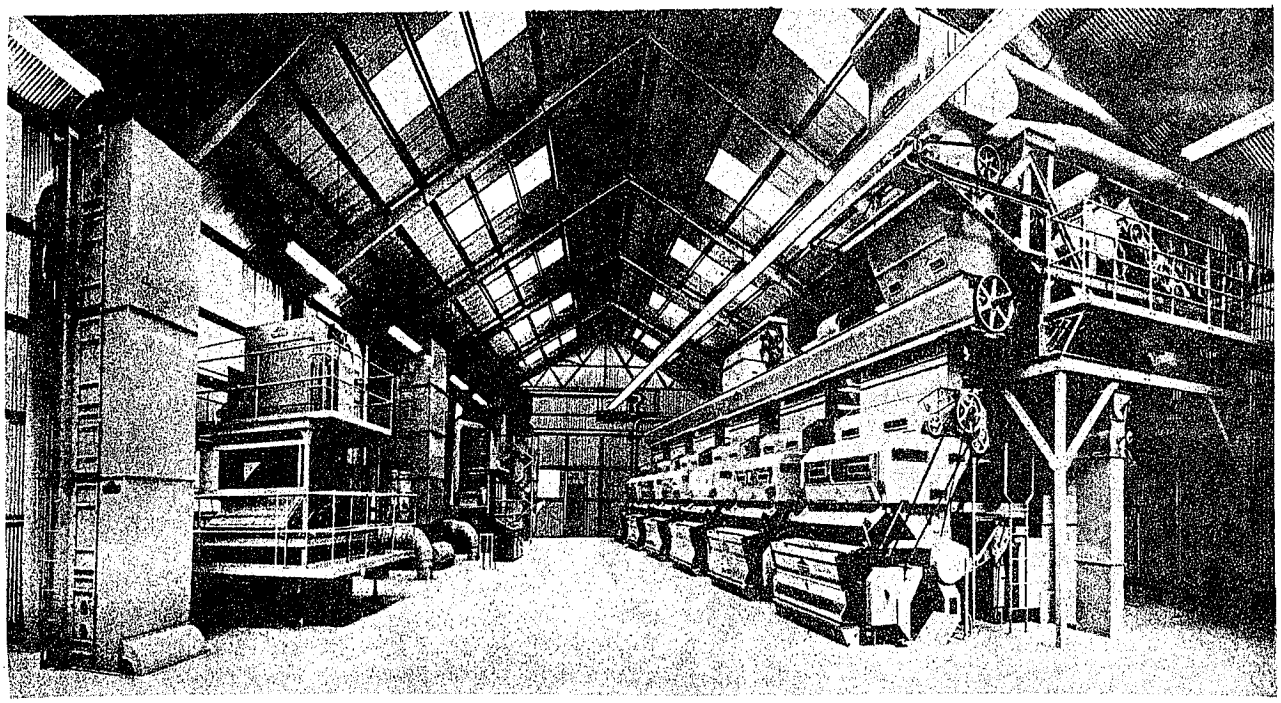


Figure 144.

A Texas five 120-saw gin stand outfit complete with feed control, 2-stage drying, master extractor with stick-remover, shown on one side, with individual feeders and lint cleaners on the other. (Courtesy, Hardwicke-Etter Co.).

Summary and Conclusions

The development of auxiliary equipment and processing stages have been responsible for significant progress in the field of cotton ginning. They have kept pace with increases in volume cotton production and harvesting methods. They have brought changes from the 18th century primitive, manually operated, single, small gin stand to 20th century continuous, automatic, machine powered, multistage outfits having batteries of gin stands and associated high capacity equipment.

Thus, the important first stage steps following the Whitney (1794) and Holmes (1796) gin stand inventions included fiber pressing and packaging which was well advanced by 1840. Miscellaneous construction improvements in gin stands, condensers and power devices brought the 1884 "system" cotton gin into being. By the end of the 19th century, the industry was improving its gin yards, buildings, separators, feeders, cleaners, presses and material handling stages with broad aims for mass production in minimum time.

For the 20th century, this brochure has endeavored to briefly depict significant developments. Two American inventions -- the toothed gin of Whitney and Holmes, and the roller gin of McCarthy -- have become worldwide in use. With these have traveled a host of valuable American developments and improvements for the benefit of humanity.

As of early 1962, the cotton ginning industry appears to be facing revolutionary changes. The two important ones appear to be automatic controls and improved machines which will be fewer in number and far greater in capacity.

Printed in the Offices of

THE TEXAS COTTON GINNERS' ASSOCIATION, INC.

P. O. BOX 26129 DALLAS 26, TEXAS

August 1962