

3. Industrialisation: mechanised paper mills

3.1 Wood became the staple raw material

By the nineteenth century the supply of linen rags could not keep up with demand, and the cheap cost of softwoods such as spruce and pine meant that wood pulp became the dominant raw material.



Scandinavia is rich in softwoods



The importance of forestry is illustrated by the University of Grenoble, whose international school of paper has organised symposia on the subject

3.1 Wood became the staple raw material

Softwoods, particularly balsam fir, larch and white and black spruce, are also plentiful in Canada.



The province of Quebec has large forested areas and major rivers. Lachute was named after the various mills in the area



Grand Fall Mill, Newfoundland, opened in 1909 specifically for the production of newsprint. It later became part of Bowater's.



The felled logs were trimmed ...



The proof in black signed by the designer and engraver R. Serres



The issued stamp



... and transported to the mill

The mill goes into production:



Tree to roll of paper

Roll of paper to printing press

Tree to book

Error: imperf at bottom (with normal)



Ayers Limited were the largest Canadian producer of woollen felts for paper making



Corner Brook Mill was built in 1923 by the Newfoundland Power and Paper Company. It was bought by Bowater's Paper Mills Ltd. in 1938.

Error: imperf pair (with normal)



By the 1930's the largest producer in Canada was Bowater's



The modern paper mill undertakes every part of production:
 - Timber being debarked and chipped
 - The boiling plant
 - Beaters and machinery
 - Dryer section and paper roll

3.2 The impact of the Industrial revolution

The biggest change came with mechanisation, resulting in rolls rather than sheets of paper.

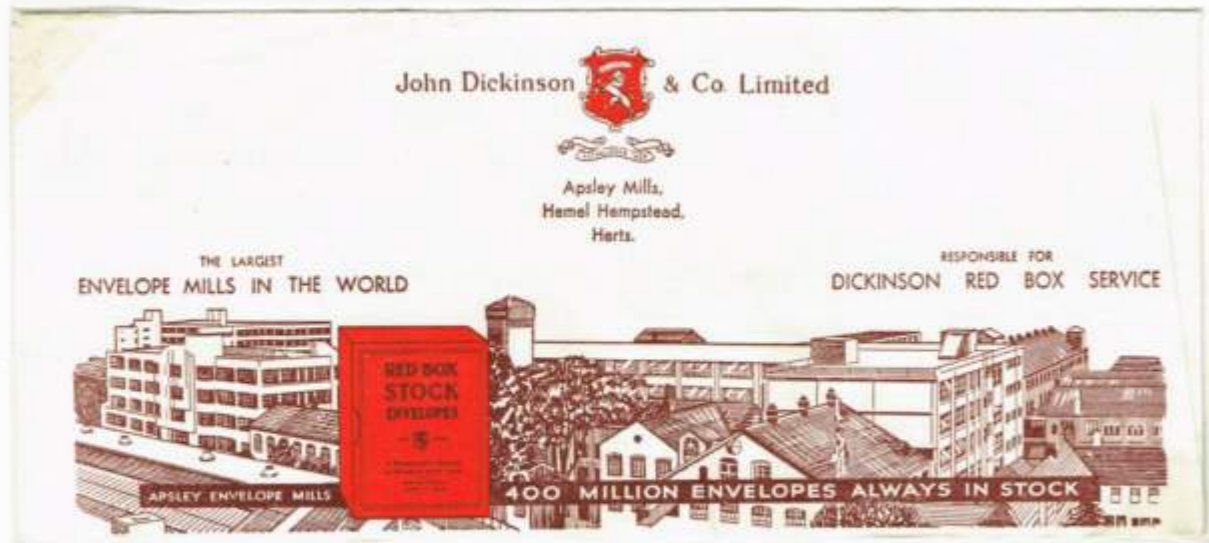
The Frenchman Louis-Nicolas Robert was the first person to be granted a patent for a continuous paper making machine. It was developed in England by the Fourdrinier Brothers.

The Endless Web



Double thickness of paper on the bottom pair and partial double thickness on the top pair at the join, caused by repair to roll or end of roll

Model in the Smithsonian Institution based on Louis-Nicolas Robert's patent filed on January 18, 1799. The pulp was drawn up from the circular vat, passed along the web and then passed through rollers



John Dickinson bought Apsley Mill in 1809, installing his own patented paper making machine, developing and improving the Fourdrinier Brothers ideas to produce the world's first commercially successful continuous web of paper
Dickinson Pitney Bowes meter mark

3.2 The impact of the Industrial Revolution

The machine was an endless moving belt of wire mesh over which stock was poured. As the belt travelled the water drained away from the mesh leaving a continual web of fibres which were pressed via rollers and felts to remove the remaining water. The resulting roll of paper was then dried with steam-heated cylinders and finally calendared to produce a smooth finish.

The Endless Web



Simple Cypher watermark on George V 1913 1/2 green. Bottom pair has a stitch watermark, only found on machine-made paper. It is created where the web is stitched together to form a continuous belt and the slightly thicker mesh causes a mark.



Fancy cancel from Kimberly, Wisconsin, featuring a paper roll for Kimberly-Clark Paper Mills. Founded in 1872 the mills are now a global corporation producing a range of paper-based products including Kleenex paper tissues. An abundance of fancy cancels in this period led to Post Office regulations banning their use. An order dated 17 November 1928 prohibited use of fancy cancels; an order clearly ignored as a further order of 17 November 1931 again banned the use of unauthorised rubber stamps, many of which "advertise some particular locality...". This cover of January 1930 falls between those two dated orders. It was used from 01 March 1930 to 01 August 1930 with the correct use of red registration label. Signed by the Postmaster C. J. Fleweger.

3.2 The impact of the Industrial Revolution
Various parts of the machinery were refined and improved

Mill technology



'Closed Millwheel' numeral cancel 356 for Nuremberg. Millwheel cancels were used from 01 Aug 1850. Numbers 1 - 603 were attributed twice, being renumbered in 1856. So this cancel for 20 Oct 1861 is the second attribution of number 356.



The earliest form of power for the mill was the water wheel



Overshot wheel

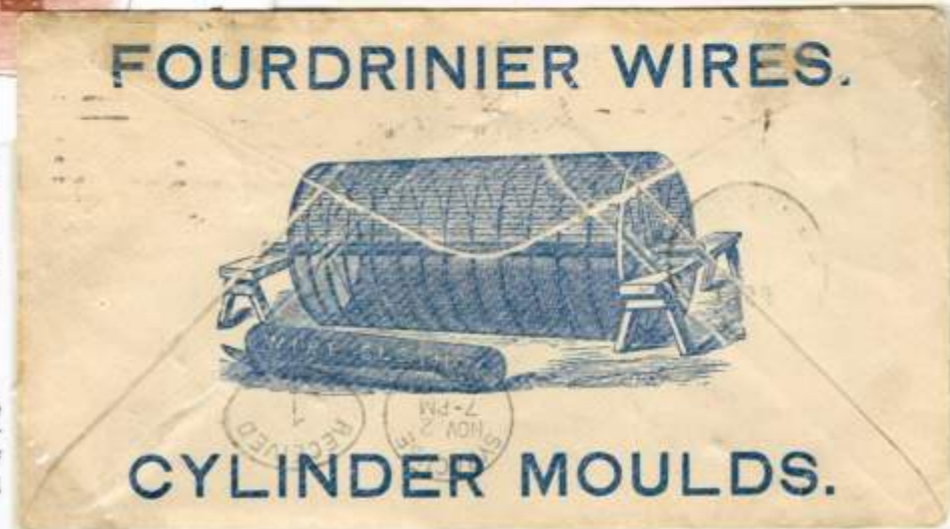


Breastshot wheel

There were various types of waterwheel, all of which could be used in any type of mill



The web still used fibres suspended in water. In both handmade and early machine made papers the fibres were produced by a Hollander machine: the fibre suspension in water was recirculated through the Hollander which beat the fibres to split them and cut them shorter. Czech Republic booklet 2001



The Hollander was replaced by the cylinder mould. A spinning cylinder pushed the contents of a trough of suspended fibres around repeatedly until the fibres were the desired length.



3.2 The impact of the Industrial Revolution
The biggest change in production methods in the 19th century was the move from water power to steam power

Mill technology



Rijeka paper mill was founded in 1821 and converted to steam in 1833



Papierfabrik Neidhardtsthal A steam-driven mill established in 1875 near Aue Cachet for rural mail



James Watt's improvements on the early steam engine paved the way for steam driven mills

3.2 The impact of the Industrial Revolution

Bundles of hand-made paper could be transported by cart, but rolls of paper required a more efficient system.

Transport of the end product



Canal building was an early feature of the Industrial Revolution, led by James Brindley who built 567 km of canals in the UK



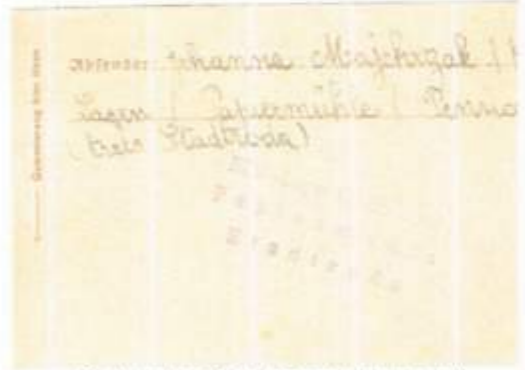
In England the Grand Junction Canal opened in 1800. It ran beside John Dickinson's Apsley Mill. Dickinson used it to take paper to London. The Regent's Canal was built to provide a junction with the Grand Junction Canal at Little Venice, extending the route right through London



In 1896 Pieter Smidt van Gelder set up a mill for newsprint in Velsen, on the then recently excavated North Sea Canal

As the railway system grew in the nineteenth century it took over a lot of mill traffic, Railways were faster and carried greater bulk

Bahnhof Papiermühle was the railway station for Stadtroda. After the Rabsburg Paper Mill situated there closed the station continued to keep its name until its own closure a few years ago



4 September 1944, Feldpost letter card Reverse has three-line cachet for KLV. - Lager (Thur. 204) / Papiermühle / Stadtroda This was a World War II Children's evacuation camp



3.2 The impact of the Industrial Revolution

Large scale production gave the impetus to specialised fields, including wholesalers and plant manufacturers

The modern mill



James Spicer and Sons were paper merchants and wholesale stationers who by the 1860s were acting as intermediaries between paper manufacturers and retailers. In 1922 they bought Eynsford Mills in Kent and the Sawston Mills in Cambridgeshire. Perfin JS (reversed) with London double-ring cancel 03 January 1901



Versäumen Sie nicht

bei eintretendem Bedarf in Pack- und Einwickelpapieren, Schreibpapieren, Briefumschlägen usw. ein Angebot einzuholen von der

Papiergroßhandlung J. Obholzer, Papierfabriklager
 Kontor: Bergstraße 6 Münster i. Westf. Fernsprecher 2026

Ein Versuch überzeugt Sie von der Leistungsfähigkeit dieser Firma.

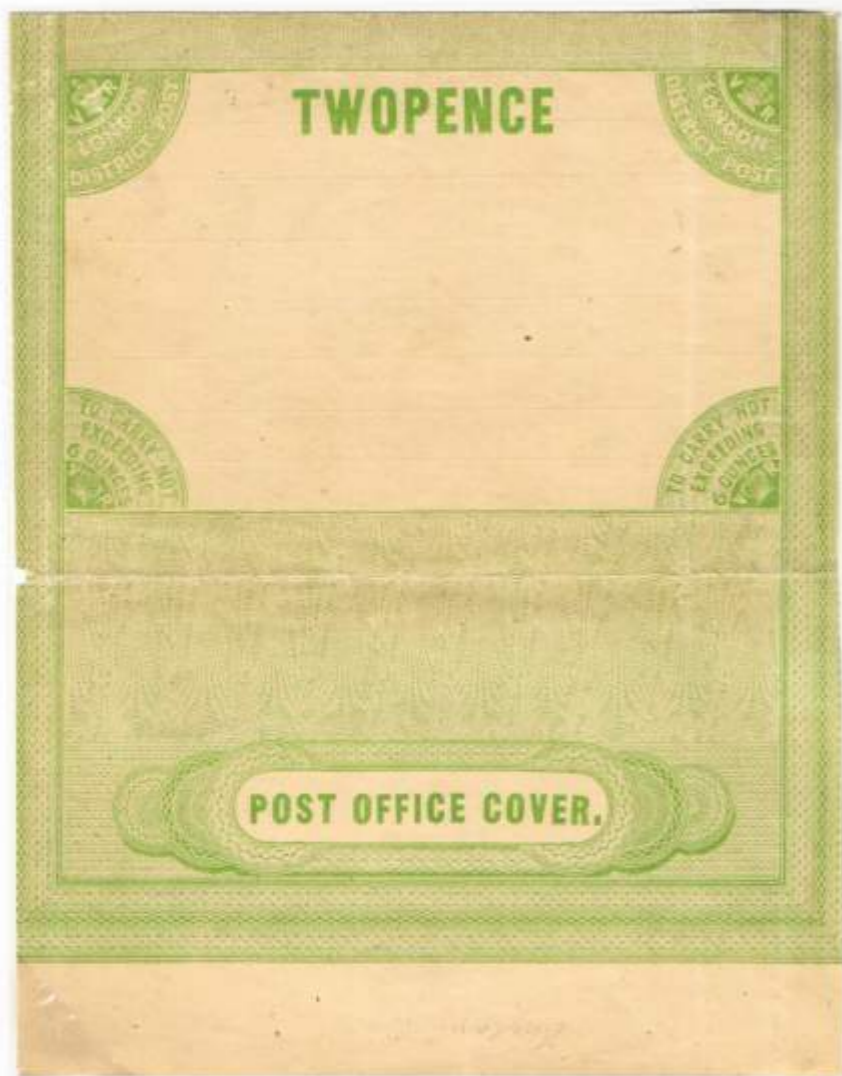
Lieferung nur an Großabnehmer.

Karl Krause, founded in 1855, manufactured specialist plant machinery for paper mills. At the end of the Second World War plant from the factory was dismantled and sent to the Soviet Union as war reparations.

Obholzer were a paper warehouse and distribution company Telegram sent Münster 19 Nov 1922

3.3 A mill and a postal service: the firm of John Dickinson

In 1829 John Dickinson patented his 'silk thread' paper, a security paper almost impossible to forge, first used in that year for Exchequer Bonds. When Rowland Hill published his pamphlet *Post Office Reform* Dickinson immediately saw a commercial opportunity. He prepared two essays of prepaid letter sheets and had them printed by Charles Whiting. He then submitted these to the 1839 Treasury competition. Although they were not accepted, silk-thread paper was used for the Mulready envelopes and letter-sheets.



Essay of a two pence letter sheet prepared by Dickinson to be used for prepayment of up to 6oz within the London District Post. It has ten blue threads, approximately 10 mm apart, running horizontally across the middle (address) panel.

NB: The term 'silk-thread' was used as Dickinson's Patent no. 5754 refers to "cotton, flaxen or silken thread". However, scientific analysis by Christopher Earland in 1990 proved that they are actually cotton threads



Mulready envelope, stereo a203, with silk threads diagonally across top flap
Dickinson owned three mills by 1840. The Mulready paper was made at Nash Mill, on two machines supervised by three Excisemen

3.3 A mill and a postal service: the firm of John Dickinson

The Mulreadys were quickly withdrawn following public ridicule. They were replaced by embossed postal stationery printed on Dickinson special paper. Envelopes were introduced in 1841 and letter sheets in 1844; both remained in use until 1857. Silk-thread paper was also used for two stamp issues.



January 1841 envelope. Small size.
Groups of threads spaced 115 mm apart
Threads on right hand flap



April 1841 envelope. Largest size.
Groups of threads spaced 153 mm apart
Threads above stamp



1844 letter-sheet
Groups of threads parallel to top edge of sheet
12 June 1844
London to Manchester with London numeral cancel 1 and Manchester receipt



In 1847 silk-thread paper was used for Britain's only issue of embossed stamps. William Wyon submitted a rough design which included lines blue threads approx 5 mm apart ruled across them to indicate the threads.



Munich printing



Berne printing



Magnification of coloured thread
Munich printing



Dickinson granted the Bavarian Paper Mill at Pasing a licence to manufacture this paper for the Switzerland 1854 issue.

3.4 The paper industry became standardised
The skill of the craftsman was recognised. Trade associations and fairs flourished.



Paper makers were a recognised guild from mediaeval times, with their own coat of arms



Austrian World of Work: printing and papermaking Black print



Dresden Paper Exhibition June to September 1927
Dresden has long been a centre for papermaking; the Dresdner Druck-und Verlagshaus still produces newspapers and magazines

3.4 The paper industry became standardised
Paper originally had its own size system, but the twentieth century saw a metric-based system.



Slogan cancel: "Instead of folio and quarto buy the new Din format standard paper"



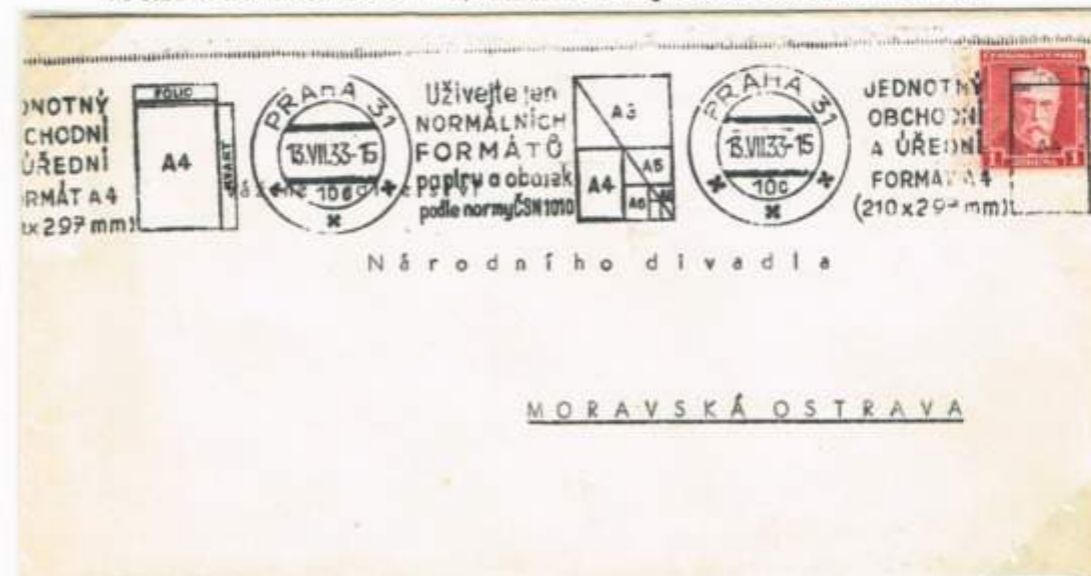
Foolscap, 13.5 x 17 inches, has been used since early European handmade paper. It gets its name from the watermark of a jester's hat, or fool's cap that was once used to identify it. Full-size foolscap sheets were divided into halves, quarters and eighths to produce other standardized paper sizes: folio, quarto and octavo.

During the twentieth century there was a move to a metric system, with slogan cancels used to encourage its adoption.



Slogan cancel: "Use standardised formats".
Switzerland adopted the metric system in 1929

Standard paper sizes today are defined by ISO 216, based on the German DIN 476 standard. The base A0 size has an area of 1 m², and all succeeding sizes are scaled down from this



Slogan cancel exhorting the Czech technical standard (CSN): "Use a standard format of paper and envelopes according to CSN 1010 . . . Uniform commercial official format A4". With illustrations of A2 to A8 sizes



Commemorative cancel in use during the Berlin paper trade fair 19 - 22 August 1922



DRUPA (DRuck Und PApier) is the largest paper and printing trade fair in the world, held in Dusseldorf every four years
Meter mark used by companies as well as Dusseldorf post



4. Types of paper and paper products

4.1 Content of the raw material

Wood, the staple raw material, needs treatment to produce good quality paper. The most basic is mechanical wood pulp, which uses all the wood except the bark. Lignin and other substances which cause the paper to discolour and crumble are not removed. It produces poor quality paper which quickly deteriorates. Newsprint (the paper for newspapers) has traditionally been made from mechanical wood pulp derived from softwood species of trees.

Wood pulp



Charles Fenerty invented a wood pulp process for papermaking in 1844 which became widely used for making newsprint.



Although Fenerty is always credited with the invention, Friedrich Gottlob Keller was working on an experimental wood grinding machine at the same time.



Swedish newsprint production used by foreign newspapers



The Günther and Richter wood mill was built in 1880 to manufacture spruce wood pulp for newspapers



Yellowish paper in comparison with the rest of the set
Printed in Paris on newsprint



The Stamford Mercury newspaper has used a special cancellation on its wrappers since the 1870s
Duplex cancellation 742 applied at Stamford Head Post Office

Undated London Newspaper Branch cancel to Hamburg
NPB mark, introduced following the 1870 Newspaper Act, was used for bulk-posted mailings overseas

4.1 Content of the raw material

Better quality paper requires the pulp to be treated to remove impurities. The term 'chemical wood pulp' refers to pulp which has been boiled with chemicals in order to remove its unwanted constituents.

Wood pulp



The first used chemical treatment of pulp was the addition of a bleaching agent. In 1775 Carl Wilhelm Scheele discovered chlorine which was soon used to bleach paper.

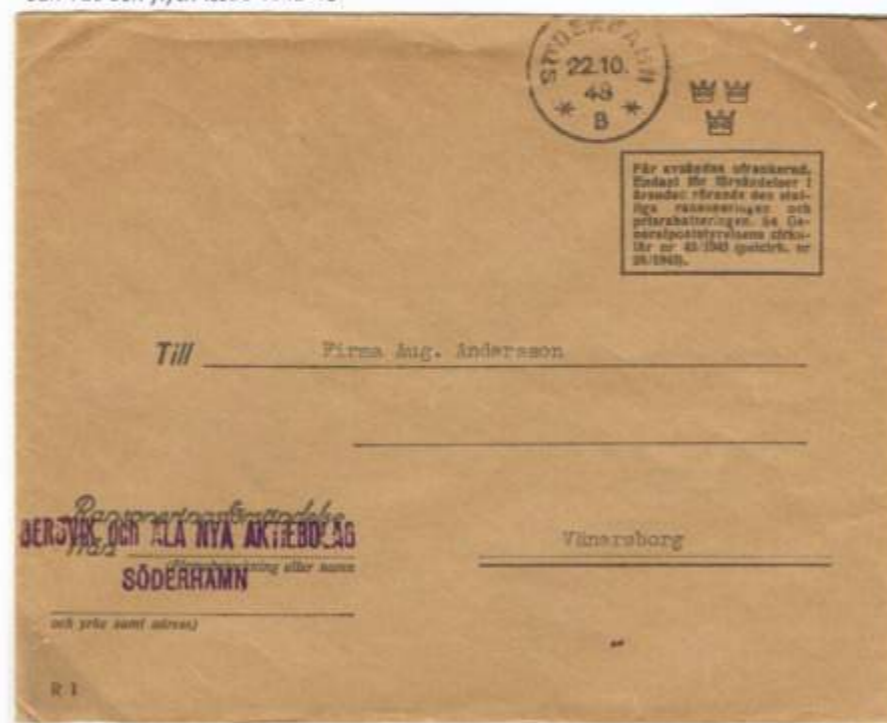
'Wood-free paper' means that, although made from wood, it does not contain any mechanical wood pulp. Chinese wood-free paper. Sun Yat-Sen fifth issue 1942-46



In 1872 Carl Ekman invented a process for bleaching wood pulp with a sulphite solution, producing a clean, white pulp. Stamp shows a drawing of the first industrial digester.



The Rosenthal Pulp and Paper Mill at Blankenstein was built in 1883. In 1976 a new sulphite pulp mill was built on the site.



Bergvik & Ala Nya Aktiebolag was the world's first sulphite pulp mill, built 1874.
Freepost official cover from Bergvik, Söderhamn, to Aug. Andersson, Vänersborg 22.10.48.

Cover authorised for free mail. Both sender and receiver had to be registered with the authorities to receive free mail. Acceptance for registration was dependant on the relevance of the companies to the war effort and post-war reconstruction. Envelope size R1. (3 sizes were issued).



The first chemical wood pulp mill in Canada was built at Windsor Mills, Quebec, using the soda process: adding caustic soda to wood pulp to aid breaking up the fibres.

4.2 Treatment of the raw material

The surface of a paper sometimes needs additional treatment to make it suitable for use. Coated papers are those which have been coated by a compound or polymer to impart certain qualities, such as surface gloss, smoothness or reduced ink absorbency.

Coated papers

Back flap

WIGGINS, TEAPE & ALEX. PIRIE (EXPORT) LTD.,
ALDQATE HOUSE,
40-50, MANSELL STREET,
LONDON,
E.1.



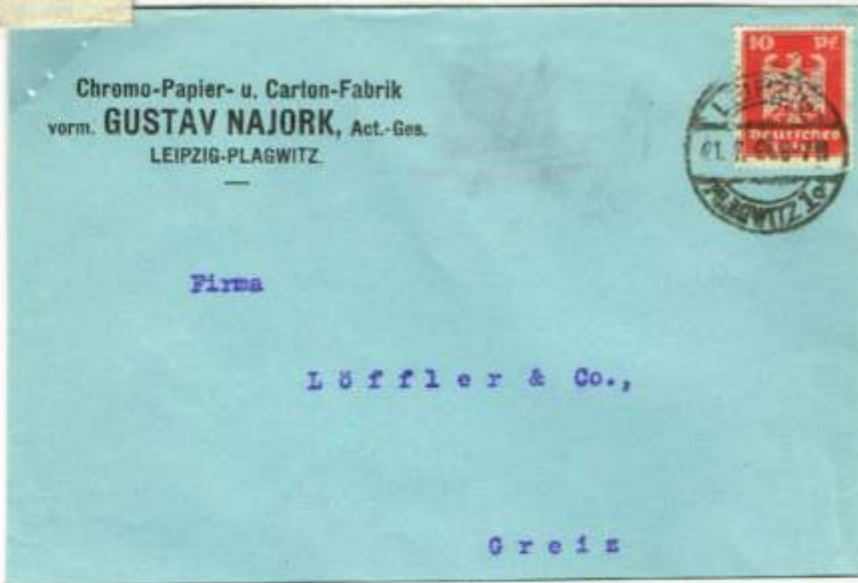
George V Downey Head paper trials 1912, on wove paper. Type a was printed on paper manufactured by John Dickinson; all others (b - h) were on John Allen paper from Stowford Paper Mill. Types a - d are in carmine; types e - h in scarlet. Description of each paper type given.



Wiggins Teape opened a mill making greaseproof paper at Dartford, Kent, in 1933. It operated two machines until closed in the 1980s.
W T perfin London to Colombo 7 January 1945
Franked 3s 9d = rate 1s 3d per half ounce, so 1.5 ounces.
Rate valid Dec 1941 - Sept 1945



Chalk-surfaced
Coated with a chalky solution to avoid tampering. Paper manufactured at Roughway Mill, Tonbridge
1906 De La Rue printings 1909



Gustav Najork were founded in 1868 and specialised in coated papers including art paper Perfin GN

4.2 Treatment of the raw material

There are a variety of uses for chemically-treated paper.

Chemically treated papers

Photographic paper is light-sensitive

Leo Baekeland is primarily known for his invention of Bakelite; but he also invented Velox photographic paper in 1893, the first commercially successful photographic paper.



Eastman Kodak were founded in 1888, first making cameras. They started manufacturing photographic paper in 1898 after buying the patent from Leo Baekeland

Invented in 1801, carbon paper was coated with a dry ink or pigment in order to make copies of documents



Founded in 1855 Gimborn made carbon paper from 1929 until World War II
Batavia (Jakarta) to Arnhem 30 July 1936



Roxor produce carbon paper



Bluish
Bank note paper imported by the German authorities in 1942, initially to produce local notes and subsequently to print stamps. Blue tinge was caused by an unexplained chemical reaction between an agent in the paper and the gum arabic added to the back of the stamp.



Occasionally the chemical treatment can be an accidental reaction



Red-brown
Blued
Deep red-brown
Pale blue tinge caused by ingredients used in the manufacture of the printing ink and/or paper, or by the chemical reaction of one on the other

4.3 Characteristic types of paper

Cardboard is a generic term for a heavy-duty paper of various strengths. Robert Gair invented the pre-cut cardboard or paperboard box in 1890.

Heavyweight



Nelsbach manufactured and distributed cardboard products, specialising in cardboard tubes



Symbolic rolls of paper and pasteboard



Bagasse is the fibrous matter that remains after sugarcane or sorghum stalks are crushed to extract their juice. It is used to make containerboard



1946 postmark commemorating Lucka's fine corrugated cardboard industry



Lozano Hermanos Group were founded in 1966 and produce cardboard and paperboard

Stempelbild

Francotyp: Cm 28282 Kennzahl:

Firma: Papierfabrik Kirchberg, Krieger, Meuser & Co. K.G.

Post: 5771 (224) Kirchberg über Jülich

Motor: Tornado Nr. K 040231 220 Volt ~ Ps 1,35 Amp.

Deliefert: 12.4.57

Wertkartenbetrag: DM 500,--

Permutationsnummer: B 4697

Klischee: 1 auswechself. fest

Spezialeinrichtungen:

Merkmale: 275.200

DM 56,00

Kirchberg were founded in 1897, specialising in corrugated board: a special kind of containerboard with a liner and inner curled card. Francotype sample card roller cancel, created when the machine was sold, showing technical details of the machine and updated change to the stamp.

4.3 Characteristic types of paper

Lightweight papers have various uses.

Lightweight



Thickness and weight do not always correspond. Blotting paper is very thick, but with no sizing it is lightweight



Edward VIII booklet

Mis-printed voucher copy (advertisement only) of a Publibel, designed to be sent to advertisers and the press. "Publibels" have been issued since 1933. Any company can make a request to Belgium Post for such cards; the requester must provide text and pictures for the advertising wanted. The paper used to print them is the property of Belgium Post using a specialized security printing company.

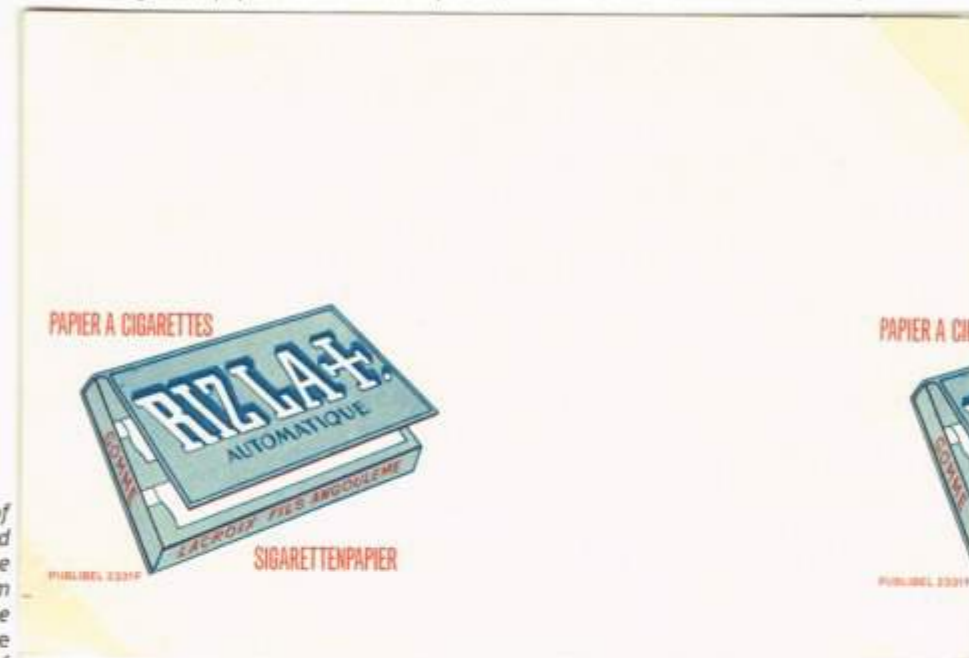
Weight could sometimes be critical, for instance for items carried by air. This is an item of siege mail on flimsy paper

Official Feldpost printed on very lightweight paper during Siege of Przemyśl. Feldpost 'cards' were individually numbered, this one 29942, carried on 18 January 1915, landing at Brzesko, southern Poland.



Przemyśl to Marienbad, Bohemia With flight mark Fliegerpost Przemyśl 1915 Circular IX/54 control "camouflage" (where "IX" stands for Galicia and "54" for Przemyśl) Red ZENSURIERT applied at Brzesko

Cigarette paper is thin and transparent, and can be made from rice or hemp



4.3 Characteristic types of paper

Modern security papers are required to be tamper-proof and anti-counterfeit. Special features applied directly into the paper structure during the manufacturing process include watermarks, security fibres in the pulp and special coatings.

Security papers

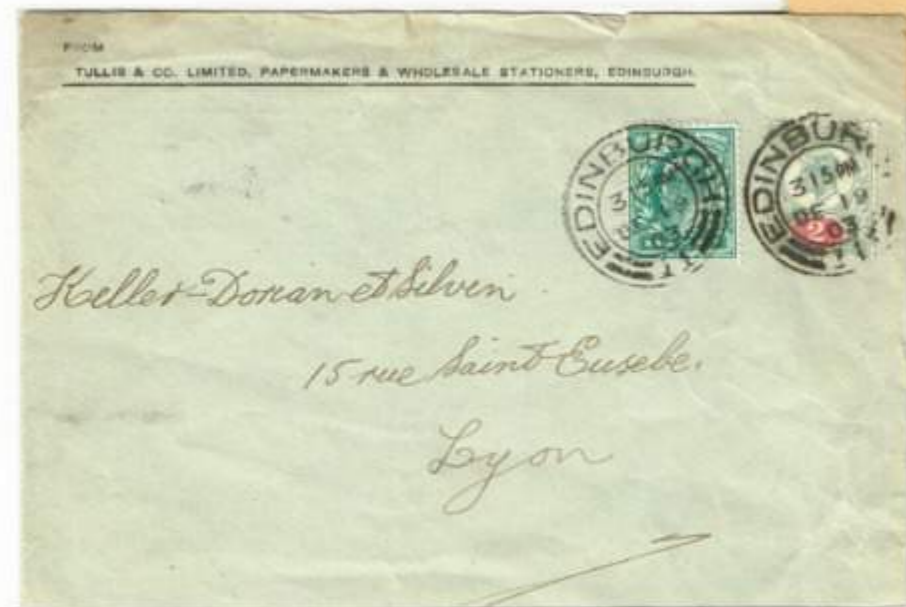


Newspaper wrapper with perfin DLR through the stamp impression. London to Bishop's Stortford 25 03 1902

De La Rue (from February 2018 Portals De La Rue) own mills making security paper at Bathford and Overton



De La Rue imprimatur of 1d newspaper wrapper with ms "Sample attached to Contract / dated July 24th 1899" plus signature of Thomas De La Rue



Founded by Robert Tullis in 1809 the company became Tullis & Co. Ltd. Stamps have perfin T of Tullis & Co 19 Dec 1903 to Lyon. Foreign letter rate 2½d up to ½ oz



De La Rue and Tullis & Co. both make specialised paper for passports and banknotes

4.4 Paper products

Paper has many uses, its first being as a writing then print medium, including books and magazines.

Books and magazines

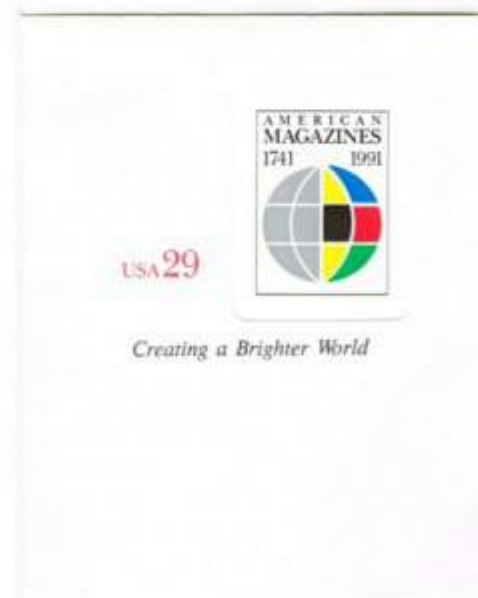


BOOKS

International Book Year 1972 Illustration is painting by Jutta Damme "Young Worker Reading". Set of five progressive proofs with partial and final colours, plus issued stamp



Violet two-line cachet for World War I Field Book Store of the German 1st Bavarian Division CDS Feldpost Nr. 124, located at this time at Avricourt, France



MAGAZINES



The British magazine 'Punch' ran from 1841 to 1992

In 2015 there were 7,293 magazine titles published in the USA USA postal stationery envelope

4.4 Paper products

The role of the stationer - suppliers of commercially manufactured writing materials - goes back to the thirteenth century.

Writing materials



Basildon Bond was created by Millington and Sons in 1911 1929 booklet with PUC stamps, watermark inverted



Addresses of shops include five for stationers Strasbourg privately printed postal stationery, for use within the city. c. 1880



Offset printing on reverse (with normal)



When Thomas De La Rue first set up in London he ran a fancy stationery business

4.4 Paper products

Paper has been used to pack things since the sixteenth century, one of its first uses other than as a writing or print medium.

Packing and Wrapping



E.S. & A. Robinson were founded in Bristol in 1844 making paper bags for groceries. 1/2d stamp with SE/RA [i.e. reversed] perfin tied by Bristol machine cancel 30 June 1924. Inland printed paper rate up to 2oz



Founded in 1921, these days Carl Hanf concentrates on packaging, but historically made papier mâché masks, hence its meter mark



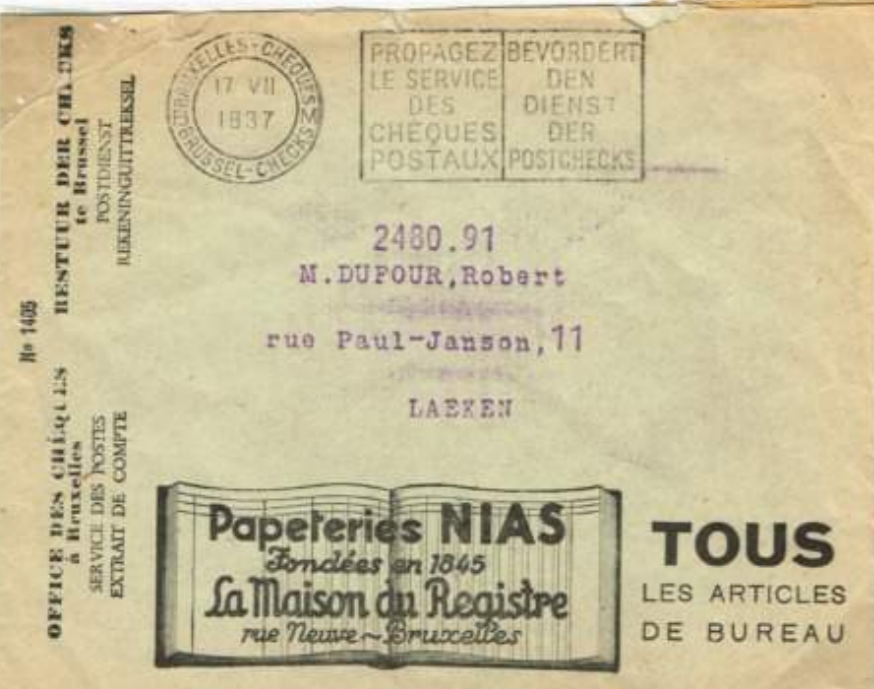
Hinde & Dauch was founded in 1880 and later sold to the West Virginia Pulp and Paper Company



Hadrbolec, Czechoslovakia's first paper mill, produced Balící Papír, i.e. wrapping paper



Decorative wrapping paper is a twentieth century feature



Papeteries NIAS was founded in Brussels in 1845. It still has a shop in Brussels selling stationery Postal cheque envelope with postal cheque slogan cancel 17 July 1937 internal to Brussels (postal district Laeken)

4.4 Paper products

A range of different paper products will be found in the kitchen and bathroom

Domestic items



The company was originally founded as G. W. Dray & Sons in 1856 and was an early producer of rolled - rather than flat sheet - toilet paper. It changed its name to Drayton in 1910 and widened its products, but kept the original perfin.
DRAY perfin
 29 March 1939 Fulham to Canada
 Overseas surface printed paper rate



The coffee filter was invented in 1908
 PostModern private post company operates throughout Germany



15 centime postal stationery letter. In 1877 letter cards were sold for 5 centimes, the balance of 10 centimes being financed by advertising revenue



Essential in the bathroom!
 The bathroom cabinet used to contain Vichy Salts (mineral salts) in its special packaging



4.4 Paper products

A wall covering today more commonly made from vinyl, historically it was paper made from wood pulp, and has been made by machine since 1840.

Wallpaper



NORTA (Norddeutsche Tapetenfabrik) were founded in 1903 as specialist wallpaper manufacturers. They closed in 1979.
 Crown Wallpapers were founded in the UK in 1899



Atlas Wall Paper Mills were founded in 1925



From 1862 the company of Morris, Marshall, Faulkner & Co. (later Morris & Co.) led by William Morris, started producing wallpapers.



Allan Cockshut Wall Paper Manufacturers Ltd. Stamps with AC/Co. perfin
 But despite the versatility of paper it did have its problems . . .