stalled in the mill of Amos H. Hubbard, Norreiche Falls, Connecticut. This machine produced usable paper during the month of May of this year.

1830 Commercially made sandpaper produced about this time, one side of the paper being brushed with glue, and sand, ground glass, or emery dusted upon the paper. Previous to this date most workers made their own abrasives by coating ordinary canvas or heavy paper with glue and sprinkling sand upon the surface.

Joel Munsell records (1876) that an issue of the Crawford Messenger, Meadville, Pennsylvania, was printed on paper made from lime and aspen wood. The paper used in printing the edition of October 28, 1830 appears different from all other issues, but inasmuch as the paper has not been analyzed, it is not possible to state definitely that it is wood-pulp paper. It has not been possible to procure a specimen of the paper for examination. If Munsell is correct, this would be the first instance of the use of wood-pulp paper in printing an American newspaper. (See: page 380.)

Bleach, invented by Scheele in 1774, first used by American papermakers in bleaching rags for making paper.

According to Julius Grant, writing in Books and Documents (London, 1937), paper was first calendared in England this year.

The "knotter" used for the removal of knots and lumps in paper stock invented in England by Richard Ibotson. The earliest patent for a knotter in America is dated March 12, 1831, and was granted to Solomon Stimpson, Newbury, Vermont.

1831 Hall, of Dartford, England, used for the first time washing-screens on the Hollander, enabling the water to be constantly changed while washing paper stock.

One of the earliest paper-machines in the "western country," Under date of July 16, 1831, the Chillicothe, Ohio, Weekly Advertiser had the following advertisement: "Machine Paper Mill. H. & I. INGHAM. Respectfully inform their friends and the public that their Machine Mill is now in successful operation, and that they will supply at the shortest notice any orders for Writing Paper, Nos. 1 2 3 cap, Nos. 1 2 post. Also, Printing and Wrapping of any size and quality, per order, upon as reasonable terms as paper of the same quality can be had from any other establishment in the Western country. The highest market price will be allowed for rags, either in cash or in exchange for paper." This was probably, if not the first, one of the first paper-machines in the West. Hezekiah and Isaiah Ingham went to Ohio from Bucks County, Pennsylvania, about 1810 and established a handmade-paper mill on Kinnikinnick Creek, Ross County. By 1812 they were making writing and printing paper equal to any manufactured in the East. Their watermark was "H & I INGHAM" in the regulation outline letters.

A cylinder machine made by John Ames, of Springfield, Massachusetts, was installed in the mill of Zenas Crane, established 1801, at Dalton, Massachusetts. The first Fourdrinier machine to be used in the Crane mill was not installed until about 1840-5, previous to the death of Zenas Crane in 1845.


1834 The earliest papermaking in the state of Missouri. Printing, however, was accomplished in this state as early as 1808 by Joseph Charless, but the paper used by this pioneer Missouri printer came from Craig, Parkars & Company, Georgetown, Kentucky, or from Jackson and Sharpless, Redstone mill, as evidenced by watermarks in early Missouri printing. The Missouri Gazette, established by Char-
less, had no end of difficulty in procuring paper for publication, and in March 1809 the newspaper was printed on letter paper; in the issue for October 9, 1813 it was stated that the newspaper was so small in size owing to the scarcity of suitable paper; in the publication of January 1814 the editor complained that there was no regular trade with Kentucky, where funds had been sent and the paper awaited a trader bound for Missouri. As early as January 1834 the newly established Missouri mill advertised for rags: “good, clean linen and cotton rags 3 cents per pound, for woolen 10 cents, and jeans rags 1 cent per pound.” But apparently it was not until the latter part of the year that the mill was actually in operation, when the Missouri Intelligencer, December 27, 1834, announced the event in the following manner: “The paper on which this number of the Missouri Intelligencer was printed, was made at the paper mill of Messrs. Lamme, Keiser & Company (David and William Lamme, John W. Keiser and Thomas Cox), in this county (Rock Bridge, near Columbia, Boone County). It is a fair specimen of what may be expected when the mill has been longer in operation. This is the only establishment of the kind in Missouri or Illinois, and the worthy and enterprising proprietors, who have expended a large sum in the undertaking, merit, and we sincerely hope, will receive a liberal and general support from the printers and merchants of the two States,—particularly Missouri. The machinery is entirely new, and the whole establishment is on an extensive scale. We have no doubt that as good paper as printers and others may wish will be manufactured here. Our own manufacturers ought to be encouraged by us, in preference to those of other parts of the Union. We are sorry to see that the new Journal at Fayette, only 25 or 30 miles from the mill in Boone, is printed on something probably called paper, but possessing neither soul nor body, of which we understand, the editor procured a large supply from Cincinnati! We hope we will not have occasion hereafter to say the same in reference to any other editor in Boon’s Lick.” The first paper manufactured

in Missouri was, of course, made on a paper-machine, but it is not known whether the machine was of the cylinder or Fourdriner type.

Michigan’s first paper mill was erected this year in the village called Raisinville, three or four miles west of Monroe. Christopher McDowell was the owner of this pioneer Michigan mill, and the original building, which was of wood, housed a paper-machine about thirty feet in length with a width of thirty-eight inches. The paper was dried by running the web around a metal drum ten feet in diameter which contained a charcoal fire. The mill was known as the River Raisin Paper Company. The mill-owner lived on a farm across the river from the mill. The first product of this mill was butchers’ paper manufactured from straw. (Michigan History Magazine, Vol. XXII, page 363; Michigan Manufacturer and Financial Record, 1924, page 112.)

Dr. Daniel Stebbins, Northampton, Massachusetts, imported mulberry trees (Broussonetia papyrifera) from China with the thought of using the inner bark for the making of paper, as in China and Japan. A few reams of excellent paper were made, but the growing of the trees for this purpose evidently proved unsuccessful, as nothing more was heard of the venture.

1837 The first use of old manila rope as a papermaking fibre in the United States. Owing to the depression Lyman Hollingsworth, South Braintree, Massachusetts, was forced to use this material as a substitute for linen and cotton rags, and a new source of material was inaugurated.

1839 Improved drying cylinders for the paper-machine invented and patented by Robert Ranson.

1840 Mulready paper envelopes adopted by the English Post Office. The “Dickinson thread paper” was used in making these envelopes (see: 1829). These envelopes were released on May 1, 1840, when 2,500 were sold, but they were not
used until May 6, 1840, when the “penny black” stamps made their memorable appearance.

Watermarking used in postage stamps, the “penny black” of England, 240 small watermarked crowns on each sheet of handmade stamp paper. This was the first issue of adhesive postage stamps.

Friedrich Gottlob Keller, a German weaver of Saxony, procured a German patent for a wood-grinding machine. Keller’s work was no doubt based on the practical experiments that Matthias Koops carried on in England as early as 1800.

Between 1835 and 1840 the cylinder washer for attaching to the Hollander was invented and used successfully. The invention is attributed to Breton frères. This style of washer enabled papermakers to cleanse the surplus bleach from the rag stock more thoroughly than formerly. The same invention was later perfected through the efforts of M. Blanchet, Rives, France.

The earliest papermaking in the state of Illinois. The actual beginning of the industry in this state is somewhat obscure, but apparently the first mill made paper by hand. In Henry B. Pierce’s The Past and Present of Kane County (1878) the following account is given: “In 1840 Read Ferson built a blacksmith shop on the East Side, which was converted in the following year into a paper mill by William Debit. Paper is said to have been made in it for some time by hand, but Debit soon quit the business, when the property was owned for a short time by R. J. Haines and P. C. Simmons, and at length by Butler and Hunt, who first fitted it with suitable machinery. The West Side paper mill was built by Butler and Hunt, 1847–48. . . .” In regard to the Butler and Hunt mill, Frank O. Butler, a descendant of the well-known papermaking family, has furnished the following further information: “The Butler and Hunt mill, built on the Fox River at St. Charles, presumably started in 1840 was unquestionably the first erected within the State. Oliver M. Butler came to Illinois in 1839–40, both he and his father, Zebediah Butler, Jr., were handmade paper producers. Neither, however, practiced this method after leaving New England. In youth Oliver M. Butler served his apprenticeship with the Hurlbut Paper Company, South Lee, Massachusetts. It was from this mill that he made his first shipment of paper to Chicago, the beginning of the present-day Butler Paper Corporations. . . . In 1839, prior by one year, to Oliver M. Butler’s journey west, a man named Devitt (William Debit?) attempted in Chicago to produce power by windmill sufficient to operate a beater. Failing in this he went to St. Charles in the hope of stabilizing wind power with paddle-wheel help from Fox River flow. This was his second attempt at producing power by the wind, but this also failed and nothing more was heard of him. Within the next year or so Butler and Hunt built the first dam, of log construction, at St. Charles.” It is recorded that the paper-machine set up in the Butler and Hunt mill was built at Brattleboro, Vermont, by Thomas and Woodcock. The machine comprised one cylinder, three thirty-six inch driers, with a cutter operated direct from the driers. The production was 400 pounds of paper each day, with twenty-five per cent newsprint and the rest wrapping paper. According to Frank O. Butler, this machine was dismantled in 1847–8 and shipped to Wisconsin, where it was used in one of the early paper mills in that state.

1841 Charles Fenerty, a Nova Scotian, produced in Halifax the first ground-wood paper made in the Western Hemisphere.

1842 Will Egley, an English artist, produced the original Christmas card, an idea that was eventually to consume prodigious quantities of paper and cardboard in all countries where Christmas is celebrated. (See: 1874.)

1843 About this time the earliest “safety paper” was produced in England. The paper was printed on both sides in all-over patterns with special inks subject to erasure, etc.
1844 The first commercial paper boxes made in America, by Colonel Andrew Dennison, a cobbler, at his home in Brunswick, Maine. This was the commencement of the Dennison Manufacturing Company.

The first use in America of silk threads in paper was accomplished by Zenas Marshall Crane, who made bank-note paper for a bank in Northampton, Massachusetts. It is said that the placing of silk threads in paper was the invention of Crane. By the year 1847 this type of protected paper was in use by various banks in the United States.

1845 Massachusetts had 89 paper mills producing 600,000 reams of paper a year; in Connecticut there were 37 mills. By this year only two handmade-paper mills remained in America; all other mills were operating paper-machines.

1846 Heinrich Voelter, of Saxony, purchased the Keller patent (see: 1840) and began making ground-wood paper on a fairly large commercial scale.

While only two handmade-paper mills remained in the United States, Germany was operating 1,043 vats for forming paper by hand.

1847 The first Fourdrinier wire to be woven in the United States was produced in September of this year by William Stanier and Cornelius Van Houten. The wire was 52 inches wide and 24 feet 10 inches long. It was woven in the shop of Stephens and Thomas, Belleville, New Jersey, on a loom made by Van Houten from a model brought from England by Stanier.

First postage stamps used in the United States, founded on the George Plitt report on the "penny black" of England, used in 1840.

1848 About this time W. H. Smith, an Englishman, invented but did not patent light-and-shade watermarks, which enabled papermakers to produce portraits and other shaded pictures in watermarks. Before this date all watermarks were made of single wire, sometimes with a "wooe" background such as the early nineteenth-century marks of Johannot, Annanoy, France.

The first paper mill in Wisconsin was established by Ludington and Garland, in Milwaukee. In 1855 paper mills were built in Beloit and Appleton; in 1857 the first mill was erected in Whitewater, and the first in Neenah in 1865. The first ground-wood paper was made in this state in 1872 by Colonel Frambach, who built the Eagle mill at Kaukauna on the Fox River. The Beloit and Whitewater mills made strawboard; the other plants produced rag-stock newsprint. In the pamphlet by Francis F. Bowman, Jr., entitled Ninety-Two Years Industrial Progress (1940), the following relates to Wisconsin paper mills: "Today over ninety years have passed since Ludington and Garland established the first Wisconsin paper mill. In that time no less than 131 papermaking firms have been organized. Of these original firms 39 now represent the Wisconsin industry. Thirteen were merged with the present concerns and 79 failed to survive the many risks of industrial enterprise."

1849 The earliest paper mill in the state of Alabama was set in motion this year. In the Alabama Beacon, Greensboro, March 10, 1849, the following account of this mill appeared: "Tuscaloosa papers announce that the Paper Mill, recently erected in that city, has commenced operations, and is now engaged in manufacturing an article of wrapping paper. . . . Having found it impossible to get, either in Mobile, or any other market we have tried a good article of printing paper, of the size we use, we shall try the Tuscaloosa Factory, as soon as it goes to manufacturing Printing paper, — and if the article and price suit, shall supply ourselves altogether from that source. Our Tuscaloosa contemporaries would oblige us, and no doubt others, by stat-
ing when the Tuscaloosa Factory will commence the manu-
ufacture of Printing Paper." The date of the opening of this
mill is further verified in the State Guard, Wetumpka, Ala-
abama, for in the issue of March 27, 1849, we read: "The
Tuscaloosa Observer of the 19th inst., says: we announced
the week before last, that the Paper Mill in this city had
commenced operations, and that it would shortly make
paper suitable for newspaper printing. Our edition of the
Observer is printed today on paper manufactured in this
city, and those of our brethren of the press have now an
opportunity of judging of its merits. The price, according
to quality, we think, is as cheap, if not cheaper, than it can
be had in any market of the South. Considering the newness
of the machinery, the inexperience of most of the hands
employed in its manufacture, and the numerous little dif-
ficulties attending a new enterprise of this kind, we think
the first effort at papermaking here is an excellent one.
Whatever it may lack now, a little time and experience will
soon give." According to the Memorial Record of Alabama,
Vol. I, this pioneer paper mill of Alabama did not survive
the Civil War.

The earliest known American photograph on paper, the
Talbot invention of "taking impressions on paper . . . por-
traits from life on paper without the least aid of the pencil,
etc." The process was perfected by W. and F. Langenheim
(? Philadelphia).

1850 First use of "ribbed" paper in printing postage stamps,
Austria.

At this date the English "Whatman" handmade papers had
become so renowned that they were imitated on the Conti-
inent. German and Austrian papermakers forged the wa-
termark "Whatman" and sold the paper as genuine.

The "lace" paper valentines, cards, envelopes, letter paper,
bands, labels, etc., originated about this period. The first

English patent for making perforated or lace embossed pa-
per was given John Evans, May 29, 1854. The lace papers
had considerable vogue for the following twenty-five years.

Paper bags made for the first time, entirely by hand. The
earliest automatic paper-bag machine was built in 1876.
(In the United States during the year 1941, 50,000,000,000
paper bags of all sizes were consumed. Paper twine was
first made in America in 1862. At the present time this ma-
terial is used almost exclusively in the tying of wool, as
it gives off no lint. For this one purpose 20,000,000,000 feet,
or 57 carloads, of paper are used in America annually.)

1851 The use of paper money resumed in China. The last former
use of money of this kind was during the time of Yung Lo
(1403-25), when its use gave way to metallic money en-
tirely.

The year of the Great Exhibition, London, the firm of Byran
Donkin, the builders of the first practical paper-machine,
made their 191st machine for fabricating paper in an end-
less reel. Of these machines 83 remained in Great Britain,
23 were exported to France, 46 to Germany, 22 to the north
of Europe, 14 to Italy and the south of Europe, 2 to Amer-
ica, and 1 to India.

First useful paper made from chemical wood fibre origi-
inated by Hugh Burgess and Charles Watt. The process was
patented in the United States in 1854.

First postage stamps used in Canada, printed by Rawdon,
Wright, Hatch, and Edson, on paper probably made by the
Willcox mill, Pennsylvania.

1852 Ground-wood pulp produced regularly in the mill of H.
Voelter’s Sons in Heidenheim; also in a mill in Giersdorf,
Silesia. A small percentage of rag fibres was used to give
the paper strength.
The earliest paper to be made in Utah was formed by hand by Thomas Howard, an English Mormon, assisted by Thomas Hollis. The small beginning was sponsored by Brigham Young (1801–77) and the Mormon Church. The original equipment for the handmade-paper mill was converted from beet-sugar machinery, which furnished the rag-cutter and hydraulic press. The first sheets of paper were produced on June 27, 1854 and probably found their original use in the printing of the Deseret News, Brigham Young’s newspaper, which began publication in Great Salt Lake City, June 15, 1850; the newspaper was an eight-page quarto measuring 6½ by 8½ inches. There was great difficulty in getting raw material for the mill, although Brigham Young, in anticipation of a paper mill, began advertising for rags as early as November 30, 1850, when this notice appeared in his newspaper: “Rags! Rags! Rags! Save your rags, everybody in Deseret, save your rags; old wagon covers, tents, quilts, shirts, etc., are wanted for paper. The most efficient measures are in progress to put a paper mill in operation the coming season in this valley and all your rags will be wanted. Make your woolen rags into carpeting and save importations.” Even with this appeal there were only one hundred and fifty pounds of rags available when Howard and Hollis commenced their papermaking by hand. This hand mill continued operation for about six months, when the sugar company demanded its machinery, which had been brought west for making sugar, not paper. This brought the making of paper by hand to a conclusion, as without a hydraulic press, or a pressure press of some description, it was impossible to make paper. In 1860 Brigham Young and his Mormon group purchased a 36-inch paper-machine from Nelson Gavitt, Philadelphia. This machine, probably the second in the Far West (see: 1856), was hauled from the Missouri River to Salt Lake City by ox teams. In January 1861 the sugar mill, a building 20 by 100 feet, was converted into a paper mill by Thomas Howard, the original catman of the old handmade-paper mill. The first machine-made paper was produced in Utah on July 24, 1861. The machinery was eventually moved from the old sugar mill to the Granite mill at the mouth of Big Cottonwood Canyon, thirteen miles from Salt Lake City. In addition to the original 36-inch machine a 66-inch Fourdrinier was put into use; also six rag engines. The Granite mill was destroyed by fire on April 1, 1893. The stone walls of the building have since been renovated and the graceful structure is at present used as a clubhouse.

John Beardsley, of Buffalo, New York, submitted to a local newspaper three specimens of paper he had made from basswood.

Henry Fourdrinier, the brother of Sealy, the last surviving partner of the Fourdrinier brothers, who financed the Bryan Donkin and John Gamble paper-machine, died in England, aged ninety years.

About this time Egyptian mummies were imported to America, the wrappings and other fibres to be used in the making of wrapping paper for grocers, butchers, etc.

Dr. Lloyd, of England, contributed to the Journal of the Society of Arts his proposal for making paper from the fibrous substance of cow dung. In 1879 the Scientific American proposed the use of this material for making into paper in this country.

Even in the Far West there was an early search for fibres that could be converted into paper, as is evidenced by the following taken from the Journal of the Sixth Session of the Legislature of the State of California (Sacramento, 1855):

“A great portion of the land acquired by the State under the Act of September, 1850, as is well known, is covered with a luxuriant growth of Tule (Scirpus lacustris and S. tatora), indigenous to the soil, and averaging at least two tons to the acre. During the past autumn, this Tule has been carefully examined by experienced manufacturers, and the
opinion expressed, that paper of good, if not superior quality, can be made from it... Several parcels of Yule have been forwarded to manufacturers in the Atlantic States, for the purposes of testing, by actual experiment, its adaptation to the making of paper, and we shall soon learn the results of these interesting and important experiments.”

1856

Discovery of aniline dye (Perkin’s mauve), used in colouring paper, etc. By 1870 dyes of this type were in common usage.

First English patent covering corrugated paper granted to Edward Charles Healey and Edward Ellis Allen, July 7. The corrugating was accomplished by passing the paper between corrugated rollers or by pressing between corrugated dies.

By this year the consumption of paper in the United States had reached a point where it equaled that of England and France combined. The newspapers of New York City required 22,000 tons of paper for the year, and by 1864 newsprint had reached the price of twenty-eight cents a pound.

During this year was produced the British Guiana postage stamp which may be now termed the most valuable piece of paper in existence. This stamp was printed at the office of the Royal Gazette, Georgetown, on paper of a deep magenta colour. The only known copy was sold at the Ferrary sale, 1921-5, to the American philatelist Arthur Hind for $32,500. Another extremely valuable piece of paper was the Swedish 1855 stamp that was printed in orange instead of blue-green; this minute bit of paper sold for £5,000. The highest price ever achieved in America for one of these “scraps of paper” was $27,000, paid for a block of eight 24-cent United States air-mail stamps with inverted centres.

1856-7 The first paper-mill to be established in California and the second in the Far West (see: 1854). The early newspapers in California were small in size, no doubt owing to the difficulty in procuring paper from Eastern mills. The Californian, the first newspaper in the state, made its initial appearance on August 15, 1846 in a size of 10% by 11% inches, printed upon paper that had been made for writing and for cigarette wrappers. The California Star, established January 9, 1847, was printed on paper brought from the East in nearly a two years’ supply, but by 1851 the Star was being issued irregularly printed upon half sheets of coloured paper and brown paper used in cigar manufacture. The usual size of the Star was 13 by 18 inches. The earliest notice of a paper mill in the state of California appeared in the San Francisco Alta, August 3, 1852, and told of the proposed mill as follows: “It will be no less gratifying to the readers than the publishers of newspapers in California to know that there is now about being shipped at New York a splendid paper-mill. It was manufactured by a practical and enterprising gentleman, expressly for this city, who intended to have shipped it by the Flying Cloud, when she made her 89 days run, but was prevented from doing so by the narrow minded and officious interference of a paper warehouse in New York. The mill was built at an expense of eighteen thousand dollars, and is calculated to turn out 3000 pounds daily of every variety of printing paper. ... In six weeks after its arrival the owner will guarantee to supply every paper in the State with whatever size and description it requires, thereby relieving publishers from the necessity of assuming the risk of shipments by Cape Horn. ...” The Sacramento Union, October 17, 1856, sets down the first definite information regarding the progress of the mill. “A paper mill, the first one in California, has been built and nearly completed near Tomales Bay, some eight or ten miles above Bolinas. The mill is owned by Messrs. V. B. Post and Samuel Taylor, and the machinery put up under the superintendence of Henry Russell, a practical millwright, from Massachusetts. It is not yet fully done but will be ready in a month or two to commence work. The situation is about six miles from the bay, upon a small creek, the water of which will be used to drive a
thirty-five horse power breast wheel. The main building is thirty-five feet square and two stories high, and intended to contain four engines with two and a half feet rolls, two of which are completed. An addition to the above building, fifty feet long by thirty-five feet wide, and two stories high, is intended to contain two machines, one of which, a Connecticut machine, has already arrived, and is nearly fixed in its place. . . . Evidently it was not until the spring of 1857 that paper was actually being made, as is evidenced by the following in the San Francisco Bulletin, April 1, 1857: "We yesterday received a specimen of printing paper, made at the new mill of Messrs. Taylor and Post, at Bolinas. It seems to be of fair quality. As it has been a point with us to encourage California manufactures, the Bulletin will, probably, soon be printed upon some material from the first paper mill in California. . . ." The first publication actually to use the California-made paper was the California Farmer, in the issue of April 17, 1857; the following notice appeared: "It gives us much pleasure to announce that the Farmer is this week printed entirely on California-made paper, from the New Mill of Messrs. Taylor & Post, at Bolinas. So we have at length what has long been needed, a paper mill in full operation in this State, and it is another advance in prosperity, as it will save to our own citizens a large amount of money which has formerly been sent out of the country for printing paper. We are gratified to state that the appearance of the Farmer will be much improved in future, as we have made arrangements for a regular supply of this Home Production, and intend to use it exclusively." The initial use of the local paper apparently proved satisfactory, for the editor of the California Farmer in the next issue (April 24, 1857), had this to say: "We again call attention to our journal, which is printed on California paper. Although at an extra cost to us weekly, we most cheerfully adopt it . . . by direct information we have received, we learn that the mill now turns out 6,000 pounds of paper, per week, of large size, and measures are in prog-

ress to increase the manufacture as fast as material can be had, from which good paper can be made. Eighteen workmen are employed, and the best prices will be paid for rags at the office of the manufacturers. . . . We have the pleasing consciousness of having contributed the first money for California printing paper on the Pacific coast. We have the agreeable fact from the books of the new Paper Mill, that the first money received for paper was received from the office of the California Farmer, thus showing that we do mean to sustain home industry." It is not recorded the length of time this mill continued in operation, but it probably ceased during the depression of 1893. In Mildred Brooke Hoover’s Historic Spots in California (1937) this description is given: " . . . Rags to supply this mill were gathered by Chinese in San Francisco, made into great bales, and shipped by schooner to the head of Tomales Bay. They were then loaded on a scow and floated on the tide to Taylor’s warehouse, whence a team of oxen completed the transportation to the factory. . . . The undertaking was prosperous from the beginning and was especially so during the Civil War period. . . . After lying idle for several years, the red-painted building with windows and doors outlined in white was mysteriously burned. Now only the damaged foundations remain; the columns that acted as supports for the water wheel are still standing and crumbling brick walls outline the space where the boiler was located. These ruins are about two miles above Camp Taylor on the road from San Rafael to Olema."


To compete with the fine English paper sized in the machine with animal glue, the French mill of Outhenin Chalandre, Savoyeux (Haute-Saône), adopted this method of sizing their papers.
1857–60  Esparto grass (Stipa tenacissima) used in England for the first time in making paper, introduced by Thomas Routledge. Esparto grass is a perennial plant that grows without cultivation in semi-arid parts of Spain and North Africa. The Algerian name for esparto is alfa. It grows wild from Morocco to Tripoli, but most abundant in Algeria. It requires twelve years to mature the roots and produce fibre suitable for making into paper. Oran, the French port of Algeria, is the chief shipping point to England. The paper made from esparto grass is smooth, with a soft printable surface, and is suited for reproducing fine screen half-tones and colour work. Such well-known periodicals as the Illustrated London News, Graphic, and Sphere are printed on paper made from this African material. Esparto grass was first used in the United States by the Smith Paper Company, Lee, Massachusetts, in 1869.

1859  On July 4 was published in New York by George Roberts the world’s largest newspaper, the sheet measuring 70 by 100 inches, with thirteen columns to the page. The paper was said to have cost the publisher $60 the ream, each ream weighing 300 pounds. It was intended to print 28,000 copies, but the press broke down before the task was completed. Only one issue of this newspaper is recorded.

The first printed sheets of an American book to be folded mechanically was a thick quarto volume concerning the Rosetta Stone, published in Philadelphia. The folding equipment was devised by Cyrus Chambers of Philadelphia.

The earliest paper mill in the state of Minnesota was established at St. Anthony by Jonathan Chase and C. C. Seecombe. The first printing to be executed in this state was by James G. Goodhue, who established the Minnesota Pioneer, the first issue of which appeared on April 29, 1849. From an examination of old invoices it has been found that Goodhue procured his paper from St. Louis, probably from the mill of Messrs. Lamme, Keiser & Company (see: 1834).

1860  In New York City alone the census of this year recorded the use of $5,000,000 worth of paper and ink, producing $11,000,000 in books, newspapers, etc., employing more capital than any other single industry.

About this time the original Jordan engine, for refining paper stock, was made by the Smith and Winchester Company, for the Boweswell Keene Company, East Hartford, Connecticut. Joseph Jordan, the inventor of this machine, died on November 25, 1903, at his home in Bridgeport, Pennsylvania. For two years previous to his death Jordan had been receiving a pension from the American Pulp and Paper Association.
As late as this date rags formed 88 per cent of the total papermaking material.

Probably the first cigarette paper to be made from the fibre of the tobacco plant, the manufacture taking place in Algiers, in 1854 an English patent was granted John Adcock for the use of waste tobacco for making into paper to be employed in wrapping cigars.

1861 In August of this year the New York Tribune adopted the papier-mâché method of stereotyping, followed soon after by the Times and the Herald.

All stamp paper used by the government of France was required to be beaten by the old stamping-mills; it was thought that better and stronger paper was the result of this form of maceration.

In Dunbar Rowland's Encyclopaedia of Mississippi History it is stated "... in 1861 the South was cut off from its paper supply," and then began a period when many newspapers discontinued altogether and the few that did appear were at times printed on wallpaper. The earliest Mississippi printing preserved in this country is the 209-page Laws of the Mississippi Territory, printed by Andrew Marschalk in Natchez, 1799, on foreign-made paper. There was no paper mill in Mississippi until comparatively recent times.

1862 The earliest manufacture of tracing-paper as a definite commodity for professional use.

The Harper papermaking machine patented by James Harper, East Haven, Connecticut. This machine was founded on a combination of the Fourdrinier and the Dickinson cylinder machines. By the year 1873 only eight Harper machines had been built.

Owing to the high cost of cotton during the Civil War it was necessary to find a substitute for cotton twine. The result was that paper was twisted into twine, cord, and string and became a standard product. (See: 1850.)

In searching for new and plentiful papermaking fibres that could be harvested in New England, the Smith and May paper mill, Lee, Massachusetts, made successful paper from the life-everlasting plant, also known as cudweed (Gnaphalium).

About this time the use of cactus (Cactaceae) as a papermaking fibre was undertaken in San Jose, California, in a mill that had originally been built for grinding grain. The mill was located on Altiso Creek and was fitted with machinery for making cactus pulp and converting it into paper, but the experiment did not prove successful. The mill was later used in making paper from straw and waste paper. This may have been the second paper mill in California. (See: 1856-7.)

1863 It is claimed that I. Augustus Stanwood and William Tower produced ground-wood paper in their mill in Gardiner, Maine, in January of this year.

The Boston Weekly Journal for January 14 printed on paper made from wood-pulp. The Daily Journal of the same date appears to be on paper of the regulation sort. It is stated editorially that the entire edition of the Journal for January 15 was printed on "paper made of wood, a new process."

1864 Piece felts for papermakers were made as early as 1854 in the United States by Asa Shuler, Hamilton, Ohio, but it was not until 1864 that paper-machine felting was manufactured. This was accomplished at Camden, Maine, by a firm that became known as the Knox Woolen Company.

About this year the United States Government established a paper-machine in the basement of the Treasury Building,
Washington, D.C. This machine was used in making paper for bank-notes and for whisky stamps. The paper was known as “membrane” owing to the silk threads interspersed through the sheets. Because of the complaints of the occupants of the Treasury Building concerning “their health being impaired by inhaling the pestilential vapors and odors developed by the process of papermaking,” the project was abandoned in 1869 and the machinery removed from the building. The manufacture of bank-note and stamp paper was then entrusted to a commercial mill under government supervision.

1865 Between this date and 1885 a larger number of patents relating to papermaking were issued by the United States Patent Office than had ever been known in the history of any country.

1866 In October of this year was established the first paper mill in the state of Oregon, at Oregon City. The mill was primarily intended for the manufacture of newsprint, and the man responsible for the activity was Henry L. Pittock (1835–1919), who began his long career with the Oregonian in 1858, at the age of eighteen. Regarding this mill the Daily Oregonian, April 19, 1866, has this to say: “The organization of the Oregon City Paper Manufacturing Company was perfected on the 18th inst. ... We are informed that the company has already purchased the necessary machinery, and that is now in San Francisco. The building of the factory is to commence at once and be completed by the first of September. The location is one block below the woolen factory, and the power comes from the basin. ...” In the October 29, 1866 issue of this same newspaper we find the following: “The building of the pioneer paper mill in Oregon is now completed and the machinery well advanced preparatory to active operations. ...” Apparently the mill was not in operation until early the next year, for in the Daily Oregonian, January 12, 1867, these hopeful comments are made: “We have on our table some samples of Oregon made paper, the first ever manufactured in the State. They are from the Oregon City paper mills, and at the hour of writing are not more than twenty-four hours old. The mill, after considerable delay, and a few alterations in the machinery, as first set up, was started yesterday, the 10th inst., on brown, straw wrapping paper, and samples of the result are before us. The paper has not been submitted to pressure and is, consequently, rough in surface, but we have never seen straw paper of tougher texture. ... We are informed that the mill will be worked right along on this kind of paper for two or three months, and that then, it will undertake newspaper, for which its machinery is well adapted. The price of brown straw paper made by the California mill, 20 by 30, is $2.00 per ream for wrapping. ...” From all indications this mill was not a success, perhaps because the machinery was second-hand, as it was probably bought from an Eastern mill where it had been discarded. It is recorded that Henry L. Pittock again ventured into papermaking when he was responsible for the erection of the Clackamas mill, on the Clackamas River, in 1868. This mill, unlike the first attempt, was a pronounced success, according to a review of papermaking history in the state that appeared in the Oregonian, October 1, 1905.

The earliest paper mill in Iowa was established in November of this year at Coralville, near Iowa City. In the State Historical Society, Iowa City, there is preserved a sheet of paper that is said to have been made in this mill. In July 1875 the mill was wrecked by an explosion, and seven workers were killed. The mill was rebuilt by M. T. Close, who operated it for several years. The United States Census for 1870 lists three paper mills in Iowa—one in each of the following counties: Clinton, Johnson, and Jackson.

First ground-wood pulp mill in Canada, the Buntin mill at Valleyfield; the material, maple blocks.

The Wilcox mill of Pennsylvania ceased making paper by hand, the last of America’s handmade-paper mills except
two revivals that did not continue long in operation. (See: 1739.)

First use of “batonné,” “quadrille carré,” and “oblong quadrille” paper in the printing of postage stamps, the Guadalajara issue of Mexico, 1866–7.

1867 “Pelure” paper used for the first time in the making of postage stamps, used by the Dominican Republic.

Albrecht Pagenstecher, Curtisville, Massachusetts, established the first ground-wood mill in the United States. (See: 1863.)

1868 By this time paper was being converted into articles for almost every conceivable purpose: boxes, cups, plates, wash-bowls, barrels, table tops, window blinds, roofing, collars, vests, cuffs, aprons, towels, napkins, shirt bosoms, buttons, hats, handkerchiefs, raincoats, corsets, slippers, petticoats, curtains, carpets, machine belts, etc. Paper had become so commonly used in making dozens of different articles that a song entitled The Age of Paper was popular in London music halls. The words were sung by Mr. Howard Paul “attired completely in a suit of paper.” (See: 1788, Ducrost.)

The New Yorker Staats-Zeitung in its editions of January 7, 8, and 9 was printed on American newsprint made from ground-wood pulp, the first New York City newspaper to use paper made of this material.

The making of fine paper for printing and writing began near Melbourne, Australia. Previous to this time the supply was imported from the United States and Europe.

1869 Paper coffins were manufactured in the United States at this time, laminated sheets of paper lending themselves to this purpose. This was not a new departure inasmuch as the Persians had made and used laminated-paper coffins hundreds of years previous to this date.

The original use of okra (Hibiscus esculentus or Abelmoschus esculentus) on a commercial scale in American papermaking. In the Weekly State Journal, Montgomery, Alabama, March 20, 1869, the following account of the okra plant and its use in Southern papermaking is given: “The Okra plant is indigenous to the South and anybody who can grow cotton can raise the Okra. The Okra is the same family as cotton, but is free from the insects which attack that plant. It can be produced so easily that an acre of good land will yield from five to eight tons of the stalks, and a ton of the stalks is worth twenty dollars. . . . The owners of the Chickasabogue paper mill, a few miles above Mobile, have lately made experiments which prove satisfactorily the great value of this plant as a papermaking material. It makes a paper as soft as rag paper, and as strong as that made from pure linen, thus affording the two essential qualities, flexibility and strength. The Okra can also be used to give strength to the paper made from cotton rags. . . . The Chickasabogue paper mill will commence using this new material as soon as they are assured of a sufficient supply, and their consumption will, of itself, amount to one hundred tons a month. . . .” In 1870 the Mobile Register was printed on paper made from the okra plant, but the use of this material was apparently not continued.

The first set of paper car wheels manufactured in the United States was made in Brandon, Vermont, by Richard N. Allen, the inventor. These wheels were used on a wood-car on the Central Vermont Railway for six months. In 1871 the Pullman Company gave its first order for 100 paper wheels. Ten years later the Allen Paper Car Wheel Company, Hudson, New York, produced 13,000 paper wheels in one year. One set of these wheels travelled 500,000 miles. It is the body of the wheel only that is composed of disks of rye-
straw paper board laminated together; the tire and the hub of the wheel are of metal.

1871 The earliest use in America of toilet paper in roll form, a United States patent issued to Seth Wheeler this year (see: A.D. 875). The use of toilet paper did not progress rapidly, but by 1889 it was used universally. In 1940 there were consumed in the United States 300,000 tons of toilet paper.

"Building paper" was first extensively used in America directly after the Chicago fire, when the Western Paper Company made the paper for lining 10,000 houses to accommodate those made homeless by the conflagration. Each house measured 16 by 20 feet and the cost of the paper was five dollars for each small building. The building, or lining, paper was composed of waste paper and straw.

1872 Carl Daniel Ekman and George Fry, working in England, continued the experiments in the sulphite process begun by the Tilghmans (see: 1857). During this year the original Ford handmade-paper mill, Little Chart, Kent, England, was acquired from Waterloo and Sons by the present firm of Joseph Batchelor and Sons. It was in this mill that the paper for the William Morris Kelmscott books (1891–8) was fabricated. This mill also made the paper for the Ashendene (1894), Essex House (1895), Doves (1900), and other well-known English private presses. The paper for 200 copies of the Oxford Lectern Bible (1833) designed by Bruce Rogers was a product of this mill.

The original establishment of a machine-made paper mill begun in Japan. The small mill was set up near Tōkyō by Marquis Chokun Asano upon the recommendation of Thomas Waters, an Englishman, in the service of the Japanese Ministry of Finance. The machine was of British construction and John Rogers, an Englishman, was the supervis-

1874 Although the first Christmas card was printed in England as early as 1842, the use of English-made cards did not become general in the United States until about 1860. A contemporary notice of greeting cards reads: "It is a happy form of business which can soothe and charm the cares and situations of social life." The earliest American-made Christmas cards were the product of Louis Prang, the Boston lithographer, who in 1874 was reproducing the works of celebrated painters for this purpose. By the year 1942, a hundred years after the original English Christmas card, the industry in the United States produced three billion cards with a value of $30,000,000.

The first paper mill in the state of Kansas was probably erected this year at Blue Rapids. The mill was put in operation by G. and J. Greene, and printing and wrapping paper was manufactured until the mill ceased manufacturing in 1877. (See The History of Marshall County, Kansas by Emma E. Porter, 1917.)

1875 First instance in the United States of coating paper on both sides, accomplished by Charles Gage, Springfield, Massachusetts. This paper, to the extent of 100 reams, was made at the request of Theodore DeVinne, New York bookprinter, to be used in printing a catalogue containing many coloured wood-engravings. The earliest coating of paper on one side in America was in 1852, by William Waldon, New Brunswick, New Jersey. (See: 1764, Cummings, and 1881.)

During this year there appeared a pamphlet entitled Bamboo, as a Papermaking Material, by Thomas Routledge (see: 1857–60). This booklet of 40 pages is printed on paper made from bamboo, probably the first use of this material in the Occident for papermaking. In 1876 at Arnhem
a book under the title Bamboe en Ampas als Gronstoffen voor Papierbereiding was also printed on paper manufactured from bamboo. Routledge states that the rapidity of the growth of bamboo is unequalled and says in his pamphlet: "... at Gehzirch, the gardens of the Khedive of Egypt in Cairo it has grown nine inches in a single night and at Syon House, the Duke of Northumberland’s, stems of Bambusa gigantea have attained a height of 60 feet in twelve weeks; at Chatsworth, the Duke of Devonshire’s, the variety of Bambusa vulgaris reached a height of 40 feet in forty days." In 1908 the government of Burma sent eight or nine tons of selected bamboo to England, where it was made into paper by Thomas and Green, Soho mills, Wooburn Green, Bucks. In 1908, R. W. Sindall issued his treatise, Bamboo for Papermaking, a booklet of 80 pages on paper made from bamboo. (See: 1100.)

1876 Japan established a government mill for the making of paper for Japanese currency and bonds. This was the beginning of the Cabinet Printing Bureau.

1877 America introduced bevelled cards with gold edges, a novelty that captured the American and English trade for several decades. The bevel edges were made by fanning out the cards and bevelling them upon an emery wheel.

At Breslau, Prussia, a factory chimney 50 feet in height was constructed entirely of paper. The chimney was said to perform its duty as well as if made from a more substantial material. In 1885 paper was used in making spokes for wagon wheels and the Germans experimented in making bearings for railroad car wheels of paper. Also in Germany paper was used in constructing piano frames. (See: 1788, Ducrest.)

1878 The firm of Elisha Waters, Lansingburg, near Troy, New York, made a paper dome for the observatory of Rensselaer Polytechnic Institute, Troy; this dome was removed in

1889 when the building was changed for another purpose. In 1881 this firm constructed a paper dome for the observatory at West Point, New York. This dome was composed of 36 sections and contained 2,500 pounds of paper. A dome made entirely of paper was also put on a building at Columbia University. This dome was in 20 sections and required 850 pounds of paper for its construction.

During this year, or early in 1879, the United States Bureau of Printing and Engraving set up machinery for the repulping of retired paper currency. The equipment was capable of repulping 800 to 900 pounds of old United States paper money daily, representing more than one million bills with a face value of about $12,000,000. The original cost of the paper amounted to about $1,100 a ton. This method of destroying old bills was abandoned in 1943; the retired currency paper is now destroyed by incineration.

According to the Papermakers Monthly Journal, an English publication, Spanish papermakers were manufacturing paper from watercress (Rorippa nasturtium) for wrapping cigarettes. Cigarettes so wrapped were thought to be of benefit to persons with lung diseases. The paper was of a greenish color and a heavy texture.

1880 About this time appeared the first pictorial end-papers in books.

At this time there were about 350,000 tons of rags used yearly in the United States in the making of paper; of this amount approximately 85,000 tons were imported from foreign countries. The rags brought from Egypt were considered the cleanest, as the rags were free from grease, owing to the limited meat diet of the Egyptians; on the other hand, the rags from England and Germany were the most filthy, containing the greatest amount of grease and impurities.
CHRONOLOGY OF PAPER AND ALLIED SUBJECTS

A.D.

The first ground-wood pulp produced on the Pacific coast was made by R. M. Brayne on Young's River, about 12 miles south of Astoria, Oregon. Four years later this ground-wood mill was acquired by the Falls Pulp Company and in 1890 it was taken over by the Willamette Pulp and Paper Company, which operated the small mill for seventeen years, when the four three-pocket grinders were removed and the wooden building allowed to fall into decay.

1881 Probable first employment of “granite” paper in the making of postage stamps, used in Switzerland.

The earliest paper mill in Nebraska established about this year, at Kearney, where cheap brown wrapping paper was made. An early pamphlet relating to papermaking in the West has the following to say about Kearney and its short-lived mill: “It is fair to presume that manufacturing west of the Missouri River must centre at Kearney, With the exception of some few mills engaged in the manufacture of straw boards and cheaper grades of paper, nearly all that is used between Pennsylvania and the Pacific Ocean is shipped from the east, while millions of tons of fine amber straw, flax straw, and other paper material is burnt in this section annually. We have the same pure soft water and water power that has made the manufacturing of paper profitable at Holyoke (Massachusetts), and the time is not far distant when Kearney will be the centre of papermaking in the west as Holyoke is in the east.” The paper mill at Kearney ceased operation soon after its commencement.

According to the Paper World, an English publication, paper was being used in the construction of outhouses in the cities and rural districts of England, and they were said to withstand the rigorous climate admirably.

First American commercially-made coated paper, manufactured by S. D. Warren for Theodore Lowe Devine, New York printer. (See: 1764, Cummings, and 1875.)

CHRONOLOGY OF PAPER AND ALLIED SUBJECTS

A.D.

1882 Sulphite pulp first made in the United States on a commercial scale, by C. S. Wheelwright, Providence, Rhode Island. The Ekman process used. (See: 1857, 1872.)

Senator J. B. Rolland made the first fine paper in Canada, at St. Jerome, Quebec.

1883 A watch made entirely of paper by a Dresden watchmaker was exhibited in Germany. The watch was claimed to be as serviceable as any timepiece made from more practical material.

1884 Sulphate pulp invented by Carl F. Dahl.

Two specimens of printed paper made from “sugar cane bagasse containing 90% such fibre” appeared in the first number of the National Syndicates of Capital and Labor, New Orleans. Probably the first actual use of bagasse in Louisiana papermaking. In the North sugar cane was used for making paper previous to this date, as Henry Howe, of Baltimore, is thought to have used bagasse as early as 1856.

1885 E. Waters, Lansingburg, near Troy, New York, made the first compressed-paper racing shells. In 1886 Harvard, Yale, and Columbia used shells formed of paper from this maker. The largest paper boat made by Waters measured 42 feet in length, with a 4-foot 4-inch beam.

The first paper was made in Washington Territory, at Camas, May 3, 1885. The mill was destroyed by fire November 7, 1886, but was rebuilt and again put in operation May 3, 1888.

The original manufacture and use in the United States of vegetable parchment, now universally employed in many branches of the food-packing industry.

1886 In The Manufacture of Paper, by Charles Thomas Davis, there are listed more than 950 materials from which paper could be made.
The largest paper-machine in the United States at this time was in the Hudson River Company mill at Palmers Falls. The wire was 112 inches wide and 50 feet long and had 22 forty-eight inch driers in two tiers. The machine was operated at 250 feet per minute. The largest paper-machine in England (1889) was at Sittingbourne, with a wire 120 inches wide and 40 feet long, with 20 driers. This machine was operated at 270 feet per minute.

John W. Mullen, Fitchburg, Massachusetts, made the first paper tester, which was sold the same year to the Parsons Paper Company. The Mullen paper tester is now universally used in all paper laboratories as essential equipment.

As outlined in the Western Paper Trade, May 16, 1887, the largest “sheet” of paper that had been brought to the editor’s attention had been made by the Remington Paper Company, Watertown, New York. The “sheet” in question measured 7½ miles in length with a width of six feet and a weight of a little over one ton.

1888
Sulphite pulp produced in Canada, by Charles Riordon, Merritton, Ontario.

1889
For the first time in the United States paper-production exceeded 1,000,000 tons per annum.

1891
The Kelmscott Press established in Hammersmith, England, by William Morris. The privately watermarked handmade paper used by this press was made in the Joseph Batchelor mill, Little Chart, Kent. The work of William Morris was instrumental in creating an interest in the revival of handmade paper.

The earliest papermaking in the state of Colorado. The paper mill, operated by the Denver Paper Mill Company, was located at Manchester. It was opened on August 22, 1891 with two thousand persons present for the occasion;

addresses were made by the Governor of the state, the Mayor of Denver, and the president of the newly established company. The paper produced was newsprint. The corporation failed during the financial panic of 1893 and did not resume operation.

Paper as insulation in telephone cables used by the Bell System; the paper was .0025 inch in thickness.

1893
The largest paper-machine in the world was started running April 7 at the Star mill, Fenniscowles, England. This machine produced paper 140 inches wide, cost 15,000 pounds, and weighed 370 tons. The machine was capable of making between 75 and 80 tons of paper each week.

The earliest recorded attempt in Europe in moulding paving blocks from paper pulp. In 1894 a section of a Washington, D.C., street was paved with blocks made of paper, but the method used in manufacturing the blocks was undeveloped and the experiment did not have an opportunity to succeed.

1894
About this time automatic machines for the making of paper boxes were in general use, the beginning of the packaging era. (See: 1025.)

1895
According to the World’s Paper Trade Review, London, a church made of paper was built in England this year. The building material was made of compressed brown paper reinforced with wire. The edifice, the Church of St. Owen, is located in the village of Downham-in-the-Isle. From the account it may be assumed that the building is serving its purpose at the present time and from all indications it is sufficiently durable to withstand the rigors of the English climate for another half century.

Plain and decorated paper napkins first brought to this country from Japan on a large commercial scale. (In 1940
the United States used 40,000,000,000 paper napkins of all types and from all parts of the world.)

1896 By this date the largest paper-machine in the United States was at Rumford Falls, Maine, with a wire 162 inches in width and 60 feet long. A year later (1897) machines in New York, New Hampshire, and Oregon were running at the rate of 500 feet per minute. By 1911 the speed of the fastest machine in the United States was 700 feet. In 1941 the largest paper-machine in the world was at Sittingbourne, Kent, England. This machine is 320 inches wide with a capacity of 1,400 feet per minute.

Electricity used in papermaking for the first time in the United States, July 10, 1896, in the mill of the Cliff Paper Company, Niagara Falls, New York.

1897 Charles S. Wood, of Wisconsin, experimented with paper as a mulch in agriculture and was probably the originator of this practice. C. F. Eckhart, Honolulu, H. I., however, was the first to use paper extensively for this purpose when he introduced the practice in 1914 on his sugar plantation. Paper is now exclusively used in Hawaii in pineapple cultivation, the material being impregnated with asphalt.

Horseshoes made of paper introduced by Chicago blacksmiths. The layers of paper were impregnated with oil to render the material waterproof; the sheets of paper were then laminated together with a cement made of powdered chalk, Venetian turpentine, Inseed oil, and lacquer. The holes for nails were stamped in the paper while moist, and the paper was next cut in the desired form and the horseshoes subjected to immense hydraulic pressure. The paper horseshoes could be shaped to the hoofs and were said to be more comfortable for the horses and as lasting as those made of iron. Contemporary with paper horseshoes came the manufacture of paper gas pipes which were made by lapping strong paper around a solid core of suitable di-

1898 Inasmuch as printing was first accomplished in Louisiana as early as 1764, it would be reasonable to expect to find records of a paper mill operating within the state a few years following. The early Louisiana imprints are on paper imported from France or brought from the North. A considerable search in old files, letters, and documents has not brought forth any evidence that would place papermaking in Louisiana previous to 1898, when a machine mill was set up by an English syndicate at Brithwaite for the manufacture of paper from bagasse (sugar-cane refuse). According to the Louisiana Conservation Review, Autumn 1938, this initial experiment in Louisiana with bagasse was a complete failure. (See: 1884.)

1899 Production of paper in the United States was 2,167,593 tons, with 22 per cent of the machines idle. The full capacity could have been 2,782,200 tons.

1900 A mendicant Taoist priest discovered in Tun-huang caves, Turkestan, the great store of rolled manuscripts on paper dating from a.d. 406 to 1035. Shortly thereafter Sir Aurel Stein and Professor Pelletier acquired many of these priceless manuscripts for the national institutions of England and France.

The earliest papermaking in the state of Florida was begun this year in Pensacola, the pulp made from pine. The mill was abandoned after a year or two of unsuccessful operation. Printing was first accomplished in Florida in 1783 by William Charles Wells, when he established the East Florida Gazette in St. Augustine; apparently no copies of this newspaper exist in America. Owing to the early date of
printing in Florida it was reasoned that paper may have been made by hand in the state previous to the nineteenth century. A careful search in the archives of the state, however, has revealed no papermaking until about 1900. The Yonge Library of Florida History, Gainesville, Florida, definitely states that there was no paper made in the state until the year 1900.

1901 In England at this time compressed paper had become a standard material for the construction of hansom cabs, interiors of railway carriages, drain pipes, oil drums, and military hospital buildings. In America the use of paper in heavy construction had begun earlier. (See: 1772, 1869.)

This year died Francis Tempest, an Englishman, who alone for forty-one years operated the Sunnysdale paper mill, Beaver Valley, Pennsylvania. The remarkable feature about this mill was that Tempest ran the mill himself, without help, from the year 1860 until the time of his death. The old stone building housed a 36-inch cylinder machine and one 125-pound heater. The machine was operated only in the day-time, but the beater was kept in motion throughout the night. By this method Tempest was able to manufacture 250 pounds of paper each working day. This was probably the longest record of a one-man machine mill in America. More than thirty-five years ago I visited this picturesque old mill, but since that time it has been dismantled.

1903 First use of corrugated fibre containers, replacing wood boxes to a great extent. The use of fibre boxes was authorized by the railroads of the United States in 1906.

1905 Glassine paper introduced into the United States by Olaf Hedstrom through his association with the Hartford City Paper Company, Hartford City, Indiana.

1906 The first paper milk-bottles made this year by G. W. Maxwell, San Francisco, California.

1907 This year terminated the making of paper by hand by the L. L. Brown Paper Company, Adams, Massachusetts. This mill also manufactured machine-made paper, but from 1881 it operated a two-oat handmade-paper department. In 1880 the William Norman family came to the United States from Wells, England, to operate this handmade-paper mill. William Norman died in 1901 and his son Walter Norman continued the mill until 1907, when it was abandoned. Nothing now remains of the original equipment, but for many years the two stone vats that had been brought from England served as watering-troughs for cattle in the Berkshire Hills.

First kraft (sulphate) pulp made on this continent, at the Brompton paper mills, East Angus, Quebec, Canada.

By this date medicated papers were in universal use. These antiseptic papers included gout papers, Christy’s chro-megelatine for bandaging, East India paper plaster for slight flesh wounds, mustard paper, Ricou’s anti-asthma paper, blister paper, Gautier’s nascent iodine paper, hygienic paper handkerchiefs, towels, etc. Also paper was used in the making of splints for reducing fractures by treating mill-board with shellac, violin resin, pine, etc.

1909 First kraft paper manufactured in the United States.

1910 About this time the wrapping of bread in printed paper became universal in America. Also the wrapping of fruit in paper had its beginning. Apples were wrapped in a specially oil-treated paper to control “scald.” In the Northwest of the United States by 1941 there were more than 350 carloads of paper consumed each season in wrapping fruit.

1915 The earliest use in California of paper trays for the drying of raisins. In 1940 more than 80 per cent of the raisin-drying trays were made of paper. Previously they were fabricated from wood.
During this year the students of the New York State College of Forestry, Syracuse, New York, planted seedlings of the red pine; a number of years later they harvested the wood and made it into pulp and finally into newsprint, in the school laboratory. The paper manufactured was used in printing the student newspaper of the college. This was the first instance, the school claimed, in which the entire process from growing the trees to making the wood into paper was carried out by an educational institution.

1919 The most accurate novel in English relating to the handmade-paper industry published this year: Storm in a Teacup by Eden Phillpotts. This novel gives an interesting and picturesque insight into the life of English papermakers. The detail is technically correct in every way, which is more than can be said of Joseph Hergesheimer’s The Foolscap Rose, a papermaking story published in 1914. The mill used as a background by Phillpotts was Tuckenhay Mills, Totnes, Devonshire, now operated by A. Millbourne and Company.

1920 Paper was made at a speed of 1,000 feet a minute on October 23, 1920. This speed was attained on a Fourdrinier machine made by Bagley and Sewell, in the paper mill of Wausa Sulphate Fibre Company, Mostine, Wisconsin. On April 15, 1921 newsprint was made at a speed of 1,000 feet a minute on a 158-inch Rice, Barton and Fales machine in the mill of the Great Northern Paper Company, Millinocket, Maine.

1921 First use of Alabama spruce pine for making paper on a commercial scale. The Birmingham Age-Herald, June 20, 1921, was printed on paper made from this pulp. The following account of the paper was given in this issue: “Paper made from Alabama spruce pine; wood cut on Yellow Creek, near Warrior River, in December; floated to Birmingham in barges and loaded on cars for Niagara Falls; ground into pulp and made into paper at Defiance mills May second. Experiment initiated, directed and arranged by E. W. Barrett, editor of the Age-Herald. Test supervised by Robert Clade, who says the paper is equal to that made from Canadian spruce.”

1927 There appeared this year in Paris the first edition of Nouara Chroniques d’un antique village papetier by Claude Drahaine, an interesting story of old French papermaking. This volume, like the Eden Phillpott’s story, is not of a technical nature.

1928 The craft of making paper by hand revived in Lime Rock, Connecticut, by Dard Hunter Associates. The equipment for this mill was brought from Downton, Wiltshire, England, and the papermakers came from Maidstone, Kent. For the most part the paper produced in this mill was used by the printing house of the late William Edwin Rudge. The mill ceased operating in 1931, but remains today the only fully equipped handmade-paper mill in America.

1933 According to Chinese government statistics there were 24,437 individual cottage “mills” for the making of handmade paper in the one province of Chekiang, China. These cottage industries gave employment to 127,000 workers in the one province. Most of the paper produced was used in making “spirit-paper” employed in Chinese religious rites and ceremonies. (See: A.D. 106.)

1934 The largest sheet of paper ever made by hand was formed this year in the Iwano mill, Okamoto, Echizen, Japan. Two sheets were made, although only one was required; each sheet measured 200 inches square, or 40,000 square inches. The Iwano paper was too large to be formed in a mould in the regulation manner, so the workers sprayed the pulp, or stock, over a porous surface laid above the floor, forming a thin coating of pulp in a more or less even thickness. One of the huge sheets was used for a painting now in the Memorial Building, Waseda University, Tōkyō, dedicated to the late Okuma, governor of the university, and one-time Premier of Japan. The largest paper ever to be formed in a hand-mould in China measures 84 by 48 inches; in Ja-
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Pan 29 by 67 inches; in Tibet 72 by 31 inches; in Nepal 64 by 28 inches; in Siam 80 by 18 inches; and in Europe 53 by 31 inches.

1940 Production of paper in the United States, 14,372,000 tons, with 14 per cent of the machines idle; full capacity would have been 16,700,000 tons. In the U.S. there were (1938) 125,500 employees; in Canada (1940), 34,719 employees in the pulp and paper industry.

1942 It is unofficially stated that the amount of paper used in the building of a battleship of the Massachusetts class is 100 tons. Of this amount 16 tons of blueprint paper are used, the balance of the paper being consumed in letterheads, carbon copies, contracts, envelopes, interoffice communications, graphs, stencils, mimeographs, sketches, tracings, routing, crating, packing, and finally the small amount of paper used in actual construction.

Newsprint to the amount of 8,971,000 tons produced in the world, Canada making two fifths of this. In the United States alone newspaper sales were 44,492,836 copies each day.

1943 Throughout this year sufficient paper was manufactured in the United States to supply each individual citizen with 287.5 pounds. This was the largest production in the history of the Nation.

1944 During the fiscal year ending June 30, 1944 the United States Government consumed 17,23 tons of paper in printing the U.S. currency, the amount used in printing postage stamps was 1,045 tons, and United States Government bonds required 1,150 tons of paper. During the calendar year 1944 the cardboard used in making U.S. postal cards was 10,620,109 pounds and in the making of embossed stamped envelopes 19,476,652 pounds of paper.

1945 It is stated that there are 14,000 different paper products.

Bibliography

(The books marked * embrace both historical and technical material; the unmarked items are purely historical.)

In forming this bibliography of papermaking and watermarking it has not been my desire to include every book, pamphlet, and article that has been compiled. Such a list would necessarily embrace thousands of titles in all languages and would be well beyond the scope or usefulness of this listing. For convenience this bibliography has been divided into four distinct parts; (1) Oriental papermaking history and practice, (2) Occidental papermaking history and practice, (3) watermarking, (4) paper colouring and surface decoration. In each of these four lists fifty titles have been selected — in all, two hundred books, pamphlets, and articles. These entries have been carefully chosen not only as the most comprehensive works on these respective aspects of paper, but on account of the availability of the material in public libraries. It would not, perhaps, be possible to find every item of this list in any single library, but this bibliography of two hundred entries is more than sufficient for a general study of the history and technique of papermaking, watermarking, and the colouring and decorating of paper in all countries and in all periods. It will be noticed that there is a dearth of material in English, although our own language has been given preference in every instance. Practically nothing has been compiled on early American watermarks, and books and pamphlets in English dealing with early European watermarks are likewise limited. In other languages, however, the watermarks used by early European papamakers have received extended attention, for in French, German, Dutch, and Russian considerable material is available. But even with the reproduction of thousands of old papermarks, the field remains practically untouched when we take into account that there are literally hundreds of thousands of different watermarks in papers extending...