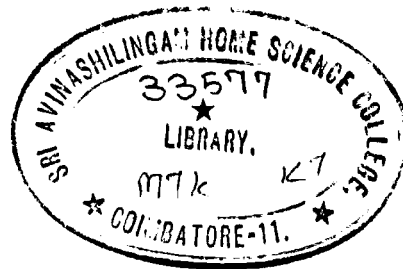


COMPLETE TEXTILE ENCYCLOPAEDIA



by
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P R E F A C E

This book is written for those who have some knowledge of textiles, either technicians or students, who are training for a career in textile-industry. It is hoped that it would be read by many others.

In writing this book, my principal object is to give a concise but systematic account of the principle or more important textile topics which may be required to be referred to almost everyday, and that this book should prove to be a useful ready-reference and up-to-date guide and interesting reading which would be easy enough for any intelligent layman or person having a reasonable working knowledge of the subject, who is faced with a problem and requires information about a particular topic, which is not sufficiently big or important enough to warrant consultation of an "expert" but at the same time which is not too small or insignificant or so unimportant as to be ignored.

Naturally this would be of interest to students learning textile industrial subjects and also others who are concerned in any way with textiles. The others concerned with textiles are :

- A textile technician
- „ processor knowing his subject
- „ trader—who is a link between the manufacturer and the consumer
- „ spinner
- „ weaver
- „ bleacher
- „ laundryman
- „ dyer who knows dyeing but may not know what material he has to deal with
- „ printer
- „ finisher or converter who may require to find out or identify fibres
- „ research worker or student who may be faced by a number of problems
- And most important of all—*A consumer*, who may require to know what stuff he has bought

Any of these persons may be faced with a small problem other than their field, and try to find out the explanation for the problem, and it is to such persons that this book may give the required guidance.

There are two important parts or sections into which this book is divided:

Part I— *Textile Times*, or historical progress of textiles, marking the more important inventions and discoveries which changed the conventional technique and set a new trend.

This is arranged chronologically.

Part II—*Textile Encyclopaedia* explaining the more important topics which are required to be referred to every day.

This is arranged alphabetically.

The two sections are interlinked with cross (X) references, appropriate and as far as possible complete in such a manner that a person who knows the topic but not its details, can easily trace the topic which would give sufficient information and also would give pointers regarding further topic-references and also the time.

I have deliberately arranged this book in the manner stated. The dates recorded have been checked and rechecked by reference to various sources so that the dates stated are correct. But of course with certain events where correct timings are not found a vague reference as to the probable date is given.

In arranging the topics, each topic is treated more or less as a complete subject-matter and quite independent of each other. This book is to be considered as an encyclopaedia (I have arranged the subject-matters alphabetically).

A concise or abridged encyclopaedia would naturally demand certain sacrifices. The obvious course then naturally would be to do away with unwanted subjects or subjects of lesser importance. In an industry handling such countless number of processes, products and terms as well as materials and equipment, it is almost impossible to describe ALL these methods and materials, and therefore, the plan had to be modified and narrowed down to the basic minimum requirements of just sufficient but most wanted processes and products only. I, therefore, cannot claim this book to be an exhaustive treatment of the subject, and as far as possible, I have avoided any such statements, but with the actual experimental data collected so far, I think this should serve a useful purpose.

In conclusion, I sincerely hope that the book will be used as a practical guide by all those who are actively concerned with textiles so that they may not have to go through oceans of books and journals just to find out information about a particular topic about which they may be ignorant especially with respect to its peculiarities, technicalities and products, by giving them a clearer understanding in simple language, both of the theoretical knowledge about such products and their peculiarities and their practical application in everyday life.

V. R. BARVE

**COMPLETE
TEXTILE ENCYCLOPAEDIA**

Textile Times, I
Encyclopaedia of Textiles, II

TEXTILE TIMES

OR HISTORICAL PROGRESS OF TEXTILES

(X stands for cross-reference in the body of the book)

B.C.

- 10000 — Evidence of animal skins and furs used as body-covering.
— Vegetable clothing—some leaves also used as body-covering. Old Sanskrit scripts are full of such descriptions.
- 7000 — Evidence shows that flax was in use in some Swiss lake-dwellings.
- 6500 — Evidence shows that weaving was in use.
- 6000 — Weaving was in regular use and strange to note that weaving was in use even before spinning.
— Evidence that flax was in regular use in Egypt.
— Evidence of interlacing of grasses and sinews.
— Evidence of asphalt being used as a plastic-material and as water-proofing agent.
— Evidence of beginning of spinning.
- 5800 — Spinning wheel and distaff in regular use. The early poetic works are full of spinning.
- 5600 — Ample evidence of spinning wheel and distaff in early folklore.
— Athena, the Greek Goddess, is considered The Goddess of Distaff.
— A Greek legend describes a Greek maiden Arachne who dared to compete with Goddess Athena and was 'metamorphosed' into a spider doomed to spin forever thereafter.
- 4000 — There are indications showing that cotton was regarded as a fibre.
- 3500 — Cotton cloth was used. Ample evidence of this is found in the old Sanskrit scripts.
— Recent explorations however indicate that not only in India was cotton cloth made but also in the then undiscovered lands of Mexico and Peru and North America.
- 3000 — Cotton fabrics of quality in regular use.
— Evidence of this is found in a tomb at Mohenjo-Daro (Sind, India); shows cotton manufacturing as established industry.
— Recently there is evidence showing that cotton was also as established in Mexico and Peru, about the same time, as in India.
— About this time there is enough evidence in old Sanskrit writings showing that the method of preparing indigo was already known in India.
- 2800 — Vedic hymns give ample indications that cotton cloth of good quality was being used regularly in India.
- 2700 — Ancient Chinese writings indicate that by this time Hemp was used as a fibre in China.
— Evidence shows that the properties of the rich fibre—wool—were recognised by this time.
- 2640 — Empress Si-Ling-Chi, wife of Emperor Huang-ti, began experimenting with silk-worms and sericulture. The invention of reeling of silk is attributed to her.

B.C.

- 2600 — Silk became an established industry in China—the art was however kept a closely guarded secret.
- 2200 — In Chaldean city of Ur, there are records showing weavers were regularly working and paid.
- 2100 — Appreciation of natural colours—of vegetable origin—with dawn of civilisation.
 — Probably now began the art of dyeing and printing.
 — Evidence of dyeing and printing of fabrics—pictured on the walls of a tomb in Egypt are shown people with decorated fabrics.
 — Also there are found illustrations of upright looms.
- 2000 — Cotton fabrics—supremacy in India.
 — Evidence shows that the secret of mordanting was discovered and used in India.
- 1594 — Near Thebes was found a piece of wall fabric printed in red and blue.
- 1466 — Natural dyestuffs began to be used.
 — Fugitive stains used for decorative effects.
 — Also fugitive stains from mineral sources. This indicates the need of fast colour-dyeing.
 — Linen decorated with conventional designs found in the tomb of Thothmus IV, suggesting dyeing and printing with natural colours.
- 1200 — A sample of “batik” printing, found in a temple in Java.
- 1050 — Early Sanskrit literature suggests the existence of silk industry, in India, at about this time.
- 1000 — King Solomon’s time—there is mentioned in some writings about cotton manufacturing and printing of cotton fabrics.
- 540 — Evidence of ornamental linen tapestry.
- 500 — Resist-printing—first practised in China.
 — More persistent inorganic or mineral colours began to be used—and probably now began the art of fast-colour-dyeing with mineral colours.
- 445 — Some Greek writings mention the popularity of gay coloured Indian printed cloths, worn by women of the Mediterranean.
 — Cotton cloths export from India to Europe was carried on fairly regularly by Arabs.
- 425 — Herodotus describes in his writings that Babylonian and Egyptian dress consisted of linen-shirt reaching to the feet—over which was worn a woollen tunic.
- 350 — Secrets of silk-manufacture were smuggled out of China.
 — Japan tried to establish its silk-industry—four Chinese girls helped to establish the Japanese silk-industry.
- 327 — Alexander the Great—in his invasion of India—took to Greece some quantity of printed cotton goods.
- 300 — A Greek traveller writes in his narrations that in India people wore flowered garments made of finest muslins.
 — This is probably the first indication of the famous dacca-mulls.

B.C.

- 300 — Megasthenes—Greek Ambassador to the Court of Chandra-Gupta Maurya—mentions decorated cotton fabrics with gold and silver threads and precious stones.
 — This is probably an indication of not only Jari garments in use but also the famous dacca-mulls.
- 287 — Theophrastus—describes cultivation of cotton.
- 100 — Records show evidence of domesticated breed of Angora goat in Turkey.
- 63 — Old Roman records mention use of cotton awnings.
- 43 — Ovid describes the process of woollen manufacture in his writings.
- 3 — Poet Theocritus writes a poem which accompanies the gift of a carved ivory distaff.
- 1 — Invention of drawloom in Egypt—an important step in weaving.
- 00 — “True-lace-fabrics” appear in the form of Egyptian plaiting.

A.D.

- 16 — Pliny explains that garments could be made without any spinning or weaving. This probably suggests the existence of the felting processes.
 — Pliny also explained in *Historiae Naturalis* that Terentine sheep (Italy) produced the finest wool—at that time.
 — Columella—a Roman—crossed the Terentine sheep with a pure white breed of Africa.
 — The progeny of this breeding were the fore-fathers of the famous Spanish-merinos.
- 61 — Pliny’s writings describe details of methods of colour-printing, practised in Egypt.
- 70 — Weaving of wool was a progressive and important industry of the Romans.
- 77 — Pliny records cultivation of cotton in Egypt.
- 80 — Romans introduced wool-weaving in England—a factory was set up in Winchester—The art was quickly mastered by the British, so much so that records show that wool of Britain is often spun so fine that it is comparable to spider’s web.
- 100 — First cotton grown in European soil—at Elis (Greece).
- 200 — Fragments of an Egyptio-Roman fabric (found and preserved) show bold printed designs done probably by wooden block printing.
- 542 — In the grave of St. Caesarius (a Bishop at Arlon) is found a fragment of distinctly printed cotton fabric.
- 700 — Hand block printing—in China—established.
- 900 — Cotton industry introduced into Spain—(By Abd-er-Rehman III).
- 1068 — William the Conqueror allowed concessions to Flemish weavers—to settle in Carlisle—These skilled immigrants raised the standard of English textile industry.

- A.D.*
- 1080 — Weavers guild was formed in England—which became a strong power in British affairs.
- 1250 — Barcelona became a flourishing cotton manufacturing centre—specialising in sail-cloth.
- 1347 — Johnna (Daughter of Edward III)—her wardrobe account shows brass-pins in quantities, suggesting use of needle-point lace.
- 1400 — Wool-wheel intermittent spinning.
- 1471 — A Harleim Mss. records directions for lace-fabric with illustrations of women making lace.
— Knitted garments were quite common by this time.
- 1488 — Price regulations for knitted goods in England.
- 1492 — 12th October—Discovery of America—and consequently discovery of new native textile materials and fur-bearing animals.
— Columbus describes how natives of Watling Island brought skeins of cotton threads to his ship—in fact this presence of cotton on this island is *the* reason why he thought he had reached India.
— This is the first record of sea-island cotton.
- 1498 — Discovery of new route to India (Vasco-da-Gama—via Cape of Good Hope) and consequently direct export of cotton goods from India to Europe.
- 1522 — Cortez—appointed officers to introduce silkworms in Mexico.
- 1530 — Invention of *Saxony-wheel*—in Nuremberg Germany which changed spinning from intermittent to continuous operation.
- 1533 — Spinning wheel with treadle movement.
- 1542 — Evidence of evolution of needle-point-lace, from embroidered or cut-linen-pieces.
- 1589 — First knitting frame—by Rev. William Lee (England). He got inspiration about the mechanism from the observation of his wife's knitting fingers.
- 1609 — First small flock of sheep—brought from England to Jamestown, Virginia, U.S.
- 1619 — Spanish settlers planted cotton in U.S. in Florida which was an immediate success.
- 1623 — England was disturbed over imports from U.S. of cotton in quantities.
- 1630 — Drebbel—a Dutchman—discovered a process of producing scarlet on wool by using tin and cochineal.
- 1643 — Skilled workers from woollen manufacturing works from Yorkshire, England, settled in Roxbury, Mass. U.S., and established what may be called the first fulling mill in U.S.
— About this time England passed laws prohibiting export of sheep's wool and wool-yarns from England to protect home woollen industry.
- 1650 — Earliest attempt made at fire-proofing fabrics.

- A.D.*
1664 — First suggestion of *man-made fibres* by Dr. Robert Hook (England), on the same lines as a silk-worm spins its silk.
- 1710 — Prussian-blue—suggesting the use of mineral colours.
— Starting of industrial revolution.
- 1733 — Flying shuttle—(John Kay—England).
- 1734 — René de Reaumur predicts man-made fibres or synthetic fibres from resins.
- 1740 — Saxony-blue.
— Record of alum used for fire-proofing.
- 1758 — Struts—improvement to Rev. William Lee's knitting frame.
- 1760 — Robert Kay develops multiple-shuttle-box.
- 1764 — Spinning-Jenny—(James Hargreaves—England) could spin 16 or more threads at a time.
- 1768 — Lace-making—stocking frame adapted for producing open-looped fabrics having net-like appearance—England.
- 1769 — Spinning-frame—Richard Arkwright—England.
- 1770 — Engraved copper plate printing—Bell's patent—England.
- 1771 — Robert Frost invented a machine for making square-net which was used in wig-making.
- 1773 — Urea discovered.
— Many thousands of knitting machines in regular use.
- 1774 — H_2SO_4 .—used for souring in bleaching.
- 1775 — Chlorine isolated—Scheele.
— First warp-knitting machine patented.
- 1779 — Mule-spinning—made by Samuel Crompton—England.
- 1782 — Invention of steam engine—James Watt—England.
- 1783 — *Roller-printing*—Bell's patent.
- 1785 — Roller printing—Adam Parkinson's improvement on Bell's patent.
— Eau-de-Javel—Berthollet dissolved Cl_2 gas in NaOH, for easier use and greater advantage—Chemick.
— Dr. Edmund Cartwright experiments with a water-power loom.
- 1786 — Ammonium phosphate used for fire-proofing.
— Frames for making point-nets introduced in England.
- 1788 — Picric acid.
— Berthollet's Chemick began to be used in bleaching.
- 1789 — *First power-loom*. Dr. Edmund Cartwright's invention formed the basis for later improvements.
- 1791 — Dausen's improvement on Rev. William Lee's knitting frame.

- A.D.*
- 1793 — *Cotton-gin* (by Eli Whitney)—with this invention cotton became the king of fibres, dethroning all others and also this invention gave a death-blow to linen industry and also silk-industry—not only in U.S. but all over the world.
- 1796 — Soda-ash.
- 1798 — Bleaching powder—(Tennant—Glasgow)—X.
- 1804 — *Jacquard-Loom*—Joseph Marie Jacquard—France—X.
- 1808 — England began spinning alpaca.
- 1809 — Bobbinet Machine—John Heathcoat.
- 1810 — Patent for flax-spinning machinery—Philippe de-Gerard—France.
- 1813 — John Levers perfected lace machine which became the foundation of all modern lace machines.
- 1816 — Seamless garments device—(Sir Mark Brunel's patent).
- 1818 — Hydrogen peroxide discovered—Thenard—X.
- 1825 — Raw mohair export from Turkey to England.
- 1827 — First Irish flax-spinning mill started.
— Mohair fabrics began to be used in Europe, England always maintaining supremacy in its manufacture.
- 1828 — Urea synthesized—(F. Wohler—Germany)—X.
- 1830 — Circular knitting machines invented.
- 1838 — First ideal *blending*—Cotton/Alpaca—done with complete success in England.
- 1839 — Growing demand for mohair fabrics and therefore a great deal of crossing of Angora-goat was done with commoner breeds.
— Power-carpet-loom—Bigelow—U.S.
- 1844 — An English chemist produced alkali-cellulose, which became the basis of Viscose-rayon.
— *Mercerization of cotton* (John Mercer—England)—X.
- 1846 — Mass emigration of Irish linen-weavers to U.S., as conditions became intolerable.
- 1849 — First batch of Angora-goats—reached U.S. from Turkey—(7 does and 12 bucks).
- 1850 — Power used for knitting machines—(Baily Co., U.S.).
- 1855 — Cellulose Nitrate—George Audeman—Compound which was the base for first rayon yarn.
- 1856 — *First Synthetic Dye*—(mauve or aniline-purple) (Sir W. H. Perkin—England). He was preparing quinine from aniline when accidentally he got the first dye, aniline purple.
This is the starting point of a new era in dyeing—synthetic dyestuffs became a reality—X.

- A.D.*
1857 — *Cuprammonium*—*Schweitzer*—Germany—which became the basic material for cuprammonium rayon—X.
1858 — Self-acting Latch-needle—(Mathews Townsend and David Moulding)—X.
— Spring needle machines for ribbed underwear.
1859 — Formaldehyde prepared.
1862 — Water-solution of synthetic mordants by sulphonation—(Nicholson).
1863 — First flatbed knitting machine perfected by Q. U. Lamb—U.S.
1864 — William Cotton patented revolutionary knitting machine.
1865 — A German chemist developed cellulose-acetate—which proved to be the basis of acetate.
1868 — Synthesis of Alizarine-red—the colouring principle of Madder—this invention marked the end of use of Madder commercially—(Graebe & Liebermann).
1869 — Commercial possibilities of (Cellulose) acetate recognised—as rayon.
1870 — Because of repeated crossing with commoner breeds—Angora-goat (true-breed) practically disappears—even then, demand for mohair continued to grow.
— Knitting industry became well established in U.S.
1874 — Eosine—(Caro).
1875 — Crysoidine—(Caro).
1876 — Axminster Loom—(Halcyon-Skinner).
1877 — Alizarine-blue.
1878 — Xylidine-scarlet.
— Hydrogen peroxide employed for bleaching of silk.
1879 — Bielrich-scarlet—(Nietzki).
1880 — Synthesis of Indigo—(Baeyer).
1884 — Direct-cotton-dyestuffs discovered.
— Congo-red—First direct-dyestuff—(Bottiger).
— Commercial rayon-yarn by Count Hilaire de Chardonnet. This was called “artificial-silk” or Chardonnet-silk.
— Crystal-violet—(Caro & Kern).
1887 — Primuline-red.
— Rhodamine.
1888 — Hydroxyalizarines—(Bohn & E. Schmidt).
1889 — p. nitraniline-red.
— Count Chardonnet began to be known as “Father of Rayon industry.”
— One of the most important “Azoic-dyes” prepared.
1890 — Patent for cuprammonium rayon process—in England.
— Alizarine-bordeaux.

A.D.

- 1892 — Patent granted for Viscose-rayon in England.
- 1893 — First sulphur dyestuff—(A. Vidal).
— Edward D. Libbey prepares the first glass-fabric.
- 1894 — S. H. Sharp's patent—single-colour stencilling machine.
— Patent for improvements to acetate process in England.
- 1895 — Alizarine-green.
- 1896 — Urea-formaldehyde resin—realisation of possibilities.
- 1897 — Development of Sodamide process for manufacture of synthetic Indigo—
(Badische Co.—Germany).
- 1898 — ASTM—American Society for Testing Materials—established.
- 1900 — Chlorination of wool gets commercial recognition.
- 1901 — First synthetic Vat-dye (Indanthrone) prepared.
— First important Anthraquinone Vat-dyestuffs—Indanthrone and Flavanthrone—by Bohn.
- 1902 — Invention of centrifugal-spinning-box in England, which greatly contributed and almost revolutionised Viscose-rayon production.
- 1904 — Discovery of Violanthrone—O. Bally & H. Isler.
- 1906 — Synthesis of Thio-Indigo for the first time—Friedlander.
- 1907 — pH expression began to be used for expressing H and OH balance or acidity and alkalinity.
- 1909 — Pacific-converter—(U.S. patent).
- 1912 — Naphthol dyes—(Germany).
— Brenthol dyes — (England).
- 1913 — Germany held almost complete monopoly of the dyestuff industry especially the intermediates from which dyestuffs are prepared.
- 1914 — Starting of World War I, which necessitated freezing of the monopoly assets of Germany.
— Substantial production of acetate-rayon which was used as 'dope' for aircrafts—Celanese (British).
- 1915 — Formation of Chemical Foundation Inc. in U.S. for administering chemical patents held by Germany.
— Attempt at revival of linen industry in Oregon—U.S.
- 1918 — ASA organised.
— End of World War I.
— Acetate rayon in U.K. commercialised.
- 1919 — Bemberg rayon in U.S.
- 1920 — Jade-green—one of the most important Anthraquinone Vat-dyestuffs—
by W. Davis, J. Thompson and A. Thompson.
— H₂O₂—hydrogen peroxide used as bleaching agent for cotton.

- A.D.*
- 1921 — AATCC established—American Association of Textile Chemists and Colorists—X.
- 1923 — Ionamines dyes produced for acetate fibres or hydrophobic fibres.
- 1924 — Acetate rayon—substantial production began in U.S.
 — Dispersed dyes produced for acetate rayon fibres—these progressively replaced the Ionamines.
 — The word “Rayon” was coined.
- 1925 — Katz showed that by stretching of rubber it develops crystalline features.
- 1926 — Urea-formaldehyde resin suggested for crease-retention (Tootle, Broadhurst & Lee Co. Ltd.).
- 1927 — Synthetic vat-dyes began to be used.
 — Production of Vinyl resins on commercial scale.
 — Copper-phthalocyanine—by H. de Diesbach and E. Von der Weid.
 — Establishment of ICI—merging of many British chemical manufacturers.
- 1929 — First man-made resin finish for crease-retention (Tootal, Broadhurst & Lee Co. Ltd.).
 — “Acele” (acetate) fibre in U.S. by Du Pont.
 — Du Pont started serious consideration and study of polymerisation (both amides and esters)—(Director, Dr. Carothers)—which resulted in the first man-made wonder fibre—nylon. E. I. du Pont de Nemures—U.S.
- 1930 — Astbury showed that stretched wool develops different diffraction patterns—quite conspicuous from unstretched wool and closely resembling natural silk.
 — Lacquer-printing process comes in vogue.
 — Chlorination of wool modernised and better controlled.
- 1930 — “Sanforised” shrinkage control process—X.
- 1931 — Experiments started for glass-fibre by two leading manufacturers which ultimately resulted in the TM—*Fibreglass*—in U.S.
- 1932 — Direct spinning of filament tow.
- 1933 — Resin finishes for cotton and rayon used in U.S.
- 1935 — Lanital (Italy)—first casein-fibre—and first attempt at man-made wool substitutes by Ferethi Snia Viscosa.
- 1936 — Aralac (U.S.)—casein-fibre.
- 1937 — Serviceability of fabrics—discussion for the first time—as a serious problem by The British Textile Institute.
- 1938 — *Nylon*—a textile wonder and first synthetic or man-made fibre. Thus the cherished dream of a man-made fibre becomes a reality.
 — Rulings on weighting of silks and shrinkage of cotton.
- 1939 — Starting of World War II.
 — H. T. Rayon and Nylon used for parachutes and also heavy duty tyre-cords.

A. D.

- 1939 — Vinyon produced.
 — Serious consideration given to problem of water-repellency and wind-proofing by Army Quartermaster.
 — Serious consideration given for blending of fibres as shortage of wool was expected due to war—this resulted in the Shirley-cloth—by Shirley Institute—X.
- 1940 — Melamine resins began to be used.
 — Vinylidene chloride polymers introduced commercially.
 — First complete Nylon costume shown at New York World Fair.
- 1941 — Wool products labelling act 1939 became effective in U.S.
- 1944 — Non-woven or bonded fabrics introduced—X.
- 1945 — End of World War II—textile industry in most countries switched over to peace-time program.
- 1946 — Terylene—polyester fibre produced—by ICI (U.K)—X.
 — Nylon staple and tow, first used by carpet-manufacturers.
- 1948 — Vicara—ideal blending fibre produced in U.S.—Virginia—Carolina Corp.
 — Resins began to be used in quantities.
- 1949 — Dynel produced—U.S.
- 1950 — Orlon produced—U.S.—X.
 — “Stabilization of fabrics”—commercial recognition—(for woollen and worsted).
- 1951 — Acrilan produced—U.S.
 — Dacron produced—U.S.—X.
 — Subject of abrasion and wear-resistance received considerable attention.
 — Cuprous ion dyeing method—for acrylonitrile fibres used.
 — “Colour-sealed” term adopted for solution-dyed Acele—by Du Pont.
- 1952 — X-51 produced—U.S.
 — Stabilization for rayon fabrics began to be used.
 — Shuttleless loom.
- 1954 — Teflon produced—U.S.
 — Flammable Fabrics Act—U.S.
 Serious consideration given for the first time to problem of flammability of fabrics.
- 1956 — Procion dyestuffs produced—ICI—U.K.
 — Introduction of fibre-reactive dyes.
- 1957 — Lycra Spandex (Du Pont) produced—U.S.
 — Du Pont 420 Nylon-introduced.
- 1958 — Fibre K—(Lycra Spandex) introduced for trade evaluation (Du Pont)
- 1959 — Du Pont—announced reuse of (TM) Acele.
 — Du Pont—announced (TM) “Lycra” for Fibre K.
 — “Antron” (Sparkling) Nylon—(Du Pont)—announced—which is a new 15 denier hosiery-yarn.
- 1960 — The (TM) “Antron” adapted by Du Pont for the new Sparkling Nylon.

ENCYCLOPAEDIA OF TEXTILES

TM = Trade Mark

AATCC: American Association of Textile Chemists and Colorists.
See 1921 (*Textile Times*).

Aba (Syrian): Woollen stuff made from camel's or goat's hair, usually striped—an outer garment made of this.

Abaca: Ref. Manila-hemp—(Musa textiles)—hard fibres 0.08 to 0.25m (3 to 10 inches) long, creamy white to brown.

See also *musa fibres, leaf fibres, vegetable fibres, fibres*.

Abrasion: (or Wear-resistance).

Surface wear as on shirt or coat sleeves, wearing into holes, threadbareness of shirts, hose, etc. tearing of seams of overcoats, etc.

Abrasion suggests wearing off or rubbing off.

The term—wearing off or wear resistance—describes the condition better.

Abrasion implies combined effects of several factors, of which abrasion is just one of the many. However this is the most important single factor in wearing off.

When two substances are in friction or contact, the harder surface acts as an abrader against the softer substance (the abraded).

Abrasion thus is a repeated stress application which occurs many times during the "life" of the material.

Abrasion-resistance is the capacity of absorbing the repeated energy impacts. Most fibres have the inherent tendency of this resistance.

This factor of Abrasion-resistance assumed importance in war, when service-fabrics had to be constructed, taking into consideration the fear of shortage of wool. Due to this, cotton and wool blends were suggested which would compensate for the lesser proportion of wool. In this, the following fabric factors

received special attention.

(a) area of contact, between the fabric and the abradent

(b) threads per meter (or inch)

(c) extent of deformation

(d) yarn and fabric pattern

(e) compressional resilience

(f) compactness of fabrics

All these factors had to be considered critically when dealing with this problem of abrasion.

See also *serviceability of fabrics, dimensional stability*.

Abrasive cloth: Polishing cloth made of cotton drills to which grains of abrasive materials are fixed with glue or resins.

See also *emery cloth or paper*.

Absorbent cotton: Cotton fibres that are thoroughly cleaned, bleached and the natural wax removed by solvents. It is very absorbent and can hold water nearly 18 times its weight. Used for many purposes especially as surgical cotton (either in fibre-form or lint or gauze) and also for packing medicinal ampules etc.

See also *surgical cotton, gauze, lint*.

Absorbent towels: Heavy cotton towelling, granite weave of 2 ply (warp and weft) where one fine yarn is plied with one course.

See also *towelling, turkish towels, bath-mat, terry cloth, huck or huckaback*.

Acacia: A genus of trees or shrubs belonging to sub-family Mimosaceae. (N.O. Leguminosae). Various species yield gum and tannin.

Acacia arabica—is gum arabic tree of India.

Acacia senegal—produces true gum arabic. Its bark (Babul) yields tannin and is also of importance in textiles.

Acacia catechu—yields an astringent product called Kat or catechu which is a natural dye.

The barks of various Australian wattles are also rich in tannin.

Acacia pyonantha—(golden wattle)

Acacia decurrens—(tan wattle)

Acacia dealbeta—(silver wattle)

Acacia nilotica and other African species are also rich in tannin.

See also *tannin, gum, thickening, tannic acid, catechu.*

Acele (TM)—Acetate Fibre :

The Du Pont News Bulletin states:

Background

Acetate, second of the man-made fibers, was known by chemists as early as 1865, but at that time it could not be produced commercially because no suitable solvent could be found for it. Drs. Camille and Henry Dreyfus are credited with development of the first practical method for manufacturing the fiber.

Acetate was spun successfully in England shortly after World War I, but it was not until December, 1924, that the process was brought to the United States. In 1929 Du Pont began production of the fiber and gave it the trademark "Acele".

During its infancy acetate was the most expensive of all textile fibers. Continuing research, however, led to vast improvements in manufacturing and processing methods, making today's acetate one of the least expensive and most universally accepted fibers in the apparel field. Acetate and rayon together account for nearly two-thirds of all man-made fiber production in the United States.

Chemical Composition

Acetate, like rayon, is classed as a cellulosic fiber, being derived from a cellulose base. But where rayon is simply pure cellulose in a changed form, acetate is made from cellulose combined with other materials. Raw materials used, as with rayon, are cotton linters or wood pulp, but in making acetate this cellulosic base is chemically changed by combining it with acetic acid and acetic anhydride.

Although Du Pont produces its "Acele" acetate fiber only in continuous filament form, it is also possible to make it in the form of staple fiber and tow, for example as in cigarette filters.

Because acetate and rayon are so closely allied, and because acetate was first commercially produced in 1924, the year when the word "rayon" was coined, the new fiber was originally called acetate rayon to distinguish it from the regenerated cellulose fiber called viscose rayon. In 1951, however, the Federal Trade Commission ruled that cellulose acetate fibers were to be designated simply as "acetate", while fibers made from pure cellulose in a regenerated or changed form were to be labelled "rayon."

Principal Uses

Acetate, sometimes called the "beauty fiber," finds one of its widest applications in luxurious satins, taffetas, failles, and other fabrics for women's glamorous evening and late-day fashions, as well as swimwear . . . also used in men's sport shirts and children's party dresses.

Acetate tricot jersey fabrics are soft and pleasing to the touch and are easily washed and quickly dried. For these reasons fabrics made of acetate are used widely for lingerie and intimate apparel as well as for dressing gowns and robes, including the decorative lace used thereon. For the same reasons acetate is also used in elastic circular knit and woven fabrics for foundation garments and swimwear.

Acetate fabrics also possess attractive draping properties. This quality accounts for their use in home furnishings, particularly draperies and curtains. Other uses for this versatile fiber include upholstery fabrics, automotive carpeting, decorative gift wrappings, lamp shades, shower curtains, wire wrapping, men's half hose, umbrellas and apparel ribbons, to name just a few.

Main Characteristics

This fiber offers luxurious beauty, even at low cost. Acetate fabrics, lustrous in appearance, exceptionally pleasing to the touch, and outstanding for beautiful draping qualities, are to be found in dresses in the inexpensive and medium price range as well as in elegant fashions in the luxury bracket.

Because acetate absorbs very little moisture and dries quickly, it is particularly adaptable to such garments as bathing suits, lingerie, and sportswear, helping them to maintain their

fresh appearance for long periods of time.

At its inception, acetate was difficult to dye because it would not take the standard dyes then in use. Through research, specific dyes were produced for the fiber, and it now can take any color of the rainbow and be dyed in any form—as the spinning solution in liquid form, as yarn, or as fabric. Acetate also can be readily printed with colour-fast patterns. Many acetate fabrics can even be home dyed satisfactorily when fabric and garment construction permit.

[Acetates are more like synthetic and thermoplastic type of fibers and are not like regenerated cellulosic fibers like viscose-rayon].

See also *acetate, cellulose acetate, fibres, rayon.*

Acetate-cellulose: (Acetate-rayon)—fibres manufactured by the acetate cellulose process—chief source material being cotton linters.

Acetate fibres are:

- (a) in continuous filaments or in staples;
- (b) are bright and fine;
- (c) smooth or crimped;
- (d) are soft and ideal for drapery,

but less absorbent and dry quickly;

- (e) staples can be blended with other fibres;
- (f) are thermoplastic or heat-setting and so care must be taken when ironing but fairly durable patterns can be embossed;
- (g) these need a special range of dyes, since these are like synthetic fibres and hydrophobic. Only acetate dyes can be used;
- (h) naturally resistant to micro-biological attacks;
- (i) although called rayons—these are not truly regenerated but are more synthetic.

See also *rayon, acele, viscose-rayon, cuprammonium-rayon, regenerated fibres, man-made fibres, cellulose, chardonnet silk, artificial fibres, acetylation.*

Acetate dyes: With the coming of the acetate fibres, it became necessary that a special range of dyestuffs must be made available since acetate fibres could not be dyed with the existing dyestuffs.

Aminoazo compounds and amino-anthraquinone derivatives containing ethanalamine or similar groups, making them readily dispersable

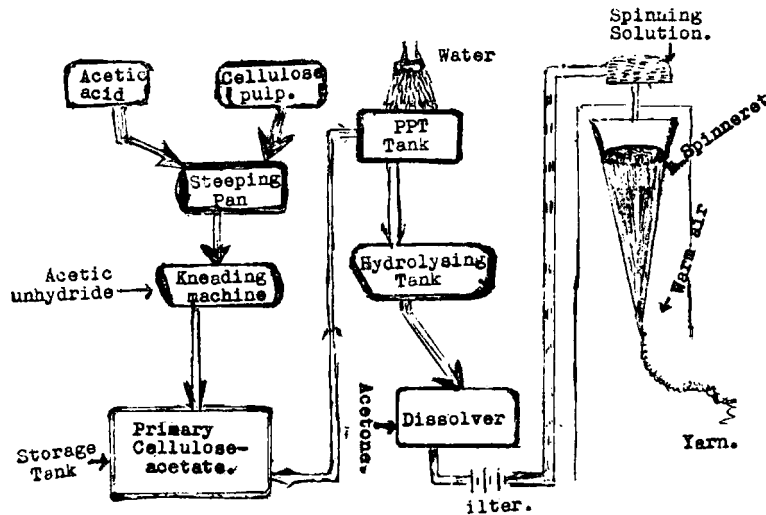


DIAGRAM OF MANUFACTURING PROCESS OF ACETATE FIBRES

in water, and which generally help in absorption by acetate fibres had to be produced.

Acetate fibres are inherently hydrophobic and so the existing dyestuffs which could only penetrate the hydrophylic fibres were useless in case of acetate fibres.

See also *dyes, dyer's chart, (individual) dyeing processes.*

Acetic acid: (CH_3COOH)—one of the most important organic acids generally obtained from destructive distillation of wood.

Gives very good results in silk-cleaning.

Ferrous and ferric acetates are used as mordants.

Important applications in textile industry.

See also *acids, dyeing, printing.*

Acetylation (Acetylation) of cotton:

(a) Cotton processed by acetate process.

(b) Introduction of an acetyl radicle into an organic molecule.

(c) Cellulose treated with acetic anhydride to produce cellulose-acetate.

See also *acetate-rayon, acetate (cellulose) rayon, rayon, acele.*

Acids: A name loosely applied to any sour substance, or in its precise chemical meaning, any substance containing H^+ which can be replaced by metals with formation of salts in case of inorganic acids while organic acids are characterised by the presence of the monovalent group COOH (Carboxyl group) in which the H atom is replaced by metals with the formation of salts.

Most common inorganic acids are

—Sulphuric acid— H_2SO_4 .

—Hydrochloric acid.

—Nitric acid.

Most important organic acids are

—Acetic acid— CH_3COOH .

—Tartaric acid.

—Citric acid.

—Tannic acid.

See also *bases, salts, pH, souring in bleaching, 1907 (Textile Times).*

Acid-colours or dyes: A type of synthetic or coal-tar dyestuffs, used for animal fibres.

Acid dyestuffs are so called because of their affinity in dyeing animal fibres—they do not dye cotton.

The dyestuffs themselves are perhaps of acidic character due to (NO_2) or (HSO_3) group molecules.

In case of acid-colours, the dyeing in an acid bath is followed by a treatment in a boiling solution of $\text{K}_2\text{Cr}_2\text{O}_7$ or alum whereby the colouring matter on the fibre is changed into an insoluble oxidised product or colour, and the operations of developing and fixing the colours upon or within the fibres can be effected either in the same bath at the end of the dyeing operation or in a separate bath.

List of important dyes and colours they yield in dyeing:

Black:—Naphthol-black, Azo-black, Wool-black, Naphthylamine black, Jet-black, Anthracite-black, Victoria-black, Azo-acid-black, Brilliant-black, Union-black, Brilliant-black-B.

Violet:—Acid-violet, Red-violet, Regina-violet, Formyl-violet, Violamine B, Fast-violet, Azo-acid-violet, Erio-violet, Lanacyl-violet.

Blue:—Alkali-blue, Soluble-blue, Opal-blue, Methyl-blue, Höchst New-blue, Patent-blue, Ketone-blue, Cyanine, Thiocarmine, Fast-blue, Induline, Violamine 3B, Azo-acid-blue, Wool-blue, Indigo-extract, Erio-glaucine, Eriocyanine, Erio-blue, Lanacyl-blue, Sulphon-azurine, Sulphon-cyanine.

Green:—Acid-green, Fast-green, Guinea-green, Patent-green, Cyanol-green, Erio-green, Brilliant-acid-green-6 G.

Yellow:—Picric-acid, Naphthol-yellow, Fast-yellow, Patent-yellow, Brilliant-yellow, Azoflavine, Metanil-yellow, Resorcine-yellow, Tartrazine, Quinoline-yellow, Milling-yellow, Azo-yellow, Victoria-yellow, Citronine, Indian-yellow.

Orange:—Diphenylamine-orange, Methyl-orange, Naphthol-orange, Crocein-orange, Brilliant-orange, Orange-G, Orange-N.

Red:—Wool-scarlet, Brilliant-scarlet, Violamine G, Scarlet 3R, Crystal scarlet, Xylidine-scarlet, Palatine, Bielrich scarlet, Pyrotine, Orchil-red, Bordeaux B, Milling-red, Azo-carmine, Acid-magenta, Fast acid violet A2R, Naphthylamine red, Fast-red, Claret-red, Eosine, Erythiosine, Rose-bengale, Phloxine, Cyanosine, Cloth-red, Lanafuch-sine, Rosinduline, Erio-carmine.

Brown:—Fast-brown, Nephthylamine-brown, Acid-brown, Resorcine, Azobrown, Chrome-brown, Chromogene. All these are available commercially as water-soluble alkaline salts.

See also *dyes, dyeing, dyer's chart*.

Acid-chrome colours:

See *chrome dyes, dyeing*.

Acrilan: A-Acrlan (TM)—a synthetic fibre manufactured by Chemstrand Corp.

- (a) a synthetic resin fibre prepared from acrylonitrile—85% and vinyl derivative—15%,
- (b) an acrylonitrile, crimped staple fibre,
- (c) light weight but bulky,
- (d) low moisture absorption,
- (e) good resistance to wrinkling, pilling, chemicals, moths, mildew and fungus,
- (f) when woven shows properties similar to wool—*warm*,
- (g) thermoplastic or heat-setting.

Uses: Wearing apparel, blankets, outdoor uses, tents, and chemical resistant fabrics.

See also *fibres, synthetic-fibres, orlon, X-51, dynel, thermoplastics*.

Aeroplane-fabric: One of the strongest cloths for its weight. Plain-woven, usually 3-2 ply, combed mercerized yarns, square-thread construction. Used for covering aircraft parts.

Agave-fibres: Fibres obtained from the fibro-vascular bundles of various agave plants—(N.O. Amaryliaceae)—Agaves are chiefly characterised by fleshy, rigid, lanceolate, hard-surfaced leaves growing directly out of the central stalk and forming a dense rosette. These fibres are chiefly employed for making ropes, twines and cordages.

- Agave sisalana—sisal.
- „ fourcroydes—henequen.
- „ cantala—cantala.
- „ letona—salvador sisal or letona.
- „ amariensis—blue sisal.
- „ cocui—dispopo.
- „ decipiens—false sisal.
- „ deweyana—zuzupe.
- „ falcata—guapilla.
- „ funkiana—jammave.

- Agave cubiens—cocuiza.
- „ lespinassei—zuzupe-fuerle.
- „ lopantha—tula-ixtle.
- „ hetero-cantha—jaumave ixtle.
- „ lurida
- „ palmeri
- „ pesmulae—pata-de-mula.
- „ pseudotechuilana—mescal (False).
- „ techuilana—mescal.
- „ striata—espadinum.
- „ zuzupe—zuzupe.

See also *leaf-fibres, fibres, vegetable fibres*.

Air-plane cloth: Manufactured to specifications—from long staple mercerised cotton with ply yarns, in plain weave, with fine thread count—usually 70s.

Plain woven fabric of cotton or linen.

Albatross:

- (a) light weight, soft, plain woven, wool fabric with pebbled creepy surface caused by yarn twisting 1.12m (44").
- (b) light weight, napped, plain woven cotton fabric.

Usually made of cotton or wool and both are plain woven.

Albert twill: (U.S.)—is the same as beatrice twill (British).

See also *twill, drill*.

Alginate fibre: A manufactured yarn from seaweeds, used for embroidery foundation and in lace-making, which is later dissolved out—by burnt-out process.

When Sodium-alginate solution (of various consistencies) is forced through spinnerettes into an acid-coagulating bath, alginate fibres can be manufactured.

Fibres can also be produced in bath containing metallic salt solutions—producing an insoluble alginate.

All alignate fibres are soluble in alkalis and soap solution and this property of alignate fibres is advantageously utilized in lace-making.

See also *fibres, burnt out process*.

Alkalies: Originally an Arabic term for ashes of plants from which was obtained (by lixiviation), sodium carbo-

nate from sea-plants and potassium carbonate from land-plants. Turning these 'mild' alkalies into 'strong' or 'caustic' for making soaps was known from very old times, and it was also known that land-plants gave potassium-alkalies while sea-plants gave sodium-alkalies. These were termed as "Fixed" alkalies as against ammonium-alkalies which are "Volatile".

In modern chemistry—alkali is a general term for compounds which have the property of neutralising acids or in its precise chemical meaning—compounds having 'OH' groups as NaOH or KOH.

See also *acids, bases, salts, fibre-analysis, pH*, 1907 (*Textile Times*).

Alkyl-aryl-sulphonates: Amongst the washing agents, at present, *syndets*, especially the alkyl-aryl-sulphonate type deserve special attention since these are becoming increasingly popular and it is quite possible that within a very short time these may completely replace soap, since these work exceptionally well under conditions which are limiting to the use of soap, i.e., in hard water, acid media, and certain electrolytes, etc. *Syndets*, especially of this type, satisfy all these conditions more or less perfectly and a stage is fast approaching when these are likely to be accepted without doubt in textile industry. Those commercially available are never in pure form but are almost invariably mixed with other ingredients which help in maintaining the quality generally or even enhance it, and in fact, without which their action is not so efficient. Phosphates and silicates of sodium are usually added and also products like CMC and optical bleach greatly enhance the efficiency. A typical formula of a heavy duty textile syndet can be as follows:

Anionic detergent—35 to 40%
Sodium tripolyphosphate—5%
" silicate
" sulphate
Carboxy-methyl-cellulose (CMC)—
2% Optical bleach—2%

Manufacture: One method of preparing these is by reacting alkyl-

di-ester of maleic acid with benzene or toluene, and then sulphonating the alkylated mass. Alkyl-benzene is also available commercially as a ready product. Sulphonation is carried out by adding 98% H₂SO₄ at 80°C to the alkyl-benzene and stirring constantly until a completely soluble product is ready.

See also *syndets (synthetic detergents), soaps, detergents*.

Alpaca: One of the two domesticated breeds derived from wild Guanaco. Alpacas are usually kept in large flocks and are not used as beasts of burden like the llamas, but are only valued for their hair or wool.

In textile industry, the name signifies two things:

- (a) Wool or hair obtained from Peruvian Alpaca,
- (b) A style of fabric originally made from alpaca wool, but now also made from allied types of wool viz., mohair or other English lustrous wools.

In physical structure, alpaca is like hair being very glossy and from which satisfactory yarns are easily possible since it is soft and fine. Peruvian Indians were the first people to use this fibre in making cloth from it. Spaniards brought it to Europe. England began spinning it in 1808, but the success of this came only after the introduction of cotton warps; after this only could the alpaca be developed into fine fabrics. It was this blending of fibres of cotton warp and alpaca weft that gave success to this fabric.

Today we have:

- (a) alpaca fabric of cotton warp and alpaca weft,
- (b) pile fabric with cotton backing and pile of alpaca yarns,
- (c) rayon alpaca, a good example of combination of yarns.

See also *animal-fibres, blending of fibres, combination of yarns*, and 1808, 1836 (*Textile Times*).

Amazon: An all wool fabric in which the weave is masked in finishing.

American upland cotton: Now grown in almost all the cotton-growing countries, making nearly ¾ of the

world's crops. The blossoms are cream-coloured and the bolls contain 4 to 5 tufts of strong fibres. The fibre is white and of 0.02 to 0.04 m ($\frac{3}{8}$ " to $1\frac{1}{2}$ " length). The seeds are covered with fuzz. Its growth is about 0.75 to 1.2 m ($2\frac{1}{2}$ ' to 4') tall.

See also *cotton*.

Amilan: Japanese name for nylon.

Amilar: See *dacron*, *fiber-V*, *terylene*, *synthetic fibres*.

Animised cotton: Produced by reacting raw cotton with aminoethyl-sulphuric acid in an alkaline solution. The amino group chemically combines with cellulose. This cotton can be dyed with acidic colours or dyes, and it also absorbs metallic water-proofing agents most readily.

(*b*) cotton and rayon treated with casein to obtain wool-dyeing properties.

See also *cotton processing treatments*, *obsolete processes*.

Analysis of fibres: For analysis of fibres, the following general facts are usually taken into consideration:

External characteristics (in case of fabrics):
colour,
feel,
pattern—printed or woven,
construction—woven, knitted, felted or braided.

Thread counting:

quoted as A × B where A is warp and B is weft,
as say 40 × 70 where 40 is warp and 70 is weft.

It is square—if the count is the same both ways—as say 80 square—if both warp and weft are 80.

Yarn examination: Done by removing a few warp and weft threads and then observing the size, smoothness and twist, gloss, etc.

Ply-yarn are examined by untwisting the yarns.

Simple tests—(a) Physical—burning tests.

(*b*) Chemical—solubility tests.

(*c*) Biological—microscopic tests.

Physical—weight, creasing, burning.

Burning tests. The simplest and the best is the burning test. The following chart may be used:

Details of burning tests:

Wool/hair—burns slowly with strong odour of burning hair ending in a bead.

Silk—burns much the same way but has a little less odour; weighted silk retains yarn form even after burning.

Vegetable fibres—cotton, rayon, ramie, jute, linen, etc., burn with a flash (like paper burning) without much residue. Smell of burning paper.

Acetate—burns slowly with characteristic flame and leaves a hard black residue.

Vicara—(vegetable protein fibre) burns rapidly leaving a black bead and with smell resembling that of wool.

Synthetic-fibres:

Acrilan—does not readily ignite but fuses into burning tar in sufficiently hot flame.

Dacron, Terylene—(polyester fibres)—melts into hard, glassy, amber-coloured ball. Non-supporter of combustion. Shrinks from flame.

Dynel—burns in open flame with a hard lumpy, dark residue and characteristic smell. Shrinks from flame.

Nylon—melts into hard, glassy, greenish or gray coloured ball which is uncrushable. Non-supporter of combustion. Shrinks from flame.

Orlon—burns with a vigorous flame and leaves a small hard, black ball.

Fibre-glass—blackens but remains unaffected.

Asbestos—fire-proof.

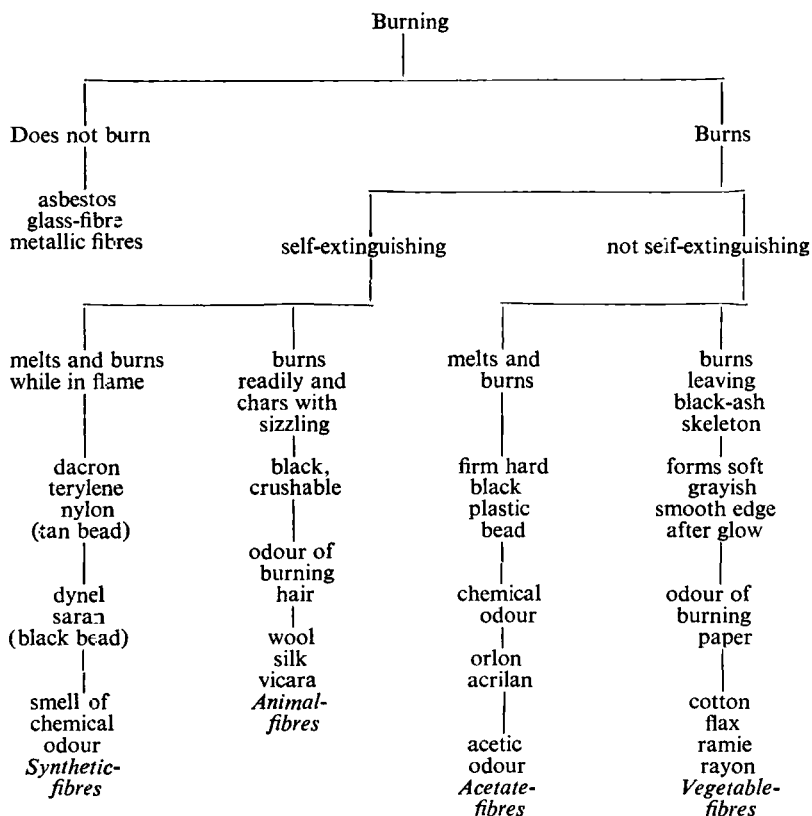
Chemical tests—solubility:

Acetone test—acetate-fibres are dissolved.

Acid tests—(for vegetable and animal fibres identification):

A few drops of sulphuric acid (2-4%), all vegetable fibres are dissolved and can be dusted out.

Alkali tests—(also for vegetable and animal fibres detection):



All animal fibres are dissolved by alkalis.

Animal/Vegetable fibres—All animal fibres are effectively dissolved by 10% NaOH or KOH solution. The fabric or material is boiled in the solution for about 10 minutes and then thoroughly washed. Any residue after this treatment will be vegetable or cellulose fibres.

[*Caution*—it must, however, be remembered that chemical properties of fibre-substances are considerably modified when dyed or printed. In most of such cases, the dyes have to be removed first and that too by treatments which would not seriously modify the fibre-substance proper].

Wool/Silk—Wool can be distinguished from silk by its relative resistance to H₂SO₄. Cold concentrated acid readily

dissolves silk as well as vegetable fibres, but attacks wool rather slowly and the epidermal scales of wool make their appearance.

True silk/Wild silk—These are distinguished by the action of cold concentrated HCl. True silks are readily dissolved, while tussore silks are only slightly affected.

Other chemical tests:

Lead-oxide—alkaline lead-oxide solution has no action on silk but it darkens wool and thus affords a method of identifying silk from wool.













HNO₃—(Nitric acid)—silk dissolves freely in nitric acid but wool remains unaffected.

Picric acid—stains silk bright yellow, while vegetable fibres remain unaffected.

After these tests and examination (both by burning as well as solubility) the fabric or material may then be subjected to microscopic analysis for further identification of fibres.

See also *identification of fibres*.

Microscopic tests:

Cross-section	Fibres	Characteristics	Length	Diameter (microns)
	Cotton	Convolute	½"–2½"	16–20
	Flax	Smooth	10"–40"	14–15
	Wool	Scales, Crimp	2"–8"	12–70
	Silk	Smooth	Filament or Staple	9–12
	Cuprammonium	Smooth or Crimped	"	Varies with Denier
	Viscose	"	"	"
	Acetate	"	"	"
	Nylon	"	"	"
	Orlon	"	"	"
	Dacron Terylene	"	"	"
	Dynel	Crimped	Staple	"
	Acrilan	"	"	"

Angora-goat: Angora goat (often mistaken for Kashmir) is quite distinct both in length and quality of hair. It has a particularly soft and silky texture covering the entire body. The fur has two kinds of hair, one short and coarse and of hairy character lying close to skin, while the other, forming the outer covering are long, curly and wooly. Both are used as fibres, but the exterior portion is much more valuable. Average wool-yield is roughly 3 lbs. per animal.

Angora-goat-hair is long, wavy, silky, fine fibres. Fabrics are called mohair—Kid-angora—less durable.

See also *mohair, fur-bearing animals, animal-fibres, goats, fibres*, and 1825, 1839, 1870 (*Textile Times*).

Angora-rabbit: The important characteristics are extreme elongation and fineness of fur, usually reaching 6½" length. But it requires great care and frequent combing to prevent matting. Albinos with pure white fur are most valued. Angora rabbit hair are fine, white, silky. Warm and very light in weight—blended with wool are chiefly used in knitted goods.

See also *animal-fibres, rabbit-hair*.

Aniline-black: Probably the best example of an aero/photo developing miscellaneous dye. Aniline black differs from other dyes in that it is not available as readymade dyestuff, but has to be prepared on the spot as a half-reaction-treatment-liquor, which is allowed to be developed upon or within the fibres by exposure to aero/photo influences. Chiefly used for cotton, it can also be used for rayons.

In practice, the half-reaction-stuff has to be prepared on the spot, and compounding of this stuff has always presented immense difficulties to chemists, the chief reason being that almost all chemists try to make one-solution dye liquor so that just one dip treatment would be sufficient to complete the operation. And it is exactly here that very great skill and care and accuracy are required since addition of a strong oxidizing agent in sufficient quantities without the presence of a reaction-arrester, would immediately complete the reaction in the half-reaction-stuff stage only and the treatment fluid would be useless as a dye-liquor.

The basic principle in compounding such half-reaction-stuffs (in case of such reactions especially aniline-black or mineral khaki) is that what is prepared as a dye-liquor treatment-fluid, is not the end product but a *half-reaction-stuff*, in which fibres are dipped and these fibres absorb this half-reaction-stuff. To complete the reaction the fibres containing this stuff are exposed to aero/photo influences to complete synthesis of this half-reaction-stuff, upon or within the fibres. A subsequent developing treatment is absolutely necessary to complete the reaction and to render the half-reaction-stuff into a complete insoluble dye upon or within the fibres. Once this principle is thoroughly understood, aniline-black (or such like processes) should not present any difficulties.

Formula

- (a) Aniline Oil—1 part
 (b) HCl commercial— $\frac{1}{2}$ part
 mixed together and allowed to cool slightly. This results in an amber-coloured liquid with tendency to form scum at the upper level. To this add
 (c) Water—3 parts

Boil the above prepared liquor and allow it to cool. To this prepared liquor add

(d) Cupric-chloride— $\frac{1}{2}$ part

The mixture may again be heated and equal quantity of water may be added. This treatment liquor is then ready for use.

From the above stated formula, it will be seen that aniline-salt in itself is incapable of bringing about the reaction or even to start it but requires addition of cupric-chloride to reach the reaction stage. But again cupric-chloride also can start the reaction but cannot complete it but would require stronger oxidizing agents like KClO_3 or $\text{K}_2\text{Cr}_2\text{O}_7$. The product at this stage can be called the *half-reaction-stuff*.

But if either of these strong oxidizing agents is added, at this stage, in sufficient quantities, the reaction would be completed instantaneous with precipitation of the end product and then this half-reaction-stuff would be useless as a dye. And so in the solution fibres or fabrics are dipped, which take up an appropriate quantity of this liquor. *These fibres or fabrics then must be allowed to dry by exposing these to sunlight or aged in an oxidizing chamber.* The fibres or fabrics thus act as a vehicle or a carrier to the soluble incomplete half-reaction-stuff and give *maximum area exposure*, so that almost all the molecules of this half-reaction-stuff get a chance of being exposed and developed into an *insoluble-end-product*.

To complete this reaction, a further developing treatment is absolutely necessary, which can be effected by dipping in a solution of KClO_3 or $\text{K}_2\text{Cr}_2\text{O}_7$. This developing treatment completes the reaction upon or within the fibres and renders the soluble-half-reaction-stuff into the completed insoluble-end-product aniline-black. (A typical example of fast-colour-dyeing). Here the most important step in the process is drying of the cloth after the dye treatment but before developing.

OTHER FORMULAS

- (a) One solution bath (a well tried formula)
 Aniline salt—neutralised by aniline oil
 $\text{K}_4\text{Fe}(\text{CN})_6$
 $\text{K}_2\text{Cr}_2\text{O}_7$

The fabric dyed with this dye-liquor develops a richer stable product and richer black tone and is free from the effect of 'greening'. But as already stated, this is a one solution treatment and extreme care has to be taken. Also this process requires an ageing at 150°C for some time in an ageing chamber.

- (b) Aniline salt—1.8 parts
 $K_4Fe(CN)_6$ —12 parts
 $KClO_3$ —dissolved in water—3.5 parts
 Water—200 parts

After treatment with this dye liquor, it is necessary to pass the fabric through an ageing chamber, heated to 50°C and supplied with moisture.

When properly processed:

- (1) aniline black is a permanent colour unusually fast to operations like exposure, washing, soaping, bleaching, etc.
- (2) must confirm to the following four essentials—
 - (a) a rich deep black tone
 - (b) nongreenable
 - (c) minimum tendering of fibres
 - (d) no violetish borders

Essential steps in aniline black processing

Cloth—washing—drying the cloth.

Aniline-black liquor treatment—with half reaction-stuff.

Drying the cloth—preferably air exposure.

Superdrying—in an ageing chamber.

Washing with soap and soda.

Developing bath (Potassium chlorate or chromate).

Washing and drying.

See also *dyes, dyeing, photo-synthesis, miscellaneous colours, emeraldine.*

Aniline-black printing:

- (a) *Direct-printing style or method.*

Aniline black is one of the fastest blacks formed by oxidation of aniline. This oxidation is effected by various oxidizing agents like $KClO_3$ (potassium chlorate) or $NaClO_3$ in presence of oxygen carriers like cupric sulphate, vanadium chloride or potassium ferrocyanide, etc.

Generally ferrocyanide blacks are preferred in printing (being comparatively safe). The formula is as follows:

Starch 4.54 kg. (10 lbs.)

Dextrine 0.91 kg. (2 lbs.)
 $K_4Fe(CN)_6$ 3.72 kg (6 lbs.)
 Water 31.5 litres (7 gallons)

Boil, stop heating and then add

$NaClO_3$ 1.13 kg. (2½ lbs.)

Cool and add

Aniline-salt 3.63 kg. (8.1 lbs.)

(neutralising the aniline salt by adding aniline oil if necessary).

Printing—then ageing (5 minutes in rapid drier)—chrome (by passing through $K_2Cr_2O_7$ solution)—wash and soap. Chroming is necessary as otherwise greening takes place, which is a common defect of this process.

- (b) *Aniline black printing: resist style.*

See Resist printing.

See also *printing, styles of printing.*

Animal-fibres: Animal fibres and filaments:

- (1) Silk, (2) Wool, (3) Mohair, (4) Alpaca, (5) Llama, (6) Vicuna, (7) Cashmere, (8) Camel-hair, (9) Rabbit-hair, (10) Cow-hair, (11) Horse-hair, (12) Furs.

See also *each heading, fibres.*

All animal-fibres are essentially protein fibres. And so any attempt at synthesis of animal-like fibres or wool-like fibres must make use of protein in some form like—

Lanital—uses milk casein (protein).

Aralac—uses milk casein (protein).

Ardil—uses peanut protein (vegetable).

Vicara—uses zein protein (vegetable).

Azlon—uses zein protein (vegetable).

(A) *Silks:*—True silks are produced by silkworms (*Bombyx-mori*) which feed on the leaves of Mulberry tree. The fibre extrudes as a viscous liquid from the glands of the silk-worm and solidifies in cylindrical threads. Peculiarity of this cylindrical thread being—it is a dual cylinder and is due to these occurring in pairs.

For textile purposes these threads have to be separated from the cocoons and several units have to be put together and twisted suitably into yarns.

Wild-silks:—Produced by a large variety of insects, more important being various species of *Antherae* which yield the so called tussore-silks. This silk differs from the true-silk both in form and composition and although they exhibit the same dual thread, each unit is more complex and

consists of a number of fibrillae. Cross-sections are quadrangular and the mean breadth is about 0.052 mm. (true-silk being 0.018). There are, however, considerable variations in both structure and dimensions.

(B) *Wool*:—(1) Here the epidermal hair of sheep is the most important. Different species of animals produce different types of characteristic-wools exhibiting considerable variations in their qualities such as staple-length, fineness, composition and spinnability. And due to these variations, wool selection or sorting becomes necessary, for subsequent operations.

(2) Angora-goats—(*Mohair*)—Llama and Alpaca are another important group of fibres which closely resemble wool. These epidermal hairs, however, are much more lustrous than wool due to their form and the nature of the substance of their composition and naturally the spinning processes for these fibres also vary correspondingly.

(3) Animal hair of cow, camel, and rabbit—these are employed as fibres and in making felts.

(4) Horse-hair—these are also employed in their natural state as filaments or monofil.

(5) Furs—these hairs are employed with their foundation skins and their manufacture is a special process—refer to heading.

See also *silks, wild-silks, attacus, antherae, bombyx, wool, sheep, fleece, woollen and worsted manufacture, fibres.*

Antherae (Wild-silks):—Besides Bombyx-mori (which produces the true-silk), several other worms or moths also produce reelable cocoons which are termed as tussore or wild-silks. Of these, the Antherae-wild-silks are as follows:

- (1) Antherae Peruyi—Chinese tussore worm—Oaktree feeding.
- (2) Antherae Assama Muga—Assam moth—Oaktree feeding.
- (3) Antherae Yamamai—Yamamai worm of Japan—Oaktree feeding.
- (4) Antherae Mazankuria—The Mazankuria moth of Assam—yields valuable cocoons,
- (5) Antherae Mylitta—Indian tussore moth—yields a large, compact, silvery-gray coloured cocoon—feeds on *Zyzeplus jujuba* tree.

See also *wild-silks, silks, bombyx attacus.*

Anti-crease finish: Treatments given to fabrics which help to resist the tendency of getting ruffled or spoiling the crease. This is effected by treatments which develop certain resins within the fibres. These resins are urea-formaldehyde or melamine-formaldehyde. These are thermo-setting resins.

See also *finishing, strutter-cloth, synthetic-resins, stabilization of fabrics, tebilized, thermo-setting resins.*

Antiseptic-finish: Treatment given to resist attacks of germs.

See also *finishing (special finishes).*

Anti-slip finish: Treatment given to counteract the tendency of slippage.

See also *finishing (special finishes).*

Anti-static finish: Treatment of materials to eliminate the accumulation of electrical charges.

See also *finishing (special finishes).*

Anti-shrink finish: See preshrinking and special finishes.

See also *shrinkage, sanforized.*

Appenzel: Hand embroidery in Switzerland, especially for handkerchiefs, which is now copied in China.

See also *embroidery.*

Aponise: (TM) a durable, crisp finish for cotton fabrics.

Aralac: A synthetic protein fibre made from milk-casein in U.S.

(Its manufacture is now discontinued).

See also *lanital, synthetic fibres, man-made fibres, 1936 (Textile Times), obsolete.*

Ardil: A peanut protein fibre produced by ICI. Resembles wool.

See also *synthetic fibres, man-made fibres.*

Argyle: Patterns of diamond shape, in many colours (3 or more) for sportswear. Originally hand made in Scotland. Now made on machines.

See *home-spun, heather-mixture.*

Aridex: Water-resistant fabric. Made by treating with wax-emulsions. Not so durable to washing.

See also *water-proofing*, *water-repellency*.

Armo: Interlinings fabrics.

(1) Light weight, cotton/wool, slightly napped, plain or twill weave, used for women's sportswear.

(2) Canvas interlining for men's or women's sportswear.

See also *interlining fabrics*.

Armure: (a) Silk fabric, close-weave, pebbly pattern, for cravats and collar facings of men's dress-suits.

(b) Drapery or upholstery fabric made of cotton or mixture in dobby weave with small woven designs on napped foundation.

Artificial fibres: See synthetic fibres, man-made fibres.

Art-linen: Plain woven linens used for embroidery. Threads are made round for ease of drawing. Warp and weft number equal.

Art-leather: See imitation-leather, linoleum.

Art-silk:

(a) Threads of silk or art-silk used for embroidery or other forms of artistic work.

(b) Silk articles with artistic designs woven on the fabrics.

Artificial mercerization effects:

(a) For artificial mercerization effects to be given to ordinary cloths, cuprammonium treatment fluid is used (for preparation of this fluid—refer to cuprammonium). The first step in the process is to bring the treatment fluid to 0°C, by external cooling. This is most important. The cloth is dipped into this solution and after the treatment fluid has soaked in, the cloth is exposed and steamed when artificial mercerization effects can be observed. It will be seen from the method that dissolved linters (α -cellulose) in the treatment fluid in solution form enter and get embedded either upon or within the fibres. On exposure,

this gets fixed on or within the fibres. This naturally causes swelling or bulging of the fibres. This stretching of the fibre-walls is probably the cause of the lustre or silk-like finish of the fabric as also the colloidal state of the cuprammonium. In this case, the fabric acts as a mere vehicle for the cuprammonium solution and the effect is actually that of cuprammonium rayon.

(b) The effect can also be obtained by dipping the cloth in cold concentrated sulphuric acid, just for a fraction of a second, and immediately taking it out. This short period is sufficient for the acid to react with cellulose and cause it to swell. The fabric is then neutralised with NaOH, washed thoroughly, stretched and finished on finishing calenders.

(This process was developed by Swiss chemists).

Great skill and care has to be exercised in this process since any delay in processing, the acid would damage the fabric beyond repair and for this reason the process, although very efficient, never became very popular.

See also *cuprammonium rayon*, *Swiss artificial wool (II)*.

Artificial silks: There are three well-known processes for the production of artificial silk, and these are:

- (1) Acetate-cellulose process.
- (2) Viscose-process.
- (3) Cuprammonium process.

See also *rayon and each heading*, *chardonnet-silk*, *nitro-cellulose*.

Artificial wool:

I. Prepared from jute. Jute is the basic material which is turned into artificial wool by the following treatment:

Jute heated with

Sodium phosphate (hot).

Wash with water.

Sodium Bisulphite—(Hot—about 4%).

Wash with water.

NaOH—(cold—about 17%).

Wash with water.

Sodium Bisulphite—(Hot—about 3%).

Wash.

Wash.

Bleaching with dil. HCl acid.

Wash with water.

Dip in $KMnO_4$ solution.

Wash.

Palited down.

II. Woollen or felting effects, can also be obtained by treating ordinary cotton cloth by cuprammonium solution. (For preparation of the solution—See cuprammonium). The woollen or felting effects are caused in very much the same manner as artificial mercerisation. The cuprammonium solution, after being absorbed by the fibres, get fixed either upon or within the fibres, which causes the blowing out or stretching of the cell walls in diameter and the outer scale-like coating gives the woollen or felting effect, or appearance.

See also *finishing (special finishes), regeneration of fibres, cuprammonium solution, artificial mercerization.*

Asbestos: A natural mineral textile fibre and probably the only natural mineral fibre. Its exclusive property is *Fire-resistance*. Asbestos is a kind of rock which can be easily separated into long, white, straight, lustrous, fire-proof fibres. Chiefly occurs in Italy, Canada and South Africa. It is the only exceptional fibre being natural and yet inorganic. Asbestos can be spun into coarser textile fabrics. The principal components of asbestos are magnesium and calcium silicates and is only obtained from Serpentine, Crysolite and Hornblende.

Being fire-proof and resistant to acids,

- (a) asbestos fabrics are made for theatrical curtains and firemen's clothings
- (b) sheets for furnace-pipes and also hot dish pads.

See also *mineral fibres, fibres.*

Astrakhan:

- (a) Lamb-skin with curled wool from the breed of sheep from Middle East
 - lower grades—Karakul lamb skins.
 - upper grades—Persian lamb skins.
- (b) A rough fabric made in imitation of it, with pile of velveteen weave, of cotton, rayon, or wool mohair.

See also *fur.*

Attacus: Worms belonging to this species are:

- (a) Attacus Atlas—The Atlas worm.
- (b) Attacus Cynthia—The Cynthia moth.
- (c) Attacus Recini—The Erandi moth.

All these yield loose, flossy, orange reddish to white type of cocoons. Of this the Atlas worm cocoon is much more valuable for wild-silk. This worm feeds on *Ailanthus glandulosa* leaves and is found in India, Ceylon, Burma, China and Japan.

See also *wild-silks, tussore-silks, Antherea, Bombyx.*

Aubuson: Tapestry weaving centre in the 18th and 19th century, where this art is still practised. The name also signifies a fine cut-pile carpet.

See also *tapestry, cut-pile fabrics.*

Australian shade-cloth: Cotton shade cloth with crinkled effects in weave in wide stripes resembling Seer-sucker, usually used for window-curtains.

See also *seer-sucker.*

Auto-seat cover fabric: Woven fibre-yarns which are twisted and coated with paper or plastic.

Auto-tyre fabric: Usually made to required specifications from high grade cotton with coarse hand twisted yarns of multiple ply. High tenacity rayon and nylon are now replacing cotton, being far more tenacious.

See also *tyre-fabric.*

Awning fabric: A plain woven fabric of cotton or linen used as covering or as shelter from the sun or a screen cloth before shop windows.

Closely woven, heavy, bright coloured, strong, striped fabric (stripes usually on one side).

Plain woven, ply yarn Army duck fabric used for superior qualities, and for cheaper varieties, single yarn flat ducks or drills are used. Many times finishes for fire-proofing, water-repellency and mildew-proofing are given for longer wear.

See also *finishing (special finishes), duck.*

Awning-stripes: Plain woven duck, yarn-dyed or printed stripes, used for awnings or umbrellas.

Axminster: Carpet variety with a vegetable fibre (cotton or jute) warp and a woollen fibre (woollen or worsted) weft with a heavy pile.

(The name now reminds the memory of a locally dead carpet-manufactory. Axminster was once famous for the admirable quality of its hand-made carpets).

See also *tapestry, carpets, brussels carpet.*

Azlon: Common term for all regenerated protein-fibres.

See also *man-made-fibres, synthetic-fibres*

Azo dyes: A group of developed colours or dyes which are developed upon the fibres, usually cotton, by suitable chemical treatments.

Azo-group:
—N = N—

Insoluble azo colours belonging to this group are also produced as insoluble colour precipitates by adding a solution of diazo compound to an alkaline solution of phenols or to an acid solution of amino compounds. The diazo compound is prepared by allowing a solution containing nitrous acid to act upon a solution of primary aromatic amine at ice-cold temperature.

See also *azo dyes, dyes and dyeing.*

Azoic dyes: Insoluble azo colours produced upon the fibres (also called ice-colours, since ice is so necessary for diazotisation of amines). These are applied to the fibres by impregnation with an alkaline solution of a coupling component (termed Naphthol) followed by developing treatment with Diazonium salt.

See also *azo dyes, dyes and dyeing, insoluble azo-colours, ice-colours and dyers-chart.*

B

Back-cloth: Besides face fabric, an extra layer of warp and weft underneath is provided to add to weight and also to give different colouring effects. Back-filled cotton fabrics such as Tag or pick cloth or mattress-tickings, are back filled and stiffened with sizing or china-clay.

Back-filling:
When a layer of starch is applied

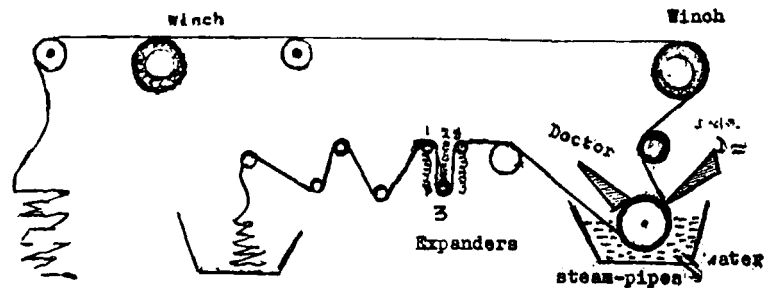
usually on the wrong side of the cloth.

Diagram of the machine and flow-chart is given below.

See also *special processes.*

Back-washing: Used in case of woollen manufacture.

See also *woollen or worsted manufacture.*



BACK-FILLING PROCESS

Badger: Badger is a common name of animals of the genus *Meles*. The more common and economically important for fur are:

Meles Canescens—Persian Badger.
Meles Chinensis—Chinese Badger.
Meles Anacuma—Japanese Badger.
Meles Taxidae—American Badger.
Meles Taxus—European Badger.

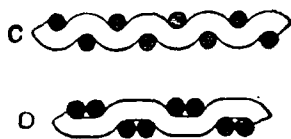
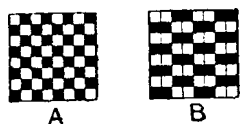
Badgers are chiefly valued for the hair, the European badger being formerly exclusively used in the manufacture of shaving brushes (now Nylons have completely replaced this), while the soft American variety is employed for soft brushes. The fur is, however, used for articles of ladies' apparel and trimmings.

See also *fur*.

Badger's fur: Size 0.61 to 0.30 m (2' × 1'). The American species have coarse, thick underwool of a pale fawn or stone colour with a growth of longer black and white hair—a very durable but clumsy fur. The best skins are used for carriage rugs and military purposes. The Japanese and Asiatic varieties are more woolly. The Russian and European varieties are coarser and darker.

See also *fur*.

Bagging: Textile material used in making bags. Originally made from Baltic-hemp, sun-hemp or Indian hemp. Now for modern industrial requirements, various types of fibres are used for specific requirements and various end-uses. Most of the bagging, however, is now made from jute fibres. The cloth is generally of plain weave, with a single or double warp.



A, C: SINGLE WARP B, D: DOUBLE WARP

The particular style naturally depends upon the specifications of the end-use. Cotton-bagging—the earliest and coarsest type—was manufactured for transporting raw cotton. It is a heavy fabric, weighing about 0.91kg (2 lbs.) per 0.91 m (yard) and width of 1.04 m (42"). A similar but rather finer variety was also made. But for transporting of commodities it is essential that the threads (or both warp and weft) must be very closely woven and therefore generally single. For making bags, these are sewn by the stitch-bag-sewing machines.

See also *burlap*, *sail-cloth*, *hessian*, *tarpaulin*, *canvas*.

Baize: A textile material probably named after the original colour of berries. It is usually a coarse woollen fabric having a long nap and generally dyed red or green. (At present it is also made of cotton). Used for curtains and linings and lighter and finer varieties occasionally for clothing. It is also used for covering billiard tables or card-tables and for show-cases linings.

Table-baize is a kind of oil-cloth used for table covering. It is cheap and can be easily washed.

See also *billiard-cloth*.

Balbriggan: Name of a place famous for cotton hosiery linings, the best known being the balbriggan-hose.

A circular knitted cotton fabric, light weight, plain-stitched, usually in tubular form with one continuous yarn. It has a right and wrong side—used for hose, underwear, sweaters.

See also *hosiery*, *knitted fabrics*.

Bale: Meaning a bundle or package of merchandise especially cotton, wool or hay packed in a cover, or fastened with a band or string of metal for transporting goods, the weight and capacity varying with various goods. As cotton bale, usually 181.44 kg. (400 lbs.).

Balloon-fabric: Made from cotton, silk or linen. In plain or basket weave.

High thread count, combed, plain-woven one yarn cloth of selected

extra strength of long staple cotton. Strongest cloth made for its weight.

Uses: Balloons; bleached, dyed and mercerised variety for cloth, especially shirting and underwear. Similar, but of hard count thread fabric for typewriter-ribbons.

See also *basket-weave*.

Baliste: Two types.

(a) Soft finished, mercerised, light weight, combed yarn, converted, lawn type fabric, bleached, dyed and printed. Used for delicate garments.

(a) Coarser broad cloth or strong heavy plain poplins used for corsets, brassieres, etc.

See also *corset*.

Bamboo-sharkskin: See *sharkskin*, *viscose rayon*.

Bandana: Name given to richly coloured silk handkerchiefs, in which light colours were characteristic. Now also made of cotton in Lancashire. The same effect is also produced by calico-printing in which designs are made by discharging or extract-printing style.

Banana-fibres: Several species of banana family yield valuable fibres, the most important being Abaca or manila-hemp (which is not a hemp), but belongs to this family. Also known as musa-textiles.

See also *leaf fibres*, *vegetable fibres*, *fibres*.

Barathea: Three varieties are common.

(1) Silk-close and pebbly weave, black for cravats or mourning dress.

(2) Finer texture and light weight for varieties of colour dresses especially silk-tie-fabric.

(3) Fine, worsted fabric of similar weave and well-fulled, in rib or *twill* weave, and in *rayon*, *cotton*, *wool* or *silk*.

Barre: Patterns produced by cross stripes or bars across goods like cross-goods. The bar effect is deliberately produced by stripes running weft-wise.

See also *cross-goods*.

Basic colours or dyes: These are salts of organic colour-bases, whose dyeing power is present entirely in the basic part of the salts. In the free state the bases are colourless and insoluble, but in combination with acids these form salts which have colour and are mostly water-soluble. Available commercially in powder form. A large variety of these contain basic-amino-group, which is alkylated.

Wool and silk are dyed in neutral bath without any addition as these animal fibres do not need any pretreatments. (The fibres themselves, probably playing the acidic part and decomposing the dyes, unite with the colour-base to form insoluble salts or lakes).

Cotton has very little or practically no affinity for these colours and hence cotton has to be pretreated with some acid before the dyeing operation with these dyes. Here a very clever use is made with greatest advantage of one peculiar property of cotton and that being *cotton has a tremendous natural attraction for tannic acid*. Cotton, therefore, is first treated with tannic acid so that it would ultimately form lakes with basic colours. Cotton pieces are run at full stretch through tannic acid solution 143 gms. to 4.5 lit. (5 oz. to 1 gal) and then thoroughly squeezed and dried on steam calenders. After this treatment, cotton is run into tarter-emetie or SnCl_2 so that the tannic acid absorbed by the fibres gets fixed upon the fibres as an insoluble antimony or tin tannate. Thus tannic acid although uniting with metallic oxide, still retains the power of attracting the base of the colour and fixes upon the fibre as insoluble colour-lake, viz., metallic tannate plus colour-base which constitutes dye. Tannic acid here is called the mordant and cotton treated with tannic acid is called the mordanted, and tarter-emetie as a fixing agent, for tannic acid. The mordanted cotton is then thoroughly washed and dyed cold for $\frac{1}{2}$ hour with the necessary dye.

Linen is dyed in the same manner as cotton.

Jute does not need pretreatment like cotton and can be dyed directly since it behaves like tannic (acid) mordanted fibre.

*List of Important Basic Colours***Black**—Diosine-black.**Grey**—Methylene-grey, Nigrocine, New-grey.**Brown**—Bismarck-brown.**Violet**—Methyl-violet, Crystal-violet, Ethyl - purple, Methylene - violet, Mauve, Paraphenylene-violet, Rhoduline-violet, Methylene-heliotrope.**Blue**—Methylene-blue, New-methylene-blue, Toluidine-blue, Thionine-blue, Indamine-blue, Victoria-blue, Night-blue, Nile-blue, Turquoise-blue, Marine-blue, Indoine-blue, Metamine-blue, Capri-blue, Indazine-blue, Metaphenylene-blue, Paraphenylene-blue, Toluydene-blue, Indizine, Indol-blue, Diaphene-blue, Setopaline, Setocyanine, Setoglucine, Helvetia-blue.**Green**—Malachite-green, Emerald-green, Imperial-green, China-green, Brilliant-green, Victoria-green, Diamond-green, Methylene-green, Azine-green.**Yellow**—Auramine, Benzo-flavine, Thioflavine T, Acidine-yellow, Homophosphine, Rhoduline-yellow.**Orange**—Chrysodine, Phosphine, Acridine-orange, Tamin-orange.**Red**—Magenta, Safranine, Rhodamine, Pyronine-red, Rhoduline-red, Rosa-zein, Induline-scarletSee also *dyes and dyeing*.**Basco**: A durable linen like finish in cotton, applied especially to damasks.**Basket-weave**: Plain-woven fabric with two or more warp and weft yarns used side by side in weaving.

A method of interlacing several warp yarns alternately over and under several weft yarns—causing characteristic rectangles. (Weave resembling a basket).

Each heddle in the harness carries 2 or more yarns (instead of one—as in case of plain weave). Because of this, the fabric is usually looser and less firm than plain-weave, unless fine yarns are used in closer basket-weave.

2 by 2 basket-weaves

1st harness

1 heddle carries yarns 1-2

2 next heddle carries yarns 5-6

3 next heddle carries yarns 9-10 and so on.

2nd harness

1 heddle carries yarn 3-4

2 heddle carries yarn 7-8

3 heddle carries yarn 11-12 and so on.

3 by 3 basket-weave:

1st carries ends 1, 2, 3,—7, 8, 9,

2nd carries ends 4, 5, 6—10, 11, 12

3 shuttles shoot through the shed each time.

Fabrics: Balloon fabric, hopsacking, Monk's cloth, Oxford cloth, shark-skin.

See also *monk's cloth, Oxford shirting, hopsacking*.**Bast-fibres**: The bast tissues of some annuals (usually Dicotyledons) staple fibres. Bast occurs in the peripheral cells external to wood-cells, but internal to cortex and can be mechanically separated from stems by stripping and drying. The following are the more important bast-fibres in order of their importance:

Jute, flax, hemp, sunn, ramie, kenaf, urena, nettle, and others (these include ambari, sida, chiqma, etc., but are not of any appreciable commercial importance although these have their characteristic virtues).

*Complete List (Alphabetical) of Bast-fibres*Austrian Sesban—(*Sesbania aculata*)—Australia—1 & 2*Bannermallow—(*Pseudabutilon spicatum*)—1 & 2Broom fibre—(*Cystissus scoparius*)—Italy, Spain—brushes, brooms.Cadillo—(*Urena lobata*)—Belgian Congo, Brazil, Cuba—U.S., Venezuela—1 & 2.

Other names for this fibre are: Ake-ire, Armina, Bamia, Ban Ochra, Bolo-bolo, Caesar-wood, Candilla, Carra-picho, Congo-jute, Cousin-rouge, Culutan, Grand-cousin, Guaxima, Guiazo, Malva-blanca, Malva-roxa, Ototo-grandi Paka, Toja. All these names mean the same fibre—cadillo.

Chinese-abutilon—(*Abutilon indicum*)—China—2.Chinese-jute—(*Abutilon theophrasti*)—China—2.Chinese-mallow—(*Hibiscus trionum*)—China—2.

* 1, Cordage; 2, Coarser textiles.

- Chinese Sesban—(*Sesbania cannabina*)—China—2.
 Chinqma—(see Chinese jute).
 Common-malu—(*Bauhinia racemosa*)—India—1.
 Cuban-jute—(*Urena sinuata*)—Bengal, Cuba—1.
 Devil's cotton—(*Abroma augusta*)—Martinique, S. Pacific.
 Escobilla—(*Sida*—entire genus)—Australia, Brazil, India—2.
 Giant Abutilon—(*Abutilon giganteum*)—Brazil—1 & 2.
 Glutinous-sida—(*Sida glutinosa*)—India—1 & 2.
 Hainan-lab-lab fibre—(*Dolichos lagopus*)—Hainan.
 Hainan-sida—(*Sida corylifolia*)—Hainan—1 & 2.
 Hainan Abutilon—(*A. haitiense*)—Hainan—1 & 2.
 Hemp—(*Cannabis sativa*)—temperate zones—1 & 2.
 Hibiscus hemp—(*Hibiscus rosa-sinensis*)—China, Philippines, S. U.S.—1.
 Indian Abutilon—(*A. gaveolens*)—S. Asia.
 Indian-hemp—(*Apocynum cannabinum*)—U.S.
 Indian-lab-lab fibre—(*Dolichos vulgaris*)—India.
 Indian-mallow fibre—(*Bauhinia vahloii*)—India—1.
 Indian-Sida—(*Sida fallax*)—India—1 & 2.
 Isora Fibre—(*Helicteres isora*)—India—2.
 Jute-panlista—(*Hibiscus kitaibeti-folius*)—Brazil.
 Jute—(*Corchorus capsularis*)
 Jute—(*Corchorus olitorius*)—Bengal (India), East Pakistan—1 & 2.
 Kenaf—(*Hibiscus cannabinus*)—India, Iraq, Russia, Asia, U.S.—1 & 2.
 The other names are: Ambari, Awasthe hemp, Bimli, Bimlipattam, Da, Deccan hemp, Dha, Gambo-hemp.
 Kendyr—(*Apocynum*—entire genus)—U.S., Russia—2.
 Kudzu fibre—(*Pueraria thumbergiana*)—Brazil, U.S.—1 & 2.
 Lab-lab fibre—(*Dolichos lab-lab*)—Asia.
 Large-leaved Sida—(*S. augustifolia*)—Hawaii—1 & 2.
 Linen—(*Linum usitatissimum*)—temperate zone—2 and textile-threads, finer textiles.
 Long-leaved crotalaria—(*C. lanceolata*)—S. U.S.—1.
 Madagascar monkey tree fibre—(*Dombeya ceria*)—Madagaskar—1.
 Madras hemp.
 Malwa fibre.
 Manchuria dogbane—(*Apo. venetum*)—Manchuria—1.
 Martinique Abutilon—(*Abu. aurethum*)—Martinique.
 Mauritius Abutilon—(*Abu. mutican*)—Mauritius—1.
 Meshta—(*Hibiscus ferox*)—Brazil, India.
 Milkweed bast fibre—(*Asclepias syriaca*)
 (*Asclepias incarnata*)—U.S.—2.
 Musk hemp—(*Hibis abelmoschus*)—India—1.
 Nettle—(*Urtica dioica*)—U.S.—2.
 Ochra—(*Touchardia latifolia*)—Hawaii.
 Pacific-lace-bark—(*Sterculia balangais*)—Pacific islands—1 & 2.
 Pacific-nettle—(*Pipturus argentea*)—Pacific islands—1 & 2.
 Parao—(*Hibiscus tiliaceae*)—Africa—Pacific—1.
 Philippine-sida—(*Retusa*)—Hainan, Philippines—1.
 Polompom—(*Thepesia* sp)—E. Asia—textiles.
 Queensland hemp (*Sida rhombifolia*)—Australia, China, Brazil, Japan, India U.S.
 Ramie—(*Boehmeria nivea*)—China, Japan, U.S.—textiles.
 Rosella—(*Hibis sabdarifa*)—Brazil, India—1.
 Sesban—(*Sesbania microcarpa*)—U.S.—1.
 Spartium fibre—(*Spartium augularis*)—1.
 St. Francis poppy—(*Hibis radiatus*)—Brazil.
 Sunn—(*Crotalaria juncea*)—India—1 & 2.
 Tall Japanese mallow—(*Partium elastrum*)—Japan—textiles.
 Tossa—jute.
 Uasima—(*Pavonia malacophyla*)—Brazil—1 & 2.
 Yercum fibre—(*Calotropis gigantea*) Africa, Asia, U.S.—1 & 2.
 Zadabuack—(*Abu logicuspe*)—tropical.

The bast-fibres in general form a very important group of vegetable fibres and are very numerous and also they exhibit extremely divergent characteristics.

See also *fibres, vegetable fibres*.

Bath-mat or rug: Small, usually 0.61 to 0.91 m (2' × 3') washable cotton/ rayon rug.

- (a) Chenille-Jacquard reversible pattern.
- (b) Chenille like bed-spread or canvas backing.
- (c) Woven-rag rug.
- (d) Braided-rug.

Bath-towel:

See also *towelling, absorbent-towel, Turkish-towel, tereck-cloth*.

Bathroom-clothing: Thick warm, two-faced cotton blanketing with thick twisted warp and double soft weft producing a very good nap. Usually 0.91 m (36"), with Jacquard weave with two or more coloured designs, having reverse effect on the back.

Uses: Bath-robos and crib-blankets.

Batik: Javanese process of resist printing. Molten-wax is poured over pattern before dyeing which leaves the waxed portion unaffected in dyeing. Wax is then dissolved out.

Now also practised on various fabrics especially silk in silk-screen printing.

See also *printing* (resist style).

Batiste:

- (1) Plain-woven, soft, sheer cotton fabric with fine combed yarns, showing lengthwise streaks, piece-dyed and starched—plain or Jacquard woven.
- (2) A corset fabric for foundation garments.

Cotton-batiste—singed and given lustrous finish,

Silk or rayon batiste—smooth appearance of silk-mull,

Linen-batiste—finer woven, softer than most linens.

Uses: for dresses and lingerie.

See also *nain-sook, cambric*.

Batting: Sheets of raw cotton or wool made up in a number of layers of matted fabric, used for upholstery,

towels, etc. Finer grade cottons are bleached and sterilized for surgical purposes. Carded cotton for general stuffings. Blends of wool, cotton, and rayon for insulations in walls.

See also *surgical cotton*.

Bayadere: Garments worn by dancing girls in India. A plain woven fabric ornamented by stripes running across the full width of the cloth. Made in cotton or cotton and worsted or worsted and silk. Used for ladies and children's dress-goods.

Beach-cloth: Strong cotton fabric, used for flag-bunting. 2 ply carded yarn, loose texture used for red, blue and white railway signal flags, also by Army and Navy.

See also *bunting*.

Beaver-cloth:

- (a) Thick napped, woollen fabric made in imitation of Beaver's fur in England. Twill woven—1.32 to 1.52 meter (52-60").

- (b) Heavy, napped on both sides two faced cotton fabric. Made for workers' clothing, sportswear and shoe-linings.

Beaver-fur: Size usually 0.91 to 0.61 meter (3' × 2'). The largest of the rodents, it possesses a close underwool of bluish brown colour measuring about 1" with a coarse bright black or reddish brown top hair about 3". When sheared the darkest wools are the most valuable, but the bright light brown colours also have a great demand. Mostly used for collars, cuffs, trimmings and coat-linings. The fur is extremely durable and also has a rich and good appearance.

See also *fur*.

Bedford cord: (Bedford-cord weave). Name given to both a fabric and a weave.

Bedford cord is a cheaper variety of pique in which the stripes run the entire length of the piece. Cord effect is in the direction of warp (like pique). Woven with vertical-rib with an extra weft yarn on the back. Napped on the back for warmth, bulk and softness.

Used for uniforms, and generally

outdoor wear like hunting clothes, etc., and also for carriage-upholstery. See also *pique*, *bedford-cord weave*.

Bedford-cord weave: In this, cords run lengthwise in the fabric, in the direction of warp. The weft yarns (every alternate pick) float over and under certain warp ends to form a rib. 1st pick weaves-plain or twill. 2nd pick floats under 4 warp ends, then over 2 warp ends—then again 4 warp under and again 2 over and so on. 3rd pick like the first. 4th pick like the second—and so forth.

Stuffing yarns are sometimes used between the floating weft yarns and the face warp yarns. These help to raise the cord but do not appear on the face fabric. These are extra warp yarns—placed in the rib section in the loom.

See also *weaving*, *bedford-cord*.

Bed-spreads: From various fabrics—according to specifications.

- (a) Chenille—machine embroidered.
- (b) Crinkled light weight fabric, white, made as seer-sucker.
- (c) Honey-comb type—Jacquard woven with soft yarns.
- (d) Home-spun type.
- (e) Jacquard-woven—heavy with various designs, rayon or cotton designs by contrast of yarns and colours.

Beetling:

- (a) A process of pressure-pounding linen damasks to flatten it to leather-like textures.
- (b) A finishing process for cottons or linens, in which the fabric is hammered to produce linen-like finish and lustrous appearance.

See also *finishing* (Special Finishes).

Bellmanizing: A chemical process which changes the cellular-construction of yarn and gives it a permanent crisp, and non-wilt finish. Used for fine count fabrics like lenos, voiles, organdies, mulls, etc.

Bemberg: (TM)—For rayons produced by cuprammonium process—filaments or staples

—bright or dull
—and having a natural permanent combed, woolly touch.

See also *cuprammonium*, *rayon*.

Bengaline: Rib-weave or plain-weave. Ribbed, similar to poplin but heavier, of cotton, silk, wool, rayon, nylon with worsted or cotton weft, warp entirely covers weft, 1m (40"). Uses: coats, dresses.

See also *ribbed-fabrics*, *rib-weave*.

Bengal-stripes: Originally from Bengal (India). Twill weave with alternating white and coloured stripes.

Benzo-nitrol colours: These are certain direct colours used with cotton fibre in ordinary manner and which are then developed by passing into a diazo solution. Here the dyed colour plays the part of phenol or aniline and reacts with a diazo compound producing a new colour. The process is similar to production of insoluble azo colours (only b. naphthol applied to fibre is replaced by a direct colour). The dye stuff recommended are Benzo-Nitrol brown, Toluylene brown, direct-fast-brown, pluto-black, direct-blue-black.

See also *developed colours*, *dyes and dyeing*.

Beutanol: Vinyl coated cotton fabric. See also *coated fabrics*.

Bier: (Bees). Unit of measurement when calculating reeds or harnesses. A coloured thread is knitted at the top of the harness, each stitch embracing 20 heddles or 1 bar. Reeds are referred to as bars, each consisting of 20 dents.

See also *weaving*.

Billiard-cloth: All wool, green-coloured felted fabric, having a structure of 50 ends and 15 picks and roughly weighing 0.45 kg (16 oz), per yard—width 1.42 meter (56").

See also *baize*.

Bird's-eye weave: Small regular geometric patterns resembling a bird's eye and used in linen towels.

See also *diaper-cloth*, *pique*.

Bisso or Bis: Fine, round-thread, open linen used as altar-cloth, church linen or embroidered table-linen.

Blanket: A heavy fabric with a raised finish. Made of various mixtures or blends of fibres such as cotton, wool, rayon, nylon, dynel, vicara etc. Plain or twill woven, with a single or double construction, and napped.

Wool-blankets—sold by weight.

Horse-blankets—heavy, coarse and felted.

Blanket-cloth: A heavy bed-cover made as under:

- (1) either cotton—napped,
- (2) or cotton and wool—heavily fulled and felted,
- (3) or all wool—heavily fulled and felted.

Blanket-pattern: A full width cloth into which a number of different patterns and colour effects are incorporated.

Bleaching: A process of whitening fibres or fabrics or depriving a material of colour.

This is brought about by using various bleaching-agents. Generally chlorine is used for cotton and other vegetable-fibres and peroxide and sulphur dioxide for animal-fibres.

Bleaching of cotton: Cotton is bleached in the raw state (as yarns) or in piece. The impurities present are cottonwax, fatty acids, peptic substances, colouring-matters, albuminoids and other mineral matters. Altogether these do not amount to more than 5 per cent of the weight.

Bleaching of cotton is comparatively a simple process, the main operations being:

- (1) Boiling with alkali.
- (2) Bleaching the organic matters by some bleaching agents.
- (3) Souring treatment with dilute H_2SO_4 or HCl.

Loose-cotton: In this, the necessary operations are:

- (1) Steeping in warm solution of soda for some hours,
- (2) washing,
- (3) bleaching powder treatment or sodium-hypochlorite,
- (4) washing,
- (5) souring with dilute acids,
- (6) washing free of acids.

Cotton-yarns: In principle the process employed for yarns is the same as for loose-cotton, but this requires different machinery:

- (1) Boiling in an alkaline lye. This is carried out in Kier-boil (6 to 8 hours) in alkaline lye (3% soda-ash or 2% caustic-soda on weight of cotton),
- (2) washing,
- (3) washing,
- (4) washing,
- (5) bleaching powder solution 2% Tw. treatment contained in stone cistern which is provided with a false bottom,
- (6) washing,
- (7) souring with dilute acids, HCl about 2% Tw,
- (8) washing to remove traces of acids,
- (9) optical-blueing.

The bleaching of cotton-yarns is a very straight-forward process and with reasonable care, is almost foolproof.

Cotton-pieces: By far the largest bulk of cotton-goods is bleached in the piece as this happens to be the most convenient form. The principle is similar to yarn-bleaching but here some alterations and additional operations have to be performed. These are necessary to remove factors like sizing and other chemical substances which are generally added in sizing or weaving operations. The sizing materials are starches, farinas with other substances like tallow, $ZnCl_2$, soaps, $MgCl_2$, etc., and sometimes some mineral oils. All these materials have to be completely removed if perfect results are desired. So two steps, viz., singeing and desizing become necessary.

The surface of the fabric, coming from weaving dept. has a downy appearance as it is covered with nap and loose fibres. A clean surface of the fabric is absolutely necessary for further operations. The napping must be removed first, and this is achieved by singeing.

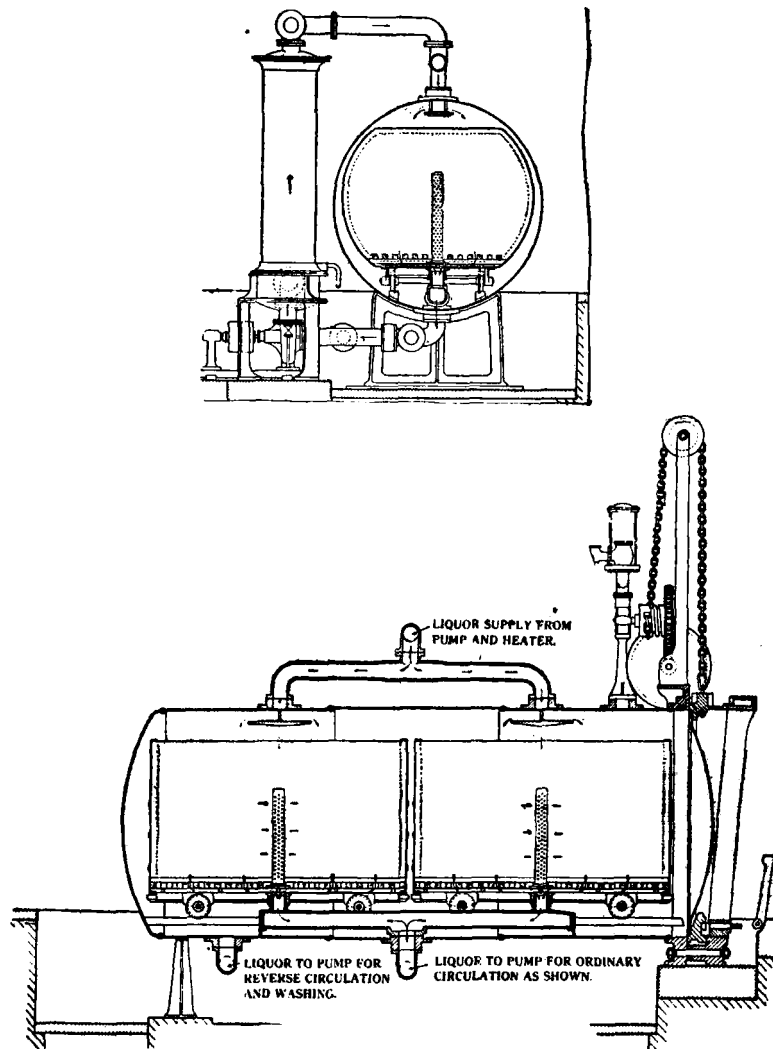
Singeing: The cotton-pieces are run at full width through the singeing machines, over a non-luminous gas flame.

Grey-washing: The operation simply consists of running pieces through ordinary washing machines.

In order to wet these out on leaving the machines, these are piled in heaps and left as such overnight when fermentation sets in which results in hydrolysis of starch and renders it soluble in water.

Treatment with alkaline-charge (NaOH + Na₂CO₃): In this operation the pieces are first run through alkaline lye of strength of about 4% of the weight of charge. They are run into Kier.

After this the pieces are run through continuous washing machine with plentiful supply of water.



CROSS AND LONGITUDINAL SECTIONS OF MATHER KIER

Grey-souring: In this operation, the goods are run through a washing machine containing HCl of strength of 2° Tw. Object of this is to remove the lime completely. The goods are then well washed.

Chemicking: The pieces are then washed free of alkali and the bleaching proper or *chemicking* follows. This operation is effected in various ways. The most efficient or effective being to run the goods in a washing machine through bleaching powder solution (1° Tw), and allow them to lie loosely piled up overnight. The goods are then washed and run through very dilute solutions of acids (at 2° Tw), called white-sour and again washed thoroughly to free them completely from acids as otherwise this results in tendering of fibres.

The next important operation of bleaching is Scutching or opening the cloth out from rope form to its full width. After scutching the opened cloth is dried on drying machine.

* * *

Practical working formulae: (Cotton-goods)

(A) *White goods*—Mulls, Voiles, L. C. Dhotis (fine count).

(B) *Coloured goods*—Dhotis and Sarees.

(a) *White goods*

(1) Singe & wash (Gas burners are used)

(2) Desize: Desizer—2.27 kg (5 lbs).

Common salt—13.61 kg (30 lbs.) at 50°C (120°F)

(3) Wash $\begin{matrix} \text{Hot} \\ \text{Cold} \end{matrix}$

(4) Kier boil or scour.

NaOH—3%

Na₂CO₃—1.5%

Silicate—1.5%

TRO—0.2%

Sodium Perborate—0.90-

136 kg (2-3000 lbs.)

20-25 lbs. pressure for

8 hrs.

(5) Wash—One hot wash—1/2 hour

One cold wash—1/2 hour

(6) Light Chemicking
1.5 gm/L for nearly 2 hrs.

(7) Wash

(8) Sour

(9) Wash

(10) Bisulphite wash

(11) Final washing & optical bleaching.

(b) *Coloured goods* (fine count)

(1) Singe & wash (Gas burners are used)

(2) Desize: Desizer—2.27 kg (5 lbs)

Common salt—13.61 kg (30 lbs.)

(3) Wash (Grey) $\begin{matrix} \text{Hot} \\ \text{Cold} \end{matrix}$

(4) Grey Chemicking—1.5 gm/L for 2 1/2 hrs.

(5) Wash

(6) Kier boil or soda boil without pressure

Na₂CO₃—3%

Silicate—0.25%

TRO—0.25%

Sodium Perborate—2 lbs./

3000 lbs. (90 kg/1361 kg)

Temp. 50° to 70°C.

for 6 hours.

(a) One hot wash in Kier—1

hour

(b) One cold wash in Kier—

1 hr.

(7) Unload

(8) Light Chemicking—0.5 to 1 gm/L.

(9) Wash

(10) Bisulphite treatment—6.80

kg/Kier load (15 lbs)

(11) 2 washes.

(C) *Full bleach*

(c) *Voiles*

(1) Desize

(2) Wash

(3) Sour

(4) Wash

(5) Press boil

2.5% NaOH

3% Na₂CO₃

for 12 hours at 9.07 kg.

(20 lbs.) pressure per sq.

inch/meter.

(6) Wash

(7) Chemick

(8) Wash

(9) Sour

(10) Wash

(11) Wash—(5 lbs. or 2.27 kg.

Na₂S₂O₄)

(12) Wash

(13) Optical bleach.

(d) *Towels, plain chaddar*

(1) Steep

(2) Desize

- (3) Wash
- (4) Sour—0.2% H₂SO₄
- (5) Open boil—2.5% Na₂CO₃
- (6) Wash
- (7) Pressure boil 4% NaOH
3% Na₂CO₃ for 12 hrs.
- (8) Wash
- (9) Chemick—twice
- (10) Wash (3 Times)
- (11) Sour
- (12) Wash (3 Times)
- (13) Optical bleach.

Coloured goods and yarns.

(e) Coloured goods

- (1) Desize (0.075% Rosin
0.30% salt)
Keep it overnight
- (2) Wash
- (3) Chemick—2 gm./L. *twice*.
- (4) Wash
- (5) Open boil—
2% soap
3.75% soda ash
2.5% silicate.
0.125% TRO
0.5% glue
at 140°F. for 8 hrs.
- (6) Wash
- (7) Chemick—*twice*—same strength.
- (8) Wash
- (9) Sour—0.2% HCl.
- (10) Wash
- (11) Wash with Na₂S₂O₃
- (12) Final wash, 2.27 kg (5 lbs.)
Na₂CO₃.

(f) Coloured yarn.

A lot of say 90.72 kg (200 lbs.)

Scouring

81.0 litres (18 gal) of 72° Tw.
NaOH
40.84 kg. (90 lbs.) soda silicate
6.80 kg. (15 lbs.) castor oil soap
Vol. of liquor—408.4 litres
(900 lbs) for 5/6 hrs. at 12.61 kg.
(30 lbs.) pressure.

Bleaching

2 gm./L for 3 hrs.
Wash for—1 hr.
Sour for—1 hr.
Wash.

Bleaching of linen: This is a far more complicated process since linen impurities are more than 20% as against 5% of cotton. Furthermore, these impurities contain complex colouring matters, inter-cellular substances and flax which are very very difficult to attack. Linen is bleached in yarns

or in pieces. Whenever the operations have to be repeated, strength of the reagents is successively diminished.

Sequence in linen yarn bleaching:

Linen—boil in Kier with Na₂CO₃
wash
reel in CaOCl₂—which means while passing continuously through CaOCl₂ exposure to air for greater part
washing
souring in H₂SO₄
washing
scald in Na₂CO₃—which means Kier boiling
washing
reel in CaOCl₂
washing
souring with H₂SO₄
washing
scald in Na₂CO₃
washing
reel in CaOCl₂
wash
souring in acid
scald again
wash
reel again
wash
sour again
wash
scald
wash
reel
wash
sour
wash

For full white:

Repeat scalding, washing, dipping, washing, then souring, and washing at least twice.

Linen-pieces:

Boil with lime in Kier.
Sour with acid sulphuric.
First lye boil with NaOH & Na₂CO₃.
Second lye boil with NaOH & Na₂CO₃.
(This may be carried on for about 6 times).

(Grassing in between in lye boils).
Rubbing with rubber bands—this is a mechanical treatment with soft-soap.

Bleach with hypochlorite of soda.
Scald—this is repeated about 3/4 times with grassing in between.
Sour with weak acids—repeated several times.

Mill-wash.
Blue.

Optical-bleaching.

Dry.

Bleaching of other textile vegetable fibres:

Hemp—process is similar to linen.

Jute— CaOCl_2 and H_2SO_4 —washing in between.

These treatments are repeated several times.

Bleaching of wool:

Wool is usually a very impure article—the main impurities are natural grease or yolk, swint (dried up perspiration from sheep's body), dust, dirt, etc., which adhere to the sticking surface of the fibre. In this raw condition, wool is absolutely unfit for any manufacturing or processing purposes. And these impurities have to be removed before commencing any further treatments. Modern methods for wool bleaching are:

Washing or scouring by soap assisted by potash or soda or sodium silicate. This operation is perfectly simple being—submerging in soap solution and stirring mechanically. Here water dissolves out swint while soap emulsifies yolk and can then be removed from the fibres. The other impurities are then mechanically washed out.

Bleaching proper is done by sulphurous acid or hydrogen peroxide.

SO₂ gas method or "Stoving": Wool is wetted then squeezed and hung in chamber in which sulphur is burnt—after 12 hours, wool is taken out and may be washed.

Hydrogen peroxide (12 vol.) plus 3 times water made slightly alkaline with sodium silicate.

Bleaching of silk:

Raw silk fibre proper is uniformly coated with a proteid substance called silk-gum or sericin which amounts to nearly 25 per cent of weight of material and removal of this coating is absolutely essential if silk is to be used for its best qualities.

The process for this consists of suspending the hanks of raw silk over poles in a vat containing strong hot soap-solution (30 per cent of soap on weight of silk). This is called "Boiling-off". During this process, the sericin at first swells up and finally dissolves out. (Only soft water must be used).

A second wash in half the above strength is usually given.

Bleaching by "Stoving": this process is exactly similar to wool bleaching by stoving or hydrogen peroxide method.

Bleaching Agents: (1) Oxidizing (2) Reducing.

- (1) *Oxidizing bleaching agents*— Cl_2 gas, ozone (O_3), bleaching powder, hydrogen peroxide (H_2O_2), hypochlorites like NaOCl , Sodium hypochlorites, NaClO_3 , $\text{K}_2\text{Cr}_2\text{O}_7$, K_2CrO_4 , KMnO_4 , KSO_4 , $\text{NaBO}_3 \cdot 4\text{H}_2\text{O}$, KClO_3 ,
- (2) *Reducing bleaching agents*—sulphur burning (S), Zn. dust, Stannous chloride ($\text{SnCl}_2 \cdot 2\text{H}_2\text{O}$) Titanous chloride (TiCl_3), Ferrous sulphate ($\text{FeSO}_4 \cdot \text{H}_2\text{O}$), Sodium hydrosulphite ($\text{Na}_2\text{S}_2\text{O}_4$) Sodium sulphite (Na_2SO_3), Sodium bisulphite (NaHSO_3), Sodium sulphide (Na_2S), Sodium sulphonylate, Formaldehyde ($\text{NaHSO}_2 \cdot \text{CH}_2\text{O}$) and glucose ($\text{C}_6\text{H}_{12}\text{O}_6$).

Oxidation involves addition of O_2 or negative radicle or loss of H_2 or positive radicle.

Reduction is opposite of oxidation, meaning withdrawal of O_2 or addition of H_2 .

Generally, oxidizing bleaching agents are used in case of vegetable fibres while reducing agents are used in case of animal fibres.

See also *bleaching, bleaching (liquors), bleaching powder, chemicking.*

Bleaching-liquors: When chlorine is made to act on cream of lime taking care that the temperature is not raised above 35°C and that chlorine is not in excess, a solution is obtained (CaCl_2 + hypochlorite), which is a very convenient bleaching-liquor. Similar liquors can be obtained by passing Cl_2 into Na_2CO_3 or K_2CO_3 , etc. These bleaching liquors are used for cotton, linen and other vegetable fibres.

See also *bleaching, bleaching agents, chemicking, 1785, 1788 (Textile Times).*

Bleaching-powder: Still by far the most important bleaching-agent especially in case of vegetable fibres, and its place as a bleaching agent so far remains unchallenged.

Formula CaOCl_2 or chloride of lime.

See also *bleaching-agents, bleaching-liquors, chemicking*.

Bleeding: Running of colours when fabric is wet.

Tendency of unstable dyes to come off or out of the cloth in water.

Blending (of fibres): Placing together two or more yarns of different materials (as cotton and wool) in an intimate mixture so that the ultimate value of the fabric can be enhanced by the joint and positive qualities of both or the components of the blend. The first essential principle in blending is that the components to be blended should have compatible qualities or harmonising characteristic qualities of each individual fibre. According to this blending of fibres should be so arranged as would enhance the qualities of the blended material over those in the raw or unblended state, and such convenient use of different components should definitely be more adaptable to environments than a single component. Thus, socks made of wool are good and comfortable but are not long-lasting and so now-a-days the parts which suffer maximum wear and tear are reinforced with nylon blends, with a result that such socks definitely have a longer life.

At present there are many fabrics which are blended with more than one fibre so that such blending would add to the properties and would generally compensate for the qualities which are lacking in a fabric with a single fibre. Examples of such blends are Cotswool—cotton and wool. Terywool—terylene and wool. Terrool is also terylene and wool.

A blend can be ideal when materials used are definitely found to be necessary and also contributing, as in case of cotton/alpaca. Fabrics of alpaca alone could never be attractive but alpaca and cotton blend was immediately an attractive product. In fact it is with this blend only did the good qualities of alpaca become known. When properties desired in the ultimate material cannot be provided by a single component, blending becomes absolutely neces-

sary and must be done. In blending a clever use of properties of the components are of vital importance as the following table would suggest:

Resiliency—nylon, rayon, wool.

Lustre—silk, nylon, rayon, alpaca, ramie.

Strength—nylon, ramie, high tenacity rayon.

Absorbency and warmth—wool.

Fire-proofing—asbestos, glass-fibre.

Exposure to air or environment—synthetic-fibres.

See also *fibre properties, combination-yarns, mixtures*.

Blister-cloth: A double cloth with face-cloth of botany warp and weft and the back-cloth of mohair warp and weft. Figures are produced by interchanging the face and back cloths during the finishing—when botany cloth shrinks and causes mohair to form blisters.

Block-printing: See (*hand-block*) *printing, printing*.

Blood: Indicates gradation or degree of softness in wool; full blood: pure merino, $\frac{1}{2}$ or $\frac{1}{4}$ blood denotes cross-breeds with other varieties and thus producing different qualities.

Bobbinet: A machine-made net (originally an imitation of lace made with bobbins on a pillow). Of cotton, rayon or silk yarns—partially twisted round, to produce hexagonal mesh. See also *net, netting*.

Bobbin-finishing laces: A basic system in lace-manufacture in which laces are made with slack bobbins and heavily weighted warps and wefts; 2 warp yarns and S and Z twists. Point-de-Paris is typical lace according to this system.

See also *lace, point-de-Paris*.

Boiled-linen: Linen passed through boiling off process to remove waxes, etc.

See also *finishing (linen), degumming*.

Boiled-off-silk: Sericin removed silk.

Silk treated with soap-water or caustic alkalis which removes sericin or silk-gum.

See also *bleaching of silk, degumming (of silk)*.

Bolivia-cloth: Of wool—satin-weave.

Soft, velvet-like woollen or worsted, napped, piled-fabric, frequently made with addition of a speciality fibre like mohair or alpaca. Napped tufts are in vertical or diagonal rows rather than overall pile effect. Uncut, piece-dyed.

Used for coats and suits.

Boll: Seed-pod of cotton plant.

Bolting-cloth: A stiff, transparent fabric of leno weave made of unboiled-off silk. Many times hand-woven (Sw.tz). Used in bolting, sifting and screen-printing and as foundation for wigs. See also *screen-printing, sign-cloth*.

Bomber-cloth: Of cotton—broken-twill-weave. Firmly woven, durable fabric with twice as many warps as weft yarns. Warps are fine and weave in groups of 2s. Wefts are heavy.

Woven in 4—harness, weft-faced broken-twill-weave.

Printed—Used for draperies.

Bombyx: An important genus of Mulberry feeding worms or moths producing cocoons which are spun into silks. Of these, the true-silk producing moth *Bombyx-mori*, is by far the most important. Of the others producing wild-silks, the more important are:

<i>Bombyx arracanesis</i>	: Burmese moth
„ <i>croesi</i>	: Madras moth
„ <i>cynthia</i>	: Allanthus moth
„ <i>fortunatus</i>	: Desi-moth
„ <i>mori</i>	: true silk-worm
„ <i>sinensis</i>	: Chinese moth
„ <i>textor</i>	: Boropooloo moth

See also *silks, true and wild-silks*.

Bonded-fabrics: Non-woven fabrics made from short cotton fibres, which are combed parallel and may be blended with plastic-fibres and bonded or joined chemically with substances like casein, C-acetate, glue, resins etc.

Used as throw-away napkins, diapers, towels, tea-trays, imitation-leather etc.

See also 1944 (*Textile Times*), *non-woven fabrics, bonding*.

Bonding: (Chemicals)—Substances like casein, glue, C-acetate, resins, etc., used for bonding or joining together textile fibres or fabrics.

See also *bonded-fabrics*.

Bonnaz: Machine for chain-stitching embroidery on cloth_or net.

See also *knitting*.

Book-cloth:

(a) A plain woven cotton fabric—heavily filled (sized), glazed and embossed, used for book-covers.

(b) A cloth made of viscose-rayon is also used for book-covers, book-binding.

See also *book-muslin, buckram*.

Book-muslin: A light-weight woven cotton-cloth filled very stiff. Used for book-binding.

See also *book-cloth*.

Botany-wool:

Shipped from Botany-bay and hence the name.

See also *merino-wool, cashmere*.

Boucle: Novel dress fabric having loop-effects. Plain, twilled or knitted. Distinguished by small spaced loops, on the surface.

A flat, irregular surfaced fabric woven or knitted from specially twisted Boucle-yarn, having small loops. These loops recur at regular intervals.

Used for coats, suits, sportswear, etc.

See also *novelty fabrics, yarns*.

Bourette: Any plain or fancy fabric which shows lumps at regular intervals on the cloth-surface.

Box-loom: Loom provided with more than one shuttle-box on one or both sides of the loom. Necessary in weaving fabrics with more than one colour, and weft.

See also *looms, weaving*.

Bradford (British system): Process in worsted manufacture, where stock is passed through a variety of gilling machines, then combed. The fibres in the resulting yarn lie in parallel (side by side) order forming a solid yarn.

See also *worsted manufacture*.

Braid: Differs from weaving or knitting.

Yarns from a single source are crossed diagonally and lengthwise—in case of hat-braids or trimmings. A plait, especially a plait of hair or plaited tape woven of wool, silk, gold, thread, etc., used for trimming or binding. Particular use is for the narrow bands bordered with open work used in making point-lace.

A narrow fabric in the form of tape 0.02 to 0.05 m ($\frac{1}{4}$ to 2") or tubular made on machine called braider; made by crossing of number of strands diagonally so that each strand or thread passes alternatively over or under one or more of the other threads.

Used in shoe-laces, suspenders, garters.

Braided-rug: Originally hand-made of narrow strips (wool or cotton) fabric braided like rug-braid laid side by side and sewed together.

Yarns from a single source crosses diagonally and lengthwise.

Imitation in machine stitched rugs in mill or roving waste.

See also *braid*, *rugs*.

Breaker-card: Feed section of woollen-card, used in woollen manufacture.

See also (*woollen*) *carding*.

Bright-filament: In man-made fibres, brightness or dullness can be controlled by adding substances like Titanium dioxide (TiO_2) in the spinning-bath. These substances affect brightness and render them dull.

See also *dullness*, *pigment-print*, *lustre*, *delustring*.

Brilliantine: Plain or twill-woven, with cotton-warp and worsted weft or mohair weft, and given a soft calender finish or stiff finish.

Silk-brilliantine—light, loosely woven, of unthrown silk in both warp and weft. Yarns in this case slip easily.

Cotton-brilliantine—fine warp and heavier slightly twisted weft—given lustrous finish by mercerisation.

Glaze brilliantine—coloured cotton warp and undyed mohair weft.

Uses: dresses, suits, etc.

See also *obsolete list*.

Bristles: Hairs are used in a variety of articles. Bristles are stout elastic hairs obtained from the backs of certain breeds of pigs. The hair of various animals which are too short for spinning are utilised in the manufacture of felts. Best qualities of bristles are used by shoe-makers. Second quality for toilets and clothes-brushes and all others for artists' brushes.

Broad-cloth: American name for British fine poplins.

Cloth of 1.83 m (2 yds.). Now the name signifies the material of superior cloth. The distinction between broad-cloth and narrow cloth came to be, because of the alnage duties.

A fine kind of woollen fulled cloth used for men's garments.

A fine, all-wool fabric, in twill weave.

In finishing, however, the face is fulled which masks the twilled face. Fabric is then sheered doubled and pressed—face out to impart a gloss.

Plain-twill or rib weave.

Fine poplin in U.S., has a fine mid rib across the whole of the width, plain woven with 2 or as many ends as picks, usually combed, ply or single yarns. Cheaper varieties made with carded, print cloth yarns.

Used for shirting, pyjamas and summer dresses.

See also *ramona cloth*.

Broad-goods: All silk or rayon woven fabrics, having more than 0.61 m (24") width—distinguished from ribbon.**Broad-loom:** For rugs—woven wider than 1.37 m (54").**Brocade (Kin Khab):** Jacquard weave, of silk, rayon or cotton.

Heavy fabric woven from silk and jari (gold or silver threads) with patterns in relief.

The name signifies a class of richly decorated shuttle-woven fabric made usually in coloured silk and many times with jari (gold or silver threads). Ornamental features in brocade are more emphasized and made in addition to the

main fabric which sometimes has a stiffening effect, but which also produces a relief-effect on the face. The back side of this however presents a distinctive appearance where the weft threads of the part brocaded are left hanging in loose groups and these have to be cut.

In brocades both sets of threads may be floated irregularly upon the surface to produce ornamental effects and in this respect are typical of all one warp and one weft fabrics that are floated by irregularly distributed materials where the threads are so distributed and where one or several weaves are used.

See also *weaving, brocatelle, shuttle-woven fabrics, broche, lampass*.

Brocatelle, Brocattelle: Jaquard weave and made of silk, rayon or cotton. A heavy fabric of brocade type with high relief designs. This effect of high relief is obtained by warp and weft being unequally twisted with one extra set of weft yarn at the back.

Used in upholstery and draperies and also dress-goods.

See also *weaving, brocade*.

Broche: (French for brocade).

Fabric with small raised figures produced with swivel shuttles giving embroidered effects.

See also *weaving, brocade, swivel-shuttle*.

Brown-linen: Unbleached linen. The term is also applicable to brown sheeting.

See also *converting, finishing, bleaching*.

Brushing: A finishing process to brush off superfluous threads, flocks, etc. Also to make nap stand perpendicular. Used extensively in pile-fabrics to raise the pile perpendicular to the ground.

The process is used especially for removing short, loose fibres in case of wool, cotton, rayon, silk, linen, etc. When fabric is sheared, many loose fibres still remain adhering to fabrics. These are removed by brushing machines. 2 large cylinders covered on the outside with bristles or brushes

are used. When the fabric passes through these cylinders the loose fibres are brushed out and removed.

See also *finishing*.

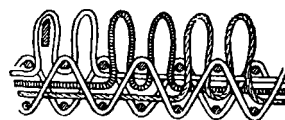
Brushed-rayon: A woven or knitted rayon fabric which has been napped.

See also *rayon*.

Brussel's carpet: A carpet or rug woven on Jaquard loom with uncut yarn-dyed pile.

A kind of figured warp-piled fabric, made with regular and irregular cut and looped surfaces. If regular, the effects are due to colour. When irregular and also when cut and looped piles are used in combination, design is not dependent on colours and sometimes the entire surface is covered with pile.

Diagram of Brussel's carpet. Circles represent 2 tiers of weft and the lines of pile threads. The ground warp interlaces with the weft to bind the whole together. The line of pile-threads, when not lifted, over the wire, to form loops, are laid between the weft.



BRUSSEL'S CARPET

See also *rugs, wilton-rug, wilton-carpet, cut-pile carpets, warp-piled-fabrics, carpets, weaving, Axminster*.

Buckram:

(a) A stiff finish used on rather open fabrics.

(b) Fabrics with stiffer finish with sometimes 2 layers glued together.

Used in interlinings, millinery and in book-binding.

See also *book-cloth, interlining*.

Bunting: The term means a loosely woven woollen cloth for making flags. It is also used for collection of

flags and particularly those of ships' banners, etc.

- (a) A plain, rather loose woven coloured cotton fabric used for flags and decorations.
- (b) A very durable wool fabric of strong, worsted, wiry yarns—plain woven for flags.

See also *beach-cloth*.

Burlap: (Plain-woven of jute, hemp or cotton).

A coarse, heavy, plain woven fabric of coarse single yarns.

A coarse canvas for wrapping.

See also *bagging, hessian, gummy*.

Burling: Removing knots in the woollen yarns.

A contributing finish applied to wool which removes knots in the yarns. In woollen manufacture, many irregularities or defects occur, of which knots is one of the major defects. These have to be removed, by "*burling-irons*." A cylinder operation.

Burling necessarily effects pulling out of yarns, smoothening of yarns, knots, etc., correcting mis-picks and broken warps and weft threads.

See also *finishing*.

Burnt-out process:

- (a) In lace and embroidery—designs are worked on a sheer base fabric, which is afterwards destroyed by chemicals or heat.
- (b) For sheer fabrics, which look like brocade, a combination of 2 yarns of different kinds are used in making a double cloth

for the design and float yarns are used for figures. (Nylon or acetate-rayon combination is usually used in this manner although other combinations are also possible).

After the acetate floats are burnt-out, the sheer nylon background is in sharp contrast to the solid portions of the design made of of nylon/rayon combination.

See also *lace, alginate fabric, carbonising, recovered wools*.

Butcher's cloth: Plain woven fabric, made of rayon, silk, acetate, nylon or worsted with a crash-like texture. Sometimes wrongly called rayon-linen. See also *crash*.

Butcher's linen Coarse, bleached crash, originally for butcher's aprons.

See also *crash*.

Byrd's cloth: (Named after Admiral Byrd)

Cotton in finer yarns of high count, twilled, bleached, dyed (vat colours), dense structure, made wind-proof and water-repellent. Used for making airmen's garments, ski-suits and rain-coats.

See also *water-proofing, finishing, shirley-cloth, Grenfell-cloth*.

Byssus-silk:

- (a) A fine yellowish flax and linen made from it.
- (b) A genus of cryptogamic plants having a silky fibrous texture found in dark places.
- (c) A bundle of fine silky filaments by which many shell-fishes attach themselves to rocks.

C

Calender: (*As ironing to clothes—calendering to fabrics*). A machine consisting of 2 or more cylinders or rollers in close contact with each other and often heated (or chilled) and through which are passed fabrics for the purpose of giving finished smooth surface. This can be compared to ironing of clothes.

Calendering: A process of finishing cloths by applying heat and pressure from rollers. The process of calendering is essentially a finishing operation of

the fabrics and especially for:

- (a) flattening of fabrics,
- (b) removing surface inequalities,
- (c) giving glaze to the surface.

Calendering can effect the following specialised finishes:

- (1) Watermarks or moiré finish.
- (2) Highly glazed finish.
- (3) Embossed or crepe finish.
- (4) Other special finishes like:
 - (i) Schreiner,
 - (ii) Palmer—etc.

See also *finishing, special finishes*.

- Calico:** A general term given to plain cotton cloth. It has its origin probably from Calicut or Calcutta both of which are important textiles centres in India. In England, the name is applied particularly to grey or unbleached cotton cloths which are used for domestic purposes, and generally to coarse heavy cotton cloths.
See also *obsolete list*.
- Calico-printing:** Means textile printing. Calico-printing started in India and was introduced to Europe by the end of 17th century where its commercial importance was at once recognized. After this, development and subsequent growth of this art was steady but rapid. Today, calico-printing is extensively carried on in practically all the countries. Calico-printing is applied to cambrics, chintzs, etc.
See also *printing*.
- Cambric:** Plain woven, of linen or cotton. The name is derived from the Flemish town of Cambrai, in Nord (France). Originally cambric was made of fine linen in the manufacture of handkerchiefs, collars, cuffs, and other delicate underclothing. The yarns of this cloth are of the finest quality—the count sometimes exceeding 120s.
Embroidery Cambric is a fine linen used for embroidery.
Batiste is a kind of dyed (usually) or printed cambric. Cheaper imitations of this fabric are many times made where cotton predominantly takes the place of linen yarns.
Cotton-cambric is a light, finely woven fabric which is given a soft finish with a little lustre and usually calendered on one side only.
See also *plain-weave, tracing-cloth, batiste*.
- Camel-hair:** Natural colour from tan to black.
Beard-hairs—used for Oriental rugs, paint-brushes, etc.
Under-hair—extremely soft and lustrous.
Outer-hair—coarse—0.10 to 0.25 m. (4"-10").
Inner-hair—soft and silky—0.05 to 0.08 m (2"-3").
See also *hair, fur, animal fibres*.
- Camel-hair-fabric:** Usually woven in the natural colour, but may also be dyed.
Hair very soft and light-weight.
Various combinations with wool.
Typical coating, twilled and napped, 1.37 m (54")
See also *camel-hair*.
- Camel-wool:** See *animal fibres, animal hair*.
- Canton-crape:** (Also called Oriental-crape).
(a) *A soft silk fabric* with a gauzy texture having a peculiar crisp or crimped appearance woven from silk yarns in the natural gum. There are two varieties—one hard and the other soft. The softer variety is Canton-crape. It is a white or piece-dyed, sturdy and durable fabric. Deniers are 14/16 to 20/22, when made of silk or rayon.
The wavy appearance of this crape is due to the peculiar manner in which the weft is prepared. The yarns from two different bobbins are twisted together in a reverse way. The fabric when woven has an even and smooth appearance and it is definitely *not* crapy, but when subsequently *de-gummed*, it at once becomes soft and the weft loses its twist and gives the fabric its distinctive appearance.
(b) *Cotton:* A weft-knit crape made with pebbly surface, and usually woven in a peculiar arrangement of 6-Z twists followed by 6-S twist yarns.
See also *crape, Victoria-crape, bombazine*.
- Canton-flannel:** Strong, twilled, cotton fabric, napped on one or both sides. Yarns are made from cotton and are bleached, unbleached or stock-dyed. Used for men's work-gloves, infantwear, linings, etc.
- Canton-linen:** Glossy, rather stiff, Oriental fabric of Ramie-fibres. Also called—Grass cloth, Grass-linen, Chinese-linen, China-grass-cloth, etc.
Used for lunch-sets.
See also *ramie (fibre), grass-cloth*.

Canton-silk: See *wild-silk*, *pongee*, *habutai*.

See also *sail-cloth*, *bagging*, *tarpaulin*.

Canvas: Plain woven cloth of cotton, linen or hemp fibres.

A very plain woven but firm cotton fabric or a light-weight duck. The name of this stout cloth was probably derived from *Canavis* or *Hemp*. Flax and hemp fibres were used for ages for the production of this quality for furnishings, sails and for certain class of cloth named as "*Sail-cloth*". At present, it can be made from hemp, flax, jute and cotton or a blend of any of these. All flax canvases are essentially double-warp—as it is meant invariably for rough use.

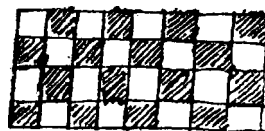
In structure, canvas is similar to jute-tarpaulin. In fact, "bagging", "tarpaulins", and "canvas" are almost alike but for the different fibres used. The cloth may have its natural tan colour or can be bleached, or dyed. It is primarily meant for use as naval-cloth or sail-cloth, although now it is used for a number of other purposes, such as bags, sporting-bags, bags for travelling goods, school-bags, haversacks for military uses, holdalls, etc. The special use which requires canvas in enormous quantities is for covering of goods on railways, wharves, tugs etc., in which case flax or cotton canvases have to be tarred before use.

Sail-cloth is naturally of a very strong built, usually two-ply.

Art-canvas—The yarns are of superior nature and the structure resembles cheese-cloth.

Canvas is an "open-built-fabric" and the yarns are invariably 2 or more ply which is absolutely essential for such fabrics and which gives uniform thickness.

The sail-cloth-weave is used where well marked open spaces are desired. Art-canvas is used by artists for painting in oils. It is much lighter than sail-cloth but it must have *levelled yarns*. And for this reason, the cloth after spinning, has to be subjected to a special treatment to prepare the "*levelled-surface*" for painting. The best qualities are made of cream or bleached flax yarns but a mixture of flax and cotton is also quite common.

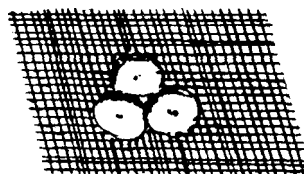


SINGLE-PLY ART CANVAS

Caravonica-cotton: (South Australia). Considerable interest is attached to this variety of cotton which is probably a hybrid between Sea-island and Peruvian cotton. But the most important and essential features of Sea-island are lacking.

See also *cotton*.

Carbonizing: A finishing process used in woollen or worsted fabrics, whereby the vegetable matters (burrs, etc.) are burnt-out of a fabric by dilute acids. Woollen rags are processed in a similar manner, viz., the rags are thoroughly soaked in dilute acid solutions, then dried and dusted or beaten which helps the vegetable matter to fall out as dust. The residue called "recovered-wools", are then processed by the woollen-system.



CARBONIZING

See also *recovered wools*, *reused wool*, *reprocessed wool*, *garnetting*, *burnt-out process*, *finishing*.

CMC: Carboxy-methyl-cellulose.

See *syndets*.

Cardigan: The name signifies two things—

- (a) a knitted woollen jacket named after the Crimean hero—The Earl of Cardigan,
- (b) a type of knitting stitch.

Cardigan fabrics are combination of rib and tuck stitches.

Half-cardigan is made by setting one bed of needles to form a tuck stitch on every other needle netting the other bed to knit rib stitch.

Full-cardigan is made by adjusting both beds to tuck every other stitch but with alternating needles. Here tucking occurs first on one bed and then in the other.

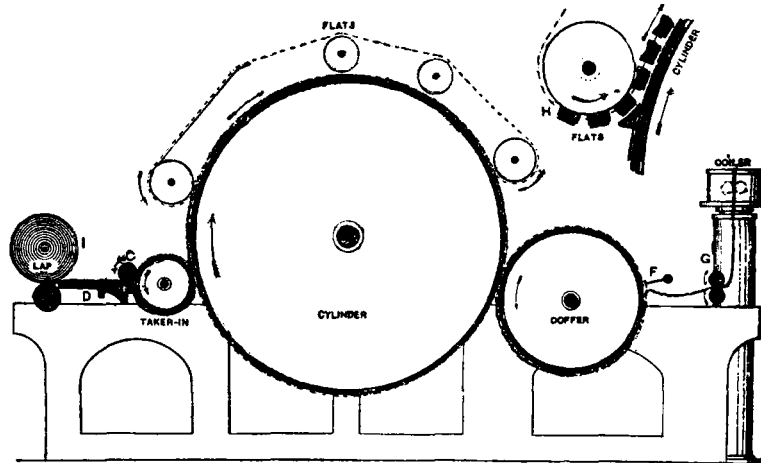
See also *knitting, tuck-stitch, rib-knit*.

Carding: The process of using a "Card" (a thistle or teasel) for combing textile fibres. This consists of combing or brushing fibres until they are straightened and placed parallel. For this, the imperfect fibres and other impurities have to be removed

latest improvements made, carding remains essentially the same as established nearly 200 years ago.

Cotton carding—since the functions of the card are to place the fibres parallel and remove other impurities so that perfect fibres can be drawn in sliver, the rollers of carding machine have to be so arranged, as would perform these functions in a more or less perfect and continuous manner.

Carding machines consist of 3 cylinders, covered with cards. (I) Taker-in is smallest. (II) Main cylinder is the largest. (III) the doffer. The outer contact cylinder lap feeds cotton to roller 'C' which rotates on a smooth iron table 'D' or feed roller. Here all the dirt is removed, and the fibres are straightened by combing. The cotton then passes along these cylinders as shown by arrows. The



COTTON CARDING

as only then can the fibres thus selected be in a condition for further treatments. Mechanical cards came probably with the industrial revolution. James Hargreaves and Lewis Paul were two of the persons concerned with this invention and improvements to carding. Since then, innumerable attempts have been made to improve these machines, but in spite of this and also the

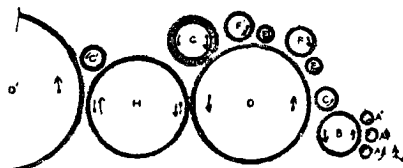
flats further flatten the fibres and also place them loose but parallel. When these are ultimately fed to doffer, its teeth draw these in light fleece and these are then further drawn into slivers, and deposited into collar can G.

Wool carding—Originally wool carding was done entirely by hand where two flat boards with *teeth* and convenient handles were employed for teasing out, lock by lock, and fibre by

fibre, so that a perfect fibre-blending resulted.

In mechanical cards, this process

Despite the efforts of making carpets by machinery in Europe and U.S.A., handloom carpets are still made and



WOOL CARDING

becomes continuous by use of rollers, the arrangement of which is as shown above:

Wool is carried forward with the machine on a travelling lattice and is fed to first feed rollers. This in turn is striped off by second, which in its turn is striped off by third, the forward-carrying-card-cylinder, and then passes over all the cylinders until completely carded wool passes out into slivers. These slivers are then wound on light bobbins and these bobbins are then placed on *Mules* for final roving and spinning operations.

See also *spinning, combing*.

Carludorica-Palmata: (The Toquilla fibre). Native of Central America —yields Toquilla fibre which is the basic raw material for Panama hats.

See also *vegetable fibres (miscellaneous), fibres*.

Carilan: (TM) for Japanese polyvinyl acetate fibre, individualised with formaldehyde.

See also *synthetic fibres, fibres*.

Carpet: A patterned fabric woven with a raised surface of tufts (either cut or looped) and used as a floor-covering. In the Orient, carpet making is still a handloom industry, but in Europe, by 19th century, carpet weaving by machines, became established.

Briefly, carpets fall into 3 main classes:

- (1) Pile-carpet either looped or cut.
- (2) Flat surface carpet (Dari or 'Sataranji').
- (3) Printed stuffs used for carpeting.

there are indications that this will remain so, especially when now these are fostered as cottage industries in many countries.

Some very important factors which are upsetting this age old industry, are the introduction of synthetic materials like linoleums or other fibrous material like coir for rough use. These new materials which are fast taking the place of carpets has the advantage of being printed in beautiful designs and the facility of cleaning these by vacuum cleaners, and so it may be quite possible that the carpet industry may be threatened by such materials.

See also *linoleum, coir, Brussels carpet, Axminster carpet*.

Carrotting process: Refer to *Special Processes and Finishing*.

Cartridge cloth: Rough plain woven silk made from silk-waste or spun nylon. Used for cartridge bags for explosives in guns.

Casein-fibre: (Bristles, fibres and yarn). A synthetic protein fibre made from milk. It was first developed in Italy in 1935, where it was called Lanital or Italian wool. Later on it was developed in U.S.A. under the name Aralac. In its chemical make up, it closely resembles wool.

See also *synthetic fibres, fibres, aralac and lanital*.

Casement-cloth: Light weight curtain-fabric of various weaves and textures of mercerized cotton, rayon, mohair, silk, nylon or mixtures. Used for curtains and screens, 1.22 to 1.27 m. (48" - 50").

Cashmere: A kind of shawl made from fine soft Kashmir goats' hair or any similar shawl.

See *Kashmir*.

Caslen: (TM) A coarse synthetic casein fibre used in mattresses, bristles, etc.

Cassimere: Twilled cloth of the finest wools.

A 2/2 twill with 4 warps and 4 picks, in its repeat. Originally a twilled, smooth, woollen suiting without nap. It is many times made with all worsted but may be made with worsted warp and woollen weft. Used for men's suiting.

See also *satin-de-laine*.

Catechu: A valuable brown dye stuff obtained from various species of acacia, araca and uncaria growing in India. The wood, leaves and fruits of these plants yield a dye, the extraction being made by boiling with water and the decoction then evaporating to dryness. Catechu is largely used for cotton in the production of brown, drab or similar colours.

Cotton is dyed by boiling it for about one hour in 100 per cent catechu decoction containing about 5 per cent CuSO_4 . After squeezing, the material is boiled for about 15 minutes in solution of potassium bichromate 0.11 kg. to 4.5 liter (4 oz to 1 gallon) then washed and dried.

By repeating this operation, two or three times, deeper shades can be obtained.

Cotton in boiling with catechu attracts the active principles catechin and catechu tannic acid, but this can acquire only pale brown colour in bichromate of potash. These are oxides to form insoluble Japonic acid which permeates the fibre and the brown colour is developed.

Catechu brown is quite fast to many operations but less so to white. Catechu and CuSO_4 is much used for dyeing the so-called khaki brown for woollen materials for military clothing.

See also *miscellaneous colours, tannic acid, vegetable colours, mordant colours, and dyeing*.

Cattail floss-fibres: See *seed fibres, vegetable fibres, fibres*.

Caustic Soda: or Sodium Hydroxide (NaOH). A strong alkali. See *Alkalis*.

Cavalry twill: Steep twill-worsted suiting like whip-cord used for army uniforms or slacks. Also made of rayon or cotton.

See also *tricotine*.

Cellophane: Or Rayon in transparent sheets. Rayon solution is run into sheet form:

- (1) Instead of the usual being drawn through spinnarets.
- (2) A similar product made from Acetate.
- (3) Various fabrics (Braided or knitted or woven) can be made into fibre-rug.

For dyeing or colouring cellophane. See *mineral colours (cellophane-colouring)*.

Celluloid: (Cellulose-nitrate). Basis for modern high explosives and useful for military purpose. These are also very useful for photo film as base and also in making toys, since this plastic can be readily moulded into desired patterns.

See also *collodian, gun-cotton, nitrated-cellulose*.

Cellulose: The name given to individual and also a group of substances. Cellulose group containing envelope of plant cells. These are complex carbohydrates or *sachharo-colloids*. Typical empirical formula ($\text{C}_6\text{H}_{10}\text{O}_5$) which resolves into monoses upon hydrolysis. Typical cellulose is white fibrous substances (familiar to us in the form of bleached cotton). Other fibrous substances are also equally characteristic in form and appearance like bleached flax, hemp, ramie, etc. It is hygroscopic and absorbs about 7 per cent its weight of moisture from air. When dry, it is electric insulator. Its specific inductive capacity about 7. When wet it is a conductor. It dissolves in 50 per cent zinc chloride solution and also in cuprammonium liquor (3 per cent CuO , 15 per cent NH_3) from which solution this can be obtained as a highly hydrated gelatinous ppt. (from ZnCl_2 by dilution with alcohol and from cuprammonium by acidification). This cellulose has very important industrial applications.

See also *cuprammonium, bemberg*.

The celluloses proper are essentially non-nitrogenous, but the celluloses of phanerograms (flowering plants) are generally associated with other complicated substances forming compound celluloses the nature of which affords convenient classification into 3 groups:

- (a) Pecto cellulose—Flax & Ramie.
- (b) Ligno cellulose—Jute.
- (c) Cuto cellulose.

Related topics: Artificial or regenerated cellulose (for processing refer to rayon). Alkali compound cellulose when treated with 15 per cent NaOH solution gives the compound alkali cellulose $C_6H_{10}O_6 \cdot 2H_2O \cdot 2NaOH$. The structural changes in the ultimate fibre are extremely remarkable and are of considerable commercial importance, since the ultimate fibre develops a very high lustre. The effect which is made use of is mercerisation.

See also *a-cellulose*, *b-cellulose*, *C.M.C.*, *linters*, *rayon*, *celluloid*, *collodion*, *mercerization*.

Cellulose-acetate dyes: Amino-azo compounds and amino-anthraquinone derivatives, containing ethanolamine or similar groups making them readily dispersible in water and generally helps in absorption by acetate fibres.

See also *acetate dyes*.

Challis: Originally made in Norwich (England), of silk warp and worsted weft, woven in high thread count with firm twisted yarns.

A light weight soft fabric of wool, rayon, cotton, plain or twilled and twisted and printed. Used for light-wear fabrics.

Chambray: Plain woven, of cotton or linen.

- Madras or Gingham type but without stripes, plaids or checks.
- White warp/colour weft.

—Variations of 2 coloured yarns are called two-toned. Sometimes with woven figures or clipped-dots. —0.91 m. (36").

Work-cambrays: Heavy weight cotton, have carded yarns, more ends than picks, dyed warp and unbleached weft.

Dress-cambrays: Combed yarn and square thread count, invariably bleached and preshrunk.

When made with alternating white and coloured warp ends is known as end-and-end Madras or Chambrays.

Fancy: Made with small figures on coloured ground.

See also *end-to-end cloth*, *gingham*, *madras*.

Chardonnet-silk: Named after Count Hailaire de Chardonnet, who was known as the father of Rayon Industry.

See also *artificial silk*, *rayon*, 1884 (*Textile Times*).

Chemical Fibres:

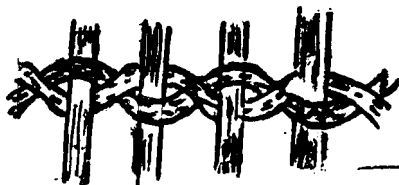
See *synthetic fibres*, *man-made fibres*, *artificial fibres*.

Cheese cloth: Cloth usually made from flax or tow yarn, of open build character resembling fine riddle or sieve used for wrapping cheese. A finer quality and texture is made for women's gowns. A similar cloth is used for inside lining in the upholstery trade and as ground for embroidery.

Chenille: (French chenille—Hairy caterpillar).

—Any weave of wool, rayon, or cotton.

—A twisted velvet cord, woven in such a manner that the short outer threads stand out at right angles to the central cord thus



CHENILLE

resembling caterpillar. Chenille is used as trimming for dress and furniture.

See also *pile-fabric*, *velveteen*, *velvet*, *Brussels carpet*.

Chemicking: A process used in bleaching and printing. Passing white goods through a solution of bleaching powder at 1° Tw. and afterwards washing and souring these.

See also *bleaching and printing (after treatments)*, *Berthollet*, *souring*.

Cheviot: Made from wool of cheviot ram.

—Sergelike worsted fabric but heavier and with a rougher surface.

—Stock or piece-dyed.

—Fulled and napped.

—Twill weave—1.37 m (54").

Used for suits and coats.

Chiffon: Light-weight soft finished velvet or taffeta.

Silk hose—2-4 thread.

Gauzelike—silk-fabric.

See also *velvet*.

Chinchilla: (Fur Peruvian and Bolivian) Size 0.30 to 0.18 m. (12" × 7") Fur 0.03 to 0.04 m. (1 to 1½") deep. One of nature's most beautiful products. Delicate, blue-gray with black shadings. It is however not so durable. Used for ladies dresses, hats and trimmings.

See also *fur*.

Chinchilla cloth: Twill, double fabric or knitted.

—Wool or cotton.

—A thick full fabric (soft and deep) with irregular surface texture covered by nubs and tufts.

—True Chinchilla is double fabric where both fabrics are twilled with long floating woollen yarns and deeply napped. The napped surface is then raised into tufts.

See also *napped fabrics*.

Chinese rug:

(a) Coarse wool with floral pattern, hand-made.

(b) Hand-made pile-rugs, with tufts of yarns knitted on warp, many

times carved in grooves, in addition to coloured patterns.

Chinosol gauze: Used especially in ophthalmic surgery.

See also *gauze*.

Chintz: (Cheet-cloth). Spot or variegated, the name was originally given to a kind of stained or painted calico manufactured in India. It is now applied to a highly glazed printed calico usually made in many colours on a light background and used as a bed or furniture covering or for baby frocks.

A light weight, plain woven, drapery fabric printed with large designs. Cotton or rayon, usually glazed, plain, embossed or quilted.

Chorinated wool: Various chemical treatments to eliminate shrinkage and felting of woven or knitted fabrics.

See also *non-felting wools*, *wool-printing*.

Chrome-spun: (TM) for solution dyed acetate fibre; colour fast to usual operations.

See also *solution dyeing*, *colour sealed*.

Circular Knit: Garment in circular form made on flat or circular machines.

See also *seamless*.

Cire: A finishing process, to produce a brilliant patent leather effect by wax, heat and pressure, on lace or woven satin, silk and rayon.

See also *special finishes*.

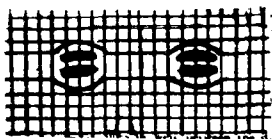
Civet hair: Fur of civet cat, size 0.23 to 0.11 m or (9 × 4½"). Short thick dark underwool with silky black top hair with irregular but unique white markings similar to skunk, but lighter in weight. Softer but less full, without any disagreeable odour. It is much warmer and durable and is used for coat linings.

See also *furs*.

Clipped-dot: Woven dots at intervals by an extra warp or weft in which

the wrong side shows floats behind these dots or figures.

See also *cushion-dots, pin-dot, float*.



CLIPPED DOT

Coated fabrics: (Coated Yarns).

(a) Fibres coated or impregnated with oil, resin, lacquers, etc. Oil cloth is the earliest example of coated fabric.

Uses: Rain-coats, window-shades, upholstery, etc.

(b) Imitation leather: plastic-coated or pyroxylin treated—1.27 m (50").

For upholstery and motor car tops.

(c) Cotton fabrics receiving various treatments to give an impervious surface, like Beutanol.

See also *back-filled, plastic goods, beutanol, tereck cloth*.

Coating: Heavy cloth for outdoor wear, mostly of cotton, wool or silk.

Now some synthetic fibres also are giving satisfactory coating fabrics.

Cochineal pigments: (Coccus-cacti). A natural dyestuff used for the production of scarlet, crimson, orange and other tints and for the preparation of lakes and carmines. Coccus-cacti is an insect.

See also *natural colours or dyes*.

Coconut fibre: (Coir). Fibrous envelope of the nut *Cocos nucifera*. Extensively used for matting, coarse carpeting, and floor-covering. Also used in rope-making. A coarse brown fibre 0.10 - 0.25 m. (4" - 10") long.

Coir is a rough strong fibrous substance obtained from the outer husk of coconuts.

See also *matting, coir*.

Cocoon: Silken sheath or covering spun by the larvae of many insects in passing into pupa or resting stage

in the life-cycle of many Lepidoptera. The last act of the caterpillar, is to spin the cocoon which offers protection in the pupa stage. In most cases, this is formed entirely of the silk produced by the spinning glands and may vary from loose mesh-work (diamond black-moth) to densely woven cocoon of the silk-worms. These cocoons are the source of the silks (both true and wild).

See also *silk, wild-silk, tussore-silk, Bombyx-mori, Attacus, Annaphae, Antherae, etc.*

Coir: A coarse brown fibre of coconut.

See *coconut-fibre*.

Collodion:

See *celluloid, soluble cotton, gun-cotton, nitrated cotton*.

Comber's waste: Waste from the combing operations.

See also *cotton-waste, wastes*.

Combed yarn: Cotton generally long-stapled, usually marked 'combed' being superior to carded yarn.

See also *spinning, carding, carded yarn, combing*.

Combination yarns: Actually a kind of core-yarn, in novelty yarns for knitting. Definitely not to be mistaken as blended yarns or mixed yarns.

See also *core-yarns, novelty yarns*.

Combing: Process of straightening of fibres, extraction of short, broken fibres, and other foreign matter. Process of making worsted yarn from long-staple wool fibres laid parallel, called tops; short left-overs called noils.

Long-stapled cotton also combed.

See also *combed yarns, spinning, carding, noils*.

Conditioning: Silks, both raw and thrown, absorbs a large quantity of moisture and also retains a certain percentage of water, being manifestly damp. It is a property of silk. As silks are mostly sold on weight, it becomes absolutely necessary to ascertain its 'condition' in respect of absorbed moisture and for this reason and purpose there

are official conditioning houses in all prominent silk-centres, whose function is to test silks and condition them and a certificate of weight issued.

The process usually followed consists of exposing silk for about 4 hours to dry heat of about 110°C (230°F.), and thereafter immediately weighing. To this weight 11 per cent is added, that being the normal proportion of moisture held by silk-fibres.

See also *silks, fibre-properties, moisture-regain*.

Continuous filaments: Synthetic or regenerated fibres and also natural silks which are reeled in continuous lengths.

(a) reeled silk.

(b) synthetic fibres—in filaments.

(c) fibre-glass, etc.

See also *staple, monofil*.

Contraction temperature: Of synthetic fibres. Also Melting-point.

See also *fibre-properties (chart), effects of heat*.

Converting: All processes the grey goods have to undergo until turned into finished material. This includes bleaching, dyeing, printing and finishing.

See also *finishing, bleaching, grey-goods, brown linen, etc.*

Cord: (French, *Cordé*—Latin, *Chorda*). A length of twisted or woven yarn which is in between rope and string in thickness. A small kind of rope.

Cordage—general term applied to all types of ropes, twines, etc.

Cord-fabrics: Quite distinct from Pique or Bedford-cord. Rayon or nylon with a distinct vertical cord—for wash-suits.

See also *bedford-cord, pique*.

Corduroy: (French, *Cordé-du-roi*). A cotton cloth (of Fustian kind), made like a ribbed velvet. Generally it is a coarse heavy material and is used for workmen's clothings, but some finer varieties are also used for ladies dresses and trousers. In U.S.A.

the name is given to this fabric because of its ribbed appearance.

A type of cotton or rayon velvet with cut-pile in warpwise ridges—plain or twilled.

Corduroy-weave: The lengthwise cords are produced after the fabric is woven. Extra weft yarns float over a number of warp yarns—which are cut after weaving and the pile is brushed and singed to produce clear corded effect. Fabrics are then dyed and the back softly napped.

Thick-set corduroy—8 to 11 cords per 0.03 m. (1")

Fine-corduroy—16 to 21 cords per 0.03 m. (1")

Used for dresses, jackets, suits, sportswear, etc.

See also *ribbed-fabrics, weaving*.

Core-yarns: Distinctly different and not to be mistaken or confused with blending of fibres or yarns. This is more in the nature of combination-yarns.

Core of one yarn wound with yarn of another fibre as cotton core with wool.

See also *combination-yarns, elastic-yarns*.

Corset: Or brassiere-fabric. Closely fitting inner bodice stiffened with whale bone and laced up.

Cotton, rayon or nylon or mixture with fine rubber woven many times as brocade, batiste, coutil, net or mesh. Coutil is especially made for corset trade.

See also *coutil, batiste*.

Cotton: (*The King of Fibres*)—Truly a (fibre) king.

“What a Royal plant this is—the world waits in attendance on its growth. The shower that falls whispering on its leaves is heard around the world. The Sun that shines on it is tempered by the prayers of all the people. The frost that chills it and the dew that descends from the stems are noted and the trespasses of a little worm upon its green leaf is more to England than the advance of a hostile army on her Asian outpost. It is gold from the instance it puts forth its tiny

shoots and its fibre is current in any bank and when loosening its fleece to the Sun it floats a sunny banner that glorifies the fields of the humblest farmer and the man is marshalled under the flag that will compel allegiance of the world and bring forth subsidy from several nations."

(W. G. Grady)

Cotton: A soft fibre, probably the most important and truly a king fibre. The cotton plant (*Gossypium harbasium*—N.O. Malvaceae), occurs in tropical and sub-tropical regions. It has a universal textile use and also in production of paper and plastics. The plant was brought from India to Europe by the Arabs and hence the name cotton (Qutun). Cotton is a vegetable seed fibre consisting of about 90 per cent cellulose—a poly-beta-deglucose and containing small per cent of wax, proteins and pectates. The cotton shrub grows to about 1.22 to 1.52 m. (4' to 5') height. The fibres are separated from the seed by ginning and then packed into bales.

The cotton plant: There are nearly 20 different species of cotton plants. All these grow in tropical and sub-tropical regions, and those growing in tropics are perennials while those in temperate regions are annuals.

The following are economically important (recorded in order of importance):

- (a) American Upland—fibre length 0.02 to 0.04 m. ($3/4$ to $1\frac{1}{2}$ ")
- (b) Asiatic—fibre length 0.02 to 0.03 ms ($3/8$ th to 1")
- (c) Sea-Island— fibre length 0.04 to 0.06 m. ($13/8$ to $2\frac{1}{2}$ ")
- (d) Egyptian—fibre length 0.04 m. ($1\frac{1}{4}$ to $1\frac{3}{4}$ ")
- (e) Peruvian—fibre length 0.03 to 0.04 m. (1 to $1\frac{1}{2}$ ")
- (f) Brazilian—fibre length 0.03 to 0.04 (1 to $1\frac{1}{4}$ ")
- (g) Coloured—experimental stage.

American Upland: This cotton is now grown in almost all cotton growing countries in the world making nearly $2/3$ rd of the total crop. The blossoms are cream white and bolls contain 4 to 5 tufts of strong fibres. Fibre is white, seed is covered with fuzz. It grows to about 0.90 to 1.22 m. ($2\frac{1}{2}$ to 4') height.

Asiatic (two varieties): Grown in

India, Persia, China and U.S.S.R. These varieties are slightly inferior to American Upland variety. The Indian cotton is coarse and its fibres vary from $3/8$ " to 1" in length.

Sea-Island: Flower are brilliant yellow and lint is light brown. This cotton is used for the manufacture of superior or fine goods and is more expensive than other kinds. Now this is also grown in West Indies.

Egyptian (or Karnak): produces silky fibres .04 m. long. Flowers are golden yellow and the colour of fibres cream to brown. Used extensively in the manufacture of underwear, hosiery and threads. It has long been preferred for the manufacture of fine clothes since this is considered superior because of its extra long staple or fibre length. Recently (1951 onwards), some cotton growers in U.S.A. have produced a new variety of cotton which equals the Egyptian Karnak. This hybrid or strain, called Pimas S.1, has an extra long uniform fibre length and has also better fibre strength as spinning tests have proved.

See also *Egyptian cotton*.

Peruvian: Produces rough fibres which appear something like wool. Used in the woollen/cotton blends especially for cheaper woollen goods, underwear, and hosiery. Some new varieties of this cotton however are promising and are generally coming into more use.

Brazilian: This is a perennial variety and need not be cultivated every year. The fibres are white and silky, but lack in "twist" which is common in most cottons. Length is usually the same as Peruvian. Seeds have very little fuzz. In quality, this is only very slightly inferior to American Upland variety.

Coloured: Coloured cotton has been a subject of research workers and breeders for a very long time. Natural freak colours appear some time, but are fugitive and fade out on exposure and therefore are of little importance. Still in experimental research stage.

Uses :

The most important uses of cotton are: apparels 40 per cent, household articles 40 per cent, and industrial use 20 per cent. The individual cotton fibre is thin, white, flexible thread.

One of the most important properties of cotton fibre is its tensile strength. It is largest for the longer and finer species (80 thousand to 1 lakh pounds per sq. inch). Its specific gravity ranges between 1.56 to 1.58. Other important physical properties are elongation, elasticity, durability, luster and water absorbancy.

This fibre-king is almost vital for the following products:

automobile-tops	mosquito-curtains
bandages	paper
book-bindings	safety bags
canvas	sheetings
carpets	shirts
cheese-cloth	shoe-laces
cloth-bags	tapes
coverlets	terry-cloth
curtains	threads
ducks	tickings
filter-cloth	tobacco-cloth
fish-nets	towelling
friction-tapes	typewriter-ribbons
fabrics	tyres
furniture covers	umbrella-cloth
handkerchiefs	wall coverings
hosiery	washing cloth
lace	yarns

What a vast kingdom indeed.

The economic constituent of cotton is cellulose. It is insoluble in water and practically all organic solvents. It does not soften or melt on heating, but decolorises at about 121° C., (250°F.) and pyrolyses at about 176° C. (350°F), in presence of air. Strong alkalis (solution) swell and then degrade cotton, especially in presence of O₂ and light. Acids and certain micro-organisms cause rapid degradation even in absence of any other agent. Cotton can be easily spun, woven, or dyed which makes it one of the most important fibres for textile industry. Cotton is a seed-fibre.

This king amongst fibres is today the most important fibre and a chief source of men's clothing as nearly 75 per cent of the world's population wears cotton clothes. It has other uses, which are even more important than cloth, viz., cellulose for paper and rayon besides cotton-seeds which are also important.

Millions in the world are directly dependent on this king-fibre and the vagaries of this king (fluctuations in prices) either make or mar millions—making them either rich or poor and

generally causing immense ups and downs.

As stated cotton is a king-fibre, but it is an arrogant king. It assumes that its virtues being so great no further skill need be exercised. Of course there can be no doubt that this king has enjoyed this unchallenged position, for cotton is a fibre with rugged virtues and unlimited hitherto unseen possibilities. And more and more qualities are added as research progresses further. An established army of researchers is already working for this king. And its kingdom is no doubt vast.

In recent years, however, this king has suddenly realised that there are other competitors for the crown and that there seems to be a general rising against it and also there are positive and hostile signs of rebellion. In fact, its crown has already tumbled down and part of its empire has already gone. And competitors are proving to be a rather tough problem and very severe headaches for this king.

Many different fibres are competing with this king-fibre and among these are silk and wool which offer competition on the finer side while enough other fibres like linen, hemp, sisal and ramie offer competition on the tougher side. But a more serious competition comes from man-made fibres like rayon and more recently from nylon and terylene.

These man-made fibres are made from substances which are negligible in price and therefore their competition is going to prove vital or almost fatal to this king.

If this arrogant king just forgets the glory of the past and tries to adjust itself to the changing environment, it may still hold its place as—not king but leader of the fibres, and may at least retain (if not regain) its losing empire, *for cotton is a fibre with rugged virtues.*

See also *fibres, vegetable-fibres, seed-fibres.*

Cotton into cloth: For making cotton cloth, the fibre must undergo the following operations.

- (1) Ginning.
- (2) Baling.
- (3) Marketing.

- (4) Manufacturing :
 - (a) cleaning or beating-breaking and beating open bales,
 - (b) combing and carding in carding machines,
 - (c) twisting into slivers for smooth and parallel lying fibres,
 - (d) roving into finer filaments,
 - (e) spinning into yarns.
- (5) Yarn-construction:
 - carding—strengthens the fibres and forms slivers,
 - combing—strengthens further and removes short-fibres,
 - drawing—parallels, blends, and reduces size of strands.
 - roving—reduces the size of strands still further,
 - spinning—twists and winds the ultimate yarns.
- (6) Sizing—to stiffen and to counteract operational wear and tear.
- (7) Weaving—into cloth by warp and weft interlacing,
- (8) Finishing:
 - (a) bleaching—to make the cloth white,
 - (b) dyeing—to colour the fabrics,
 - (c) printing—to give ornamental effects or appearance,
 - (d) finishing for special effects and making it market-attractive.

See also *weaving, cotton weaving, spinning, carding, finishing, fibre into fabric.*

Cottonade: A heavy, strong, 3 harness, weft-faced twill, mill-finished workmen's clothing fabric. Greyish-white blended warp and heavy black weft. Heavier than covert, napped. Used for workmen's clothings.

See also *covert.*

Corypha australis: A plant native of Australia. Yields a fibre similar to that used in Panama hats, viz. toquilla fibre.

See also *vegetable fibres, fibres, Carludorica palmata.*

Count: (Or yarn-number). Counts are determined by the number of hanks per pound. Unit being 840 yards. The origin of this 840 yards hank is probably that spinners used winding reel of 1½" circumference so that 80 threads (1 lea or rep) count contains 120 yards and 7 leas would contain 840 yards. The hank of 7 leas was the common measure in woollen industries in which reels were one or two yards in circumference.

(a) *Fixed weight system.*

(b) *Fixed length system.*

(a) Fixed weight system:

System	Yarn	Length unit	Standard weight
British	cotton	hank = 840 yds.	1 lb. (0.45 kg.)
"	worsted	" " 560 "	"
"	spun rayon	" " 840 "	"
Wet-spun	linen	" " 300 "	"
American	woollen	cut = 300 "	"
"	"	run = 1600 "	"
Yorkshire	"	Skein = 256 "	"
West England	"	cut = 320 "	"

(b) Fixed length system:

System	Yarn	Weight unit	Standard length
Aberdeen	woollen	1 lb.	spindle of 14,400 yds.
American	"	1 gr.	20 yds.
Dry-spun	linen	1 lb.	spindle of 14,400 yds.
Denier	raw-silk	0.05 gm.	hank of 450 meters
Denier	rayon	"	"

See also *yarn-number, denier, tex (system).*

Coutil:

- (a) Twill, herringbone-twill, or jacquard weave.
- (b) 3-harness, warp-faced herringbone-twill, closely woven, made especially for corset trade.
- (c) A fine, firm yet lightweight cotton fabric, made from hand-twisted yarns.

See also *corset*.

Covert-cloth: Mill-finished workmen's clothing. Fabric has a characteristic flaked or mottled appearance. Shade or mock-twist given to warp yarns. Cotton fabric of 2 ply-double twist warp and single or 2 ply weft. Warp yarn may have colour twisted with white to give speckled effects.

Wool-covert has twill weave running left to right.

Cotton-covert has plain weave—diagonals running right to left.

Generally twice as many warps as wefts.

American covert cloth is mill finished work-fabric and has a characteristic appearance (being mottled or flaked). Shade or mock twist given to warp yarns. Light-weights used for work-shirts, smocks, caps, etc., and heavy-weights used for trousers and uniforms.

Generally used for top-coats, sports-wear, uniforms, etc.

See also *cottonade*.

Crabbing: Permanently sets the weave.

Wool crabbing is an operation that sets the warp and weft yarns into their permanent places in the fabrics. For this, the fabric passes through a series of rollers in a crabbing machine.

The first units of the roller immerse the wool-fabrics into boiling water and the last units into cold water or tank. This application of alternating heat and cold, sets a permanent weave in the fabrics.

See also *finishing, wool, special finishes*.

Crape: A lightweight black worsted or thin, tightly twisted silk fabric usually dyed black, used mostly by the clergy and for mourning wear.

See also *crepe*.

Crash: A token term used in case of a narrow towelling 0.36 to 0.51 m. (14" to 20") wide.

(1) "Russian crash" is simplest and coarsest type of cloth made from grey flax yarns or boiled yarns. The more common types are grey, boiled, bleached, plain, twilled and fancy crash. Lately cotton is introduced as warp and mixed or jute yarns as weft, with or without fancy borders. When finished, it is cut up into lengths of 2.74 m. (3 yards) and the two ends are then sewn together. These are termed roller-towelling. (2) Any of the several fabrics having coarse uneven yarns and rough texture. Plain or printed, plain-woven of linen, cotton or rayon and jute.

See also *butcher's cloth, butcher's linen*.

Cravat: Fr. Cravete—corruption of Crote.

Name given by the French to scarf worn by French soldiers. Made of linen or muslin with broad lace. It became a fashion and that name was subsequently given to various forms of "neckerchiefs"—from very loosely tied lace cravats with long flowering ends to the elaborately folded and lightly starched linen or cambric neck-cloth.

See also *scarfs*.

Crease-resistant, Crease-retention: A urea-formaldehyde or melamine-formaldehyde treatment given to fabrics so that it would resist the tendency of creasing.

The terms crease-retention, wrinkle resistance and dimensional stability are more or less used in similar sense.

"The crease and wrinkle

Are alike in a number of ways.

But crease is the one that

quickly comes out,

While wrinkle is the one that stays."

It must be noted that a fabric which is wrinkle-resistant (as a distinctive feature), is also difficult to crease by using heat, pressure and moisture viz., ironing. The inherent hygroscopicity of natural fibres is the fundamental cause that brings about wrinkling, and moisture-regain of various fibres governs the extent to which they are humidity-sensitive to dimensional changes. Natural fibres like wool, cotton or

hygroscopic fibres like rayon will swell the most while thermoplastic fibres will swell the least. In other words—hydrophobic-fibres will swell the least while hydrophilic-fibres will swell the most.

The observed facts that hydrophobic-fibre fabrics maintain their original and satisfactory shape and are least affected in dimensional changes (or in other words, they maintain their dimensional stability) can be attributed directly to their low or almost nil moisture-regain.

Similarly the application of finishing treatments on wool, cotton or rayon—like urea-formaldehyde or melamine-formaldehyde, tends to slow down the moisture-absorption and correspondingly reduces the tendency to change and generally maintain dimensional stability.

See also *antirease-finish, finishing, special finishes, thermosetting-resin, wrinkle-resistance, dimensional stability, tebilise, moisture-regain.*

Crepe (Crape): A silk fabric of gauzy texture having a characteristic crisp or crimped appearance, woven of hand-spun silk yarn in its natural state.

There are two distinct varieties, one soft or Canton-crepe or oriental crepe and the second is hard-crepe.

For soft-crepe see Canton-crepe.

Hard-crepe: the crisp and elastic structure of this hard-crepe is not effected in either spinning or weaving, but a special process through which the fabric passes after weaving. (The details of this process are jealously guarded secrets.) Commercially these are distinguished as 1, 2, 3 or 4 ply crapes according to the yarns used in the manufacture. They are invariably dyed black and used for mourning-dresses or nun's veils.

A crepe of silk warp and worsted weft is called Bombazine.

A very successful cotton yarn imitation of it is made in Manchester and is called 'Victoria' crepe.

Crape-canton: ref. Canton-crepe.

Crape-de-chine: ref. Canton-crepe.

Crape-flat: Plain woven silk or rayon dress fabric of crepe construction. Smooth, dull but richer looking than crepe-de-chine.

Crape-French: (France) flat crepe, light weight, flat, rayon crepe for lingerie.

Crape-satin: satin-face-crepe fabric from silk in the gum. Produces dull, crapy surface after degumming.

Mourning-crepe: plain woven, of silk. Dull surface finish by hot, engraved rollers.

Romaine: silk, rayon or wool. Plain woven, a heavy crepe woven with alternating right and left twisted weft.

See also *canton-crepe, bombazine, romaine.*

Cretonne: Plain, twilled or satin.

Originally a strong white fabric with warp of hemp and linen weft. It is now applied to a strong printed cotton cloth, stouter than Chintz, used for almost the same purposes.

Usually unglazed and may be printed on both sides, sometimes with different designs. Occasionally it has a fancy woven appearance, modified by appropriate printed designs. Many times, it is made with cotton-waste weft.

Uses: Draperies and furniture covers.

Crimp: Crimp-in-staple. Crimping machine.

(a) Crimping machine is a machine for forming crimp or plates on raffles. Textile fibres are called "Crimped" when they are wavy with the distance between the peaks being shorter than 6mm. (1/4").

(b) A thin East-Indian linen fabric.

See also *finishing (special finishes), seersucker.*

Crinoline: A stiffening material made of horse hair and cotton or linen thread. Substitute for these, such as straw-like materials in making hat shapes, are also known as crinoline. Used to expand ladies skirts. The term was applied especially at the time when it was a fashion to wear greatly expanded skirts. Originally the name was given by the French to stiffen fabric of horse hair employed in women's attire.

A looped petticoat made to project all round by means of steel wires around whale bones.

See also *padding, interlining.*

Crinollete: A small crinoline causing the dress to project at the back only.
See also *finishing, padding*.

Crisp or starchless finish: Curling closely having a wavy surface.
See also *finishing, special finishes*.

Cuprammonium: One of the three processes employed in the manufacture of regenerated cellulosic fibre, in either staples or continuous filaments.

In employing cuprammonium solution, the solution can be spun or drawn in strong acid bath which instantly regenerates cellulose hydrate in continuous length.

There can be two ways in which the cuprammonium solution can be employed with advantage: (i) in making cuprammonium rayon directly, (ii) or employing cuprammonium solution for treatment of cotton fibres which are made to absorb this solution and which changes the appearance of the cotton fibres.

(i) For making cuprammonium rayon—cotton linters are dissolved in cuprammonium solution. And this cellulose-rich solution is then forced through spinnerets into an acid coagulating bath. (For making cuprammonium solution, of cellulose: NaOH and ammonium hydroxide are mixed together, at ice-cold temperature, and into this mixture are dissolved cotton linters. Great care however must be taken as the ammonia solution is strong and accidents are quite common. The entire reaction is to be maintained at ice-cold temp.)

(ii) In employing cuprammonium solution for giving woollen or felting effects to cotton fibres, the cotton fibres are dipped in cuprammonium solution (at ice-cold temp.) and kept there until the fibres have absorbed the desired degree of the solution. The cotton fibres or fabrics are then taken out and subjected to hot water treatments when the solution inside the fibres gets fixed and causes bulging out of the cell-walls. In this blown out con-

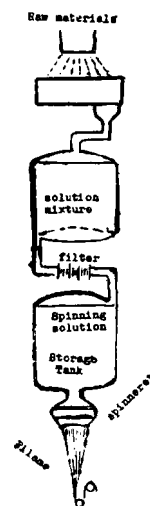
dition, cotton fibres develop wool-like or felting effects.

It can be seen from the reaction that here the cotton fibre fabrics merely act as a vehicle for the cuprammonium solution which develops into rayon upon or within the fibres and the felt-like appearance is due to the bulging out of the fibre walls.

This causes the peculiar appearance it develops after the cuprammonium treatment. This appearance is silk-like in sheen while it is felt-like in appearance.

It can also be seen that in cuprammonium solution, the copper ions that get stuck inside the fibres, are in the colloidal state, which also helps in imparting the silk-like finish. It is also obvious that cotton fibres or fabrics, in this process, are merely made to act as a vehicle to carry the desired quantity of the treatment fluid while the effect is that of rayon (which resembles silk). The finish however makes the vehicle far more attractive commercially than cuprammonium rayon.

See also *rayon, cellulose, viscose, artificial wool, artificial silk, benberg, fibres, artificial mercerization*.



FLOW CHART FOR CUPRAMMONIUM PROCESS

Cushion dot: Larger and more fluffy than pin dot, usually on marquissette or swiss, made from soft rovings.

See also *clipped dot, swiss, marquissette, pin dot.*

Cut-edge: Ribbon, of acetate, woven

wide and then cut with hot blade to seal edges.

See also *heat-sealing, ribbon.*

Cut-pile fabrics: Pile fabrics for velvets in contrast to uncut pile or frise.

See also *velvets, pile-fabrics.*

D

Dacca-mulls (muslins): Famous for generations, for its very fine count. Muslins have been made in India and were exported to U.K. at the beginning of the 18th century. The best known Indian muslins were made at Dacca (Bengal). They were mostly handspun but were so fine that even upto this day, they are not surpassed by any modern appliances. The yarns of this Dacca-mulls were so fine that 0.45 kg. (1 lb.) weight of the cotton could be spun into a thread nearly 402.34 km. (250 miles) long. Reports are current which state that a dhoti (the Indian loin-cloth) made of Dacca-mull could be packed in a match box.

The spinners of these famous Dacca-mulls were experts and have carried on this art from generation to generation. Even today these skilled workers can spin a yarn of counts exceeding 250s.

See also *mulls, muslins, jacksonet, lenos, muslins—arni, book and swiss.*

Dacron: (TM) for a polyester fibre manufactured by Du Pont. Du Pont's New Bulletin gives the following information about this fibre:

Background: The groundwork for discovery of "Dacron" (third of Du Pont's true synthetic fibers) was laid with the work of Dr. Wallace H. Carothers and his staff when they were studying the "high polymers" in the 1930's.

Polyesters were among the first "condensation" polymers investigated by Carothers. Rather than continue with an exhaustive study of polyesters, he elected to devote the major portion of his efforts to polyamides—a course that led to the discovery of nylon. British research chemists of Calico Printers Association, Ltd., after studying the published works of Dr. Carothers, initiated a further study of polyesters. Their work led to the development of a polyester fiber now known in England

as "Terylene". Independently, Du Pont researchers had undertaken a search for other useful condensation polymers, expanding the early work of Carothers.

Du Pont learned about the research of the British chemists and ultimately negotiated for the purchase of the patent rights then owned by Calico Printers Association, Ltd., specific to the polymer selected by Du Pont for development. This is the polymer from which "Dacron" polyester fiber is spun...

"Dacron" polyester fiber was previewed for the press in New York in May, 1951, at a meeting and fashion show...

Among the exhibits shown at this preview was one that promptly captured the imagination of the public—a man's business suit, destined to become known as the "swimming pool" suit. To dramatize the superior wrinkle resistance of "Dacron" when wet, this suit was worn for 67 days without ever being pressed and during that time was worn twice in a swimming pool and washed once in a washing machine. When shown at the press preview it was still in presentable condition.

In June, 1951, these suits were on the market... and in December of that year the first women's suits were introduced...

Chemical composition: The basic materials used in making "Dacron" are the two chemicals with rather forbidding names from the layman's point of view—*dimethyl terephthalate and ethylene glycol*. These compounds are derived from such familiar matter as coal, air, water, and petroleum, as in the case with other true synthetic fibers. "Dacron", however, is not chemically related to either Du Pont's nylon or "orlon" acrylic fiber.

Du Pont makes "Dacron" in four forms: as long... continuous filaments; ... staple; ... fiberfill; ... tow.

Main Characteristics: "Dacron" is an

exceptionally resilient fiber, making apparel which is outstanding in its resistance to wrinkling. Even if wearer should be caught in the rain, a man's suit or woman's pleated skirt will dry without wrinkles and with trouser creases or pleats still sharp. The fiber also has excellent recovery from wrinkling, which might occur, for example, if a garment were left packed in a suitcase for a long period. Usually in such cases the wrinkles will "hang out" in a short time, with little or no need for pressing.

A very high degree of shape retention is another property inherent in "Dacron". Properly made garments do not shrink or stretch and become baggy, even in moist, humid weather, but keep their crisp, neat appearance. "Dacron" has good esthetic properties, especially when used in recommended blends.

Next to nylon, "Dacron" is the strongest and most abrasion resistant of Du Pont's textile fibers. This ruggedness, coupled with its exceptional resilience and retention of shape, is a notable economy factor. Garments not only will prove long wearing and durable, but will cost less by saving on

frequent pressing bills.

Another economy note is the factor that fabrics of "Dacron" are washable and many spots can be scrubbed or sponged off without need for dry cleaning the entire garment.

"Dacron" also shares with the other true synthetic fibers the qualities of being neither appetizing to moths nor weakened by mildew. . . .

A table of blend levels:

65 per cent or more "Dacron" with cotton or rayon.

50 per cent or more "Dacron" with "Orlon" acrylic fiber.

50 per cent or more "Dacron" with wool.

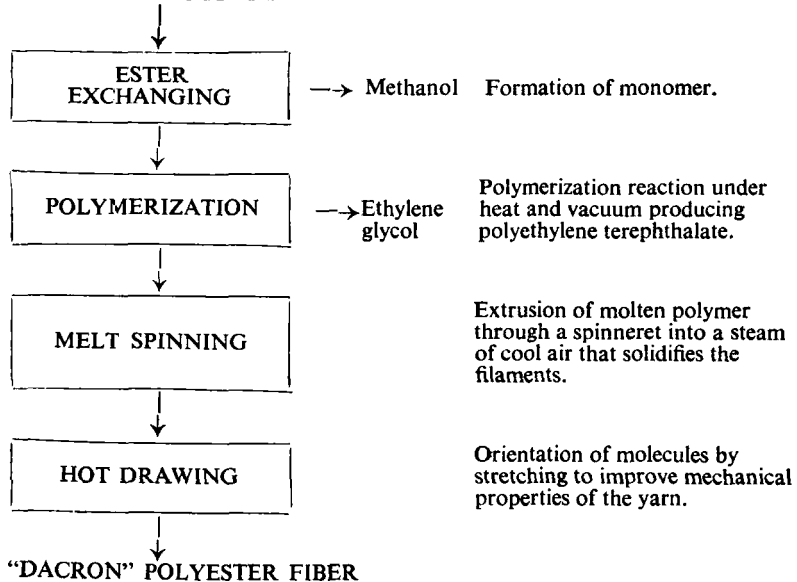
Apparel Uses: Men's wear . . . originally . . . now every member of the family . . . from dainty lingerie and children's dresses to sturdy suits and top coats, from frilly blouses to warm, insulated underwear. Industrial uses—jacketing of fire-hose, in cordage, as reinforcement for V-belts, in sewing thread, in felts and fabrics for filtration.

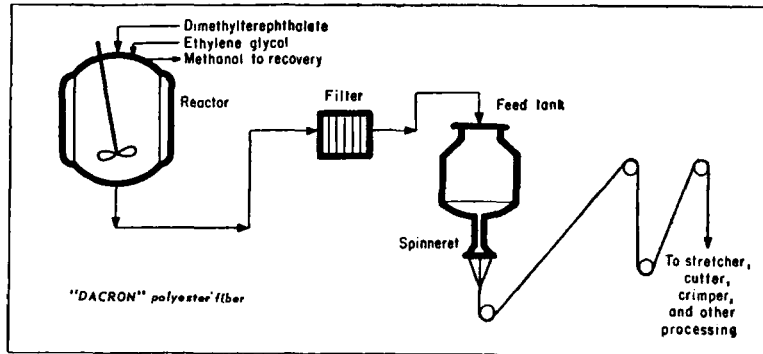
Fiberfill is used for filling material for pillows, comforters, sleeping bags, etc.

See also *terylene, synthetic fibres, thermoplastic fibres, man-made fibres, fibers.*

"DACRON" POLYESTER FIBER

DIMETHYL TEREPHTHALATE
ETHYLENE GLYCOL





PROCESS CHART FOR DACRON

Damage: This may be biological or microbiological.

Damage (biological) caused by animals:

- | | |
|---|--|
| (1) Moths (clothes moths)—maximum to textiles, esp. wool. | (5) Silver-fish—some damage to cellulose fibres. |
| (2) Beetles (carpet beetle)—maximum to textiles, esp. wool. | (6) Lice—present on some textiles, esp. furs. |
| (3) Cockroaches—damage to textiles. | (7) Fleas—present on some textiles, esp. furs. |
| (4) White ants—damage to textiles, | (8) Rats—may attack textiles. |

Damage to fabrics caused by microbiological agencies:

<i>Fibre</i>	<i>Nature</i>	<i>Damage</i>
Cotton	Cellulosic	Vs.
Vegetable fibres	Cellulosic	Vs.
Viscose rayon	Regenerated cellulose	Vs.
Cuprammonium rayon	Regenerated cellulose	Vs.
Saponified acetate	Regenerated cellulose	Ms.
Acetate rayon	Modified cellulose	R.
Wool	Native protein	Ms.
Animal hairs	Native protein	Ms.
Silk	Native protein	Ss.
Aralac, Lanital	Regenerated protein (casein)	Ms.
Vicara	Regenerated protein (zein)	R.
Soyabean	Regenerated protein (zein)	Ms.
Ardil	Regenerated protein (peanut)	Ms.
Nylon	Synthetic polyamide	R.
Orlon	Synthetic polyacrilonitrile	R.
Vinyon	Synthetic copolymer acrilonitrile and vinyl chloride	R.
Terylene, Dacron	Synthetic polyester	R.
Saran	Synthetic vinylidene chloride	R.
Polythene	Synthetic polyethylene	R.
Glass	Borosilicate	R.
Asbestos	Mineral	R.

Vs. Very susceptible. Ms. Moderately susceptible. Ss. Slightly susceptible. R. Resistant.

See also *finishing of textiles, finishing (special finishes), antiseptic treatment, mothproofing, mildew proofing.*

Damask: Of Jaquard weave.

A technical term for certain distinct type of fabrics. A firm, lustrous reversible fabric of cotton, linen, silk, wool, etc., with flat jaquard patterns, on one side, the figure is in satin and ground of plain weave while on the other, both figure and ground are reversed. Used for draperies.

The term damask probably has its origin in the ornamental silk fabrics of Damascus which were elaborately woven in many colours and sometimes with Jari (gold or silver threads). At present this denotes linen texture richly figured in weaving with various types of ornamental designs of flowers, fruits, animals, etc.

Damasks were manufactured in China, India, Persia and Greece, but none could surpass Damascus in beauty and design and demands for her silken fabrics were so great that ultimately every silken fabric richly finished with curious designs, became commercially known as Damask. At present, Damask is better known as Damask table-cloth—figured cloth of flax or tow yarns, but sometimes cotton is also used in the weave.

The finest qualities are pure white and are made of the best linen yarns. The highlights in these are obtained by floats of both warp and wefts which are set at right angles and which reflect light characteristically according to the position of the observer, shorter floats producing subdued effects. Finest results are obtained by double damask weave in which maximum float is 7 threads.

Single damask weave, with maximum float of 4 threads.



DAMASK

Cotton damask is used for toilet covers, table-cloths, etc., and is often ornamented with colours. Silk damasks are used for curtains and upholstery.

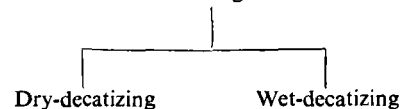
See also *dice-cloth, diaper cloth.*

Damask ticking: Closely woven cotton fabrics.

- (a) Damask woven designs—in 2 colours, mercerised cotton or combination rayon. Jaquard weave—1.37 m (54").
- (b) Blue and white striped, heavy, herringbone—twilled—0.81-0.91 m (32"-36") usually, sometimes 1.52 m (60").
- (c) Printed satin type—with tough cotton warp for mattresses and pillow covers—0.81 m (32").
- (d) Bohemian—fine, smooth plain-weave, white warp and coloured weft—0.71 to 0.91 m. (28" to 36").
- (e) Straws: blue and white stripes—coarse, sized, twilled—0.91 m. (36").

Decatizing:

Decatizing steam setting of cloth in finishing.



(i) *Dry-decatizing*—for setting lustre.

This finish is given to wool fabrics, for setting up lustre permanently while in case of rayon and silk, it gives a softer dull lustre, eliminates defects, dulls the lustre and effects evenness. The resultant fabrics have better depth and clarity.

On a perforated cylinder called "shells", a fabric is wound. The cylinder is first covered with a cotton fabric, then the fabric to be "decatized" and again an outer protective covering of cotton fabric.

The cylinder is then placed in a tank and air is taken out by a vacuum pump while steam is forced through the fabric both ways—from cylinder through the perforations to fabric and also steam is forced into the tank which works its way in the opposite direction, viz., from outer cotton to fabric, then inner cotton fabric and then to cylinder.

The cylinder is slowly rotated so that steam can penetrate through the entire fabric.

After the operation, the roller is removed to cooling tank. This moisture and heat treatment sets and evens the fabric in width and length and also sets the lustre permanently.

- (ii) *Wet-decatizing* is used to set a permanent nap, in addition to lustre. The process is the same as dry-decatizing. Only here the fabric is wound directly on the cylinder face down, and steam is forced through perforations inside the cylinder and through the fabric. In this case, sometimes water is used instead of steam. After the operation, hot water (or steam) is forced out and cold water is forced in.

See also *finishing, special finishes*.

Defects: In woven goods specific defects are known by various names like Barré, crack, crease, cockled-yarns, finger-marks, float, fuzzy, mispick, picks (broken, hang, tight), reed-marks, rough, set-mark, shuttle-mark, slug, smash, tear, warpend-broken, warp-streaks, weft (open, kinky, mixed, pulled-in), etc.

See also *weaving (defective goods)*.

Degumming: Depriving of natural gum. A process of importance in case of natural fibres where the natural gum must be removed especially in case of silk.

See also *silk, boiled-linen*.

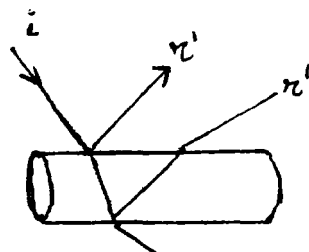
Delustering: Mechanism of delustering (of man-made fibers). A normally bright synthetic fibre can be rendered dull or lusterless (delustered) if during the manufacture, small particles of an opaque material are incorporated into the fibre.

The result of this is illustrated in the figures below. In fibre A... the reflected light (r) is further reinforced, from the refracted light and also from internally reflected light (r') which gives the specular reflection a high lustre.

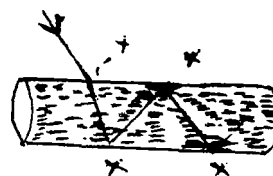
In fibre B... the small particles in the interior of the fibre cause the refracted light to be scattered

in all directions so as to mask almost completely, the reflected component of the original incident light.

See also *pigmented, pigment-print, lustre, solution dyeing, dullness, brightness, brilliant fabrics*.



Lustrous
Total
Reflection



Dull
Pigmented
Total Absorption
DELUSTERING

Delustering of rayons:

- (a) Addition of colourless pigments to spinning solution to deluster fibres.
- (b) Pigment-prints on cloth produce patterns in contrasting dull and bright.

See also *lustre, bright-filaments, pigment-printing, dullness*.

Denier: Literally means an old French silver coin of the value of 1/12th sou. Used for numbering of yarns and especially silk-yarns (true, wild) and rayons. The metric system is now almost universally recognised and forms the most suitable basis of

yarn-counts (*a*) with ref. to cotton, silk and other textiles spun from fibres, they are based on the fixed weight and variable lengths, the unit being one metre to one gram; (*b*) with ref. to raw or thrown silks, it is decided by fixed lengths and variable count-weights. The length of skein adopted was 450 meters of 0.05 grams. Thus the count of silk is expressed by number of 0.05 grams which is weight of 450 metres length. In actual practice, this differs very little from the previous method of determination of the number of deniers per 476 metres, denier being calculated on the equivalent of 0.0531 grams. English equivalent shows $33\frac{1}{2}$ deniers per 1 dr. Av. Most widely used system is the weight in grams of 9000 m. of yarns.

See also *count, yarn-number*.

Denim: A heavy cloth in 2/1 twill weave, 0.71 m (28"). Warp 68, Weft 52, Yarn No. 204.

See also *dungaree*.

Detergents: Cleansing agents due to combination of properties. Substances or mixtures having cleansing action due to lowering of surface-tension, wetting action, emulsifying and dispersion action and foam-formation.

See also *soaps, syndets, synthetic detergent, alkyl-aryl-sulphonates*.

Developed colours: Colours or dyes which are developed and fixed on the fibre itself (usually cotton) by suitable treatments. Developed colours are:

- (1) Insoluble azo colours. See Azo colours, Insoluble colours.
- (2) Developed direct colours. See Primuline colours.
- (3) Benzo-nitrol colours. See this heading.

Developed direct colours: See Primuline colours, Dyes and dyeing.

Dextrine: Thickening agent used in printing; also known as British gum.

See also *gum, adhesives, thickening-agents*.

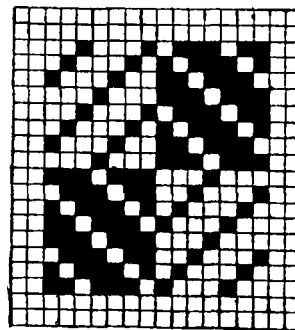
Dhoti: A loin cloth worn by Hindus. It is a light narrow cloth made with

coloured borders which are quite elaborate, and which requires dobbie loom for manufacture. The finest kinds are made from Egyptian cotton yarns. Plain-woven, usually bleached, lightweight cloth usually 4.57m. (5 yds).

Diaper cloth: Fabric originally of a rich and costly nature with embroidered geometrical designs, but now made of cotton or linen with simple woven designs. The figure shows a typical design of diaper cloth. Diapers usually are absorbent cotton in bird's-eye weave.

The floats of warp and weft are mostly in 3, a typical feature of diaper cloth-weave. Diaper cloths are mostly used for towelling, napkins and nursery towels, and also for table-cloths.

See also *weaving, bird's-eye weave, damask, dice-cloth*.



DIAPER CLOTH

Die or Dice: These fabrics were usually in rectangular forms and many times perfect squares. Now almost all are in rectangular forms, but having the same weaving principle. The dice weave is almost similar to Damask double weave, although now simpler weaves are used.

See also *damask, diaper cloth*.

Dimensional stability: There can be no doubt that swelling of the fibres is one of the fundamental causes that brings about dimensional changes, especially in the case of cellulosic fibres, and that resin-treatments (urea and melamine formaldehydes)

produce dimensional stability, depending upon their efficiency in reducing fibre swelling.

Fibre-swelling brings about crimp-changes in the yarns which appear to be the main factor in shrinkage. Dimensional changes in fabrics are in relation to moisture-absorption. The hygroscopicity of wool is well known and it is its greatest asset; but it is this property which also causes appreciable dimensional changes in wool fabrics—changes both in size of the tailored garment and also in visual appearance.

Fibre-blending: many blends are suggested to improve the properties of the garments but up to date, the only observations are that resin-finishes are the only satisfactory method of imparting true resilience to rayon or cotton.

(See *tebilised*).

Yarn twist (construction of weave): to construct a crease-resistant fabric—the fibres must be placed as relaxed and free from any strain as possible.

1/1 plain weave, with high count: the fabrics are placed under maximum strain and this limits the flexibility of the fabrics.

It is recognised that fabric flexibility increases as weave pattern becomes more complicated and these crease and wrinkle less than plain weaves.

The lower the number of picks and ends per inch, the better is the crease-resistance since lesser the number of picks and ends, the greater will be the freedom of movement of each fibre, to escape strain.

Dimensional stability is more or less an appeal to eyes of the consumer and this may be more psychological.

The creases and wrinkles in a woollen fabric are less obvious visually than in the worsted fabrics. This is because woollen surfaces are rough, heterogeneous and largely broken so that minor defects or imperfections are *not easily visible*. Also in some woollen garments, the imperfections are uniformly distributed all over the surface, so much so that they are not taken as defects at all.

As against this, the worsted fabrics are smooth and uniform and so every defect or distortion on the surface, is immediately noticeable or visible.

These optical defects or effects deserve special consideration since visibility of wrinkles is largely due to difference in character of light reflected from section of fabric adjoining the wrinkle and so the lustre of textile is involved.

See also *lustre, moisture-regain, synthetic-resins, crease-retention, wrinkle-resistance, abrasion, tebilized, thermo-setting resins, urea-formaldehyde*.

Dimity: Plain weave, of cotton or linen.

(a) A stout white cotton cloth, striped or figured in the loom by weaving with two threads. Used for lingerie, pyjamas, etc.

(b) Seersucker type of bedspread with puckered stripes. Used in hospitals.

In Dimity, the cords run lengthwise forming stripes, or both lengthwise and crosswise forming checks. The cords can be single, double or triple formed by two, three or more yarns together.

See also *seersucker, pyajama-check*.

Direct colours: They dye cotton direct without the aid of any mordant:

(a) Direct cotton colours, which see.

(b) Sulphide colours, which see.

See also *dyes, sulphide colours, direct (cotton) colours, dyer's chart*.

Direct (cotton) colours: Chemically these are mostly alkali salts of sulphonated tetrazo colours obtained by diazotizing certain diamido compounds.

Cotton: The method of dyeing cotton consists of merely boiling the material in the solution of a dyestuff, when cotton absorbs and retains the dye by reason of a special natural affinity.

Wool and Silk are dyed with the direct colours either natural or with addition of little acetic acids to dye-bath. Direct colours are not very fast. The few vegetable dyestuffs belong to this class—Turmeric, Saffron, Annathe, Safflower—but even these are fugitive and therefore of little commercial importance.

LIST OF DIRECT COLOURS

Black: Diamine Black, Columbia Black, Nyasa Black, Tabora Black, Zambaji Black, Chromanil Black, Benzo Black, Benzo Fast Black, Direct Blue-black, Pluto Black Oxydiamine Black, Diamine Jet Black, Polyphenyl Black, Union Black, Triazol Black, Titan Black, Cotton Black, Oxamine Black.

Brown: Benzo Brown, Congo Brown, Toluylene Brown, Diamine Brown, Cotton Brown, Hessian Brown, Terracotta, Mikado Brown, Catechu Brown, Wool Brown, Columbia Brown, Zambaji Brown, Benzo-chrome Brown, Direct Fast Brown, Direct Bronze Brown, Chloramine Brown, Triazol Brown, Dianol Brown, Crumpsall Direct Fast Brown.

Blue: Azo Blue, Benzoazurine, Brilliant Azurine, Sulphone-Azurine, Diamine Blue, Benzo Indigo Blue, Benzo Black Blue, Chicago Blue, Columbia Blue, Aric Blue, Zambaji Blue, Benzocyanine, Congo Blue, Diamine Sky Blue, Brilliant Benzo Blue, Benzo Chrome Black Blue, Oxamine Blue, Diphenyl Blue, Diamineral Blue, Diaminogene, Benzo Fast Blue, Diazo Indigo Blue, Brilliant Chlorazol Blue.

Grey: Benzo Gray, Benzo Black, Azomauve, Diaminogene Neutral Gray.

Green: Benzo Olive, Columbia Green, Benzo Green, Diamine Green, Direct Green, Diphenyl Green, Oxamine Green, Eboli Green.

Orange: Congo Orange, Benzo Orange, Toluylene Orange, Mikado Orange, Brilliant Orange, Columbia Orange, Diamine Orange, Pyramine Orange, Benzo Fast Orange.

Red: Congo Red, Brilliant Congo, Benzopurpurine, Brilliant Purpurine, Deltapurpurine, Diamine Scarlet, Diamine Fast Red, Resazurine, Solomon Red, Reica, Titan Pink, St. Devis Red,

Columbia Red, Naphthalgene Red, Congo Rubine, Acetopurpurine, Direct Red, Thiamine-Crimson, Ceramine, Brilliant Ceramine, Columbia Fast Scarlet, Benzo Fast Scarlet, Thiamine Red, Diamine Rose, Dongola Red, Robophenine.

Yellow: Chrysamine, Cresotni Yellow, Diamine Yellow, Carbazol Yellow, Chrysophenine, Hessian Yellow, Curcumine Yellow, Thiozol Yellow, Thioflavin Oriol, Mimosa Yellow, Columbia Yellow, Cotton Yellow, Chloramine Yellow, Direct Yellow, Diamine Fast Yellow, Diamine Gob, Sun Yellow, Stilbene Yellow, Chlorophenine, Oxyphenine.

Violet: Hessain Purple, Congo Corinth, Heliotrope, Congo Violet, Diamine Violet, Hesaain Violet, Azo Violet, Benzo Violet, Violet Black, Diamine Bordeaux, Chlorantine Lilac, Diphenyl Violet, Triazol Violet, Columbia Violet.

See also *dyes, dyeing*.

Direct printing style: The style is capable of being applied to almost every class of colours. Essential feature is that colour and fixer are both applied to the fabric simultaneously.

Refer to *Styles of Printing*.

APPLICATION OF MORDANT DYESTUFFS

This include both natural and artificial dyestuffs, the most important being Alizarine. With different metallic oxides, alizarine forms different colour lakes all exceedingly fast to light and soap. Aluminium mordant gives red and pink lakes. Iron mordant gives purple and lavender. Chromium mordant gives maroon. Uranium mordant will give gray shades.

Fe + Al gives various lakes of brown and chocolate.

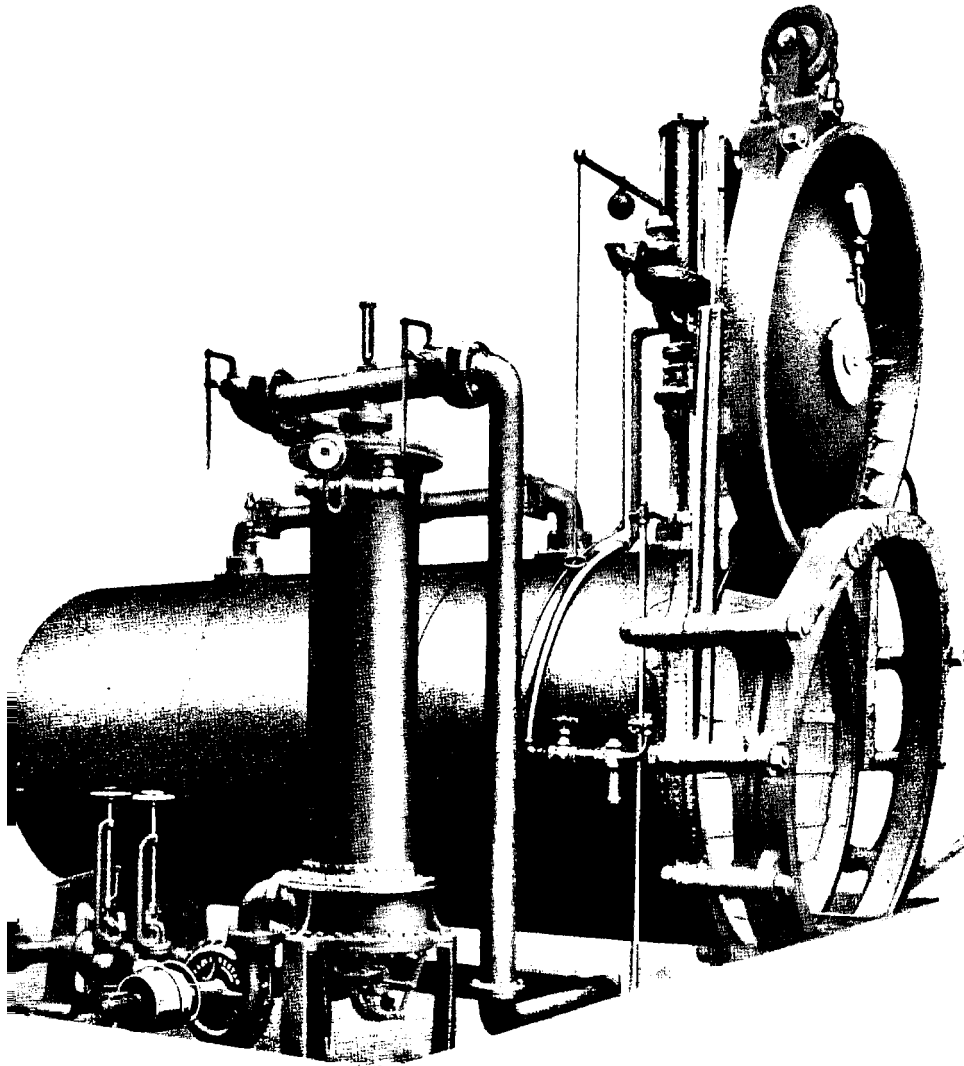
Besides Alizarine:

More important mordant dyestuffs employed are—

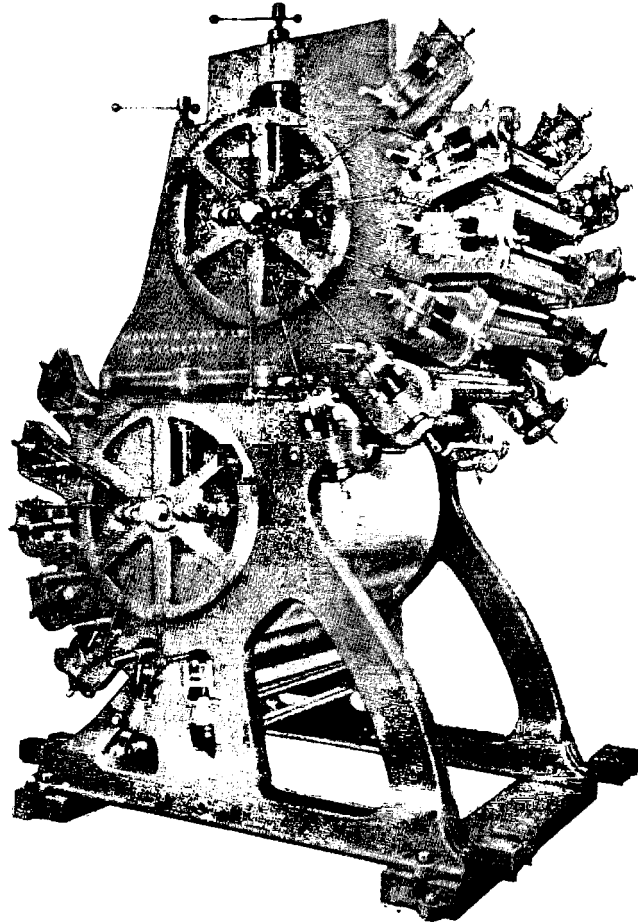
Dyestuffs	+ Mordant	Colours.
Alizarine orange	+ Al + Cr.	=	Orange & Warm Brown.
„ Bordeaux	+ Alumina	=	Violets.
„ Blue	+ Cr. & Zn.	=	Blue shades.
Cocculamine	+ Alviridin + Cr.	=	Greens & Olives.

Natural Dyestuffs are:

Logwood	+ Cr or Fe mordant	=	Blacks.
Persian berries		=	Colours ranging from brilliant yellow to Orient old gold and brown.
Catechu	+ Cr.	=	Very fast dark brown.



HORIZONTAL 'MATHER' KIER BOILER USED FOR LEACHING
(By courtesy of Mather & Platt Ltd.)



DUPLEX ROLLER PRINTING MACHINE FOR COLOURING
BOTH SIDES OF A FABRIC

(By courtesy of Mather & Platt Ltd.)

The mordants are mostly in the form of acetate, stable in cold but decomposed in steaming and combine as hydroxides with colours thus forming and fixing on fibre an insoluble lake.

Alizarine reds and pinks are the most

complicated mordant colours requiring addition of brightening agent (Tin oxalate, oils and tartaric acid) and also acetate of lime for proper production.

Reds, pinks and oranges must be prepared fresh on each day.

RED :

- 29.5 Lit. (6½ Gal.) Thick starch and tragacanth paste
 5.6 Lit. (1¼ ,,) Alizarine (20% commercial)
 4.5 Lit. (1 ,,) Nitrate of Alumina 18° TW
 2.27 Lit. (½ ,,) Acetate of Lime 28° TW
 1.2 Lit. (¼ ,,) Oxalate of Tin 10° TW
 2.27 Lit. (½ ,,) Tartaric Acid Soln. 10%

PINK:

- 29.5 Lit. (6½ Gal.) Starch and tragacanth paste
 4.5 Lit. (1 ,,) Blue shade Alizarine (20% Paste)
 5.6 Lit. (1¼ ,,) Sulpho-cyanide of Alumina 18° TW
 2.1 Lit. (¾ ,,) Acetate of Lime 28° TW
 1.2 Lit. (¼ ,,) Oxalate of Tin 10° TW
 2.27 Lit. (½ ,,) Citrate of Alumina 40° TW

ORANGES are made in a similar manner.

PURPLE:

- 43.3 Lit. (9.1/8 Gal.) Starch paste
 0.56 Lit. (1/8 ,,) Blue shade Alizarine 20%
 2.27 Lit. (½ ,,) Acetic Acid
 0.56 Lit. (1/8 ,,) Acetate of Lime 28° TW
 0.56 Lit. (1/8 ,,) Acetate of Iron 24° TW

MAROON:

- 25.0 Lit. (5½ Gal.) Paste
 4.5 Lit. (1 ,,) Alizarine 20%
 3.4 Lit. (¾ ,,) Chrome acetate 32° TW
 2.1 Lit. (¾ ,,) Lime acetate 28° TW

Blues and other colours are made by eliminating lime in recipe and replacing the Alizarine with another colour.

BLUE (Light):

- .22 Kg. (½ Lb.) Alizarine blue shade powder
 4.5 Lit. (1 Gal.) Water
 4.5 Lit. (1 ,,) Thick paste
 6.7 Lit. (1½ ,,) Chrome acetate

Natural colours (Logwood) are specially boiled.

LOGWOOD BLACK:

- 6.8 Kg. (15 Lbs.) Starch
 4.5 Kg. (10 ,,) British Gum
 20.8 Lit. (4½ Gal.) Water
 3.6 Lit. (¾ ,,) Acetic Acid
 6.7 Lit. (1½ ,,) Logwood Extract 48° TW
 2.1 Lit. (¾ ,,) Quercitron Extract 48° TW
 B o i l — C o o l & A d d
 .22 Kg. (½ Lb.) Red Prussiate of Potash
 1.2 Lit. (¼ Gal.) Water
 9.0 Lit. (2 ,,) Chrome Acetate 40° TW
 56 gms. (2 Oz.) KClO₃

QUERCITRON YELLOW:

6.7 Lit. (1½ Gal.) Quercitron extract 48° TW
 29.5 Lit. (6½ „) Water
 5.0 Kg. (11 Lbs.) Starch
 Boil—Cool—Add ¼ gallon Chrome acetate 30° TW

The above mentioned are standard formulas which may be varied or altered according to circumstances or individual taste. A little experiment can fix formulas for any printer. After printing, the goods are dried, steamed for one hour, and then washed and finished.

BASIC ANILINE DYE-STUFFS

All these colours form insoluble lakes with tannic acid—so tannic acid acts as a common fixing agent of the group.

Important basic dyestuffs are:—Methylene Blue, Methylene Violet, Rhodamine, Auramine Yellow, Saffranin, Emerald Green, Indomine Blue.

The method of application is simple. The typical formula with Methylene Blue can show the method of compounding all basic colours.

BLUE:

9.0 Lit. (2 Gal.) Methylene Blue 10% solution in water and Acetic Acid.
 27.3 Lit. (6 „) Thick starch paste
 4.5 Lit. (1 „) Tragacanth Mucilage
 4.5 Lit. (1 „) Tannic Acid solution 50%
 10 Gal.

(Blue to be replaced by other colours.)

After printing, goods containing basic dyes are “Steamed” and passed through a solution of Tartar-emetic or other salts of Antimony, whereby an insoluble double tannate of antimony and colouring matter is formed. This constitutes a much faster colour than single tannate of dyestuff.

Basic colours may be printed along with “mordant” or albumen colours.

APPLICATION OF DIRECT DYEING COLOURS

These colours have a natural affinity for cotton fibre and so require no mordants. However they are not very fast.

The general formula:

1.2 Lit. (¼ Gal.) Water
 3.6 Lit. (¾ „) Starch or Tragacanth thickening
 112 gms. (4 oz.) Phosphate of soda
 56 gms. (2 „) Sulphate of soda
 112 gms. (4 „) Colouring matter

After printing, the goods are first steamed then washed slightly in weak tepid soap solution and finally finished.

Application of Pigment Colours

Pigment colours and lakes played a very important part in textile printing before the introduction of coal-tar dyes.

These being insoluble mineral precipitates, can only be fixed mechanically and hence they require a vehicle like albumen which has proved to be the most important and the best.

Albumen forms a smooth viscous solution with cold water, mixes readily with all colours used in pigment printing and possesses that unique property of coagulating when heated to temperature of boiling water.

When cloth printed with colours containing albumen is passed through hot steam or hot acid solution (as in Indigo discharge style), the albumen coagulates, forming a tough insoluble colloidal deposit, which firmly fixes on the fibre any colour with which it is mixed.

Chiefly employed pigment printing colours are, Chrome yellow and orange, Chrome green, Artificial ultramarine, Lamp black for greys, various ochres for gold and brown, ZnO, Vermilion and its substitutes and occasionally lakes of natural and artificial colouring matter. The method of application in all these is exactly the same. These can also be mixed together to form compound shades.

For successful working of these colours—the most important factor is their being finely divided. The finer the division the better they print and more beautiful is the quality of colour.

The following is a typical formula:
by using ultra-marine blue:

- 10.8 Kg. (24 Lbs.) Artificial ultramarine.
Place in grinder and beat up gradually
- 20.8 Lit. (4½ Gal.) 40% blood albumen solution
- 11.6 Lit. (2½ „) Tragacanth mucilage (80oz. per gal.)
- .14 Lit. (1/32 „) Ammonia
- .28 Lit. (1/16 „) Glycerine
- .14 Lit. (1/32 „) Turpentine
- .28 Lit. (1/16 „) Olive or cotton seed oil

Grind thoroughly till homogeneous.

Application of Indigo

Several methods are used for printing with Indigo.

The chief methods, however, are:

- (1) Glucose process (Schlipfer & Baum)
- (2) Hydrosulphite process
- (3) Kalle's Indigo Salt process.

1 & 2: These are truly aerophoto synthetic and are based on the fact

that indigo in presence of caustic alkalis is converted into indigo white by reduction, and that the indigo white, being soluble in alkali, penetrates the fibre, where it is subsequently re-oxidized to its original insoluble state.

Glucose Process:

It is truly an aerophoto synthetic process. Preparation of cloth: The cloth is run through a box containing 30 per cent Glucose solution in water. The cloth is thus first prepared or pre-treated with Glucose and then printed with colour containing fairly ground indigo, caustic soda and dextrine thickening (in caustic soda). After printing, the cloth is *Aged* (i.e. passed through damp steam) for a few minutes to effect reduction and is then hung in a cool chamber for 1 or 2 days in order to reoxidize the indigo white to indigo by action of O₂ in the air. A wash in cold water finally completes the fixation of indigo.

The cloth may then be soaped and finished. It is then printed with the following mixtures:

According to the colours desired:—

B L U E

	<i>Dark</i>	<i>Medium</i>	<i>Light</i>
Alkaline dextrine paste	6.7 Lit. 1½ Gal.	36.3 Lit. 8 Gal.	36.3 Lit. 8 Gal.
Caustic soda 38° TW	4.5 Lit. 1 Gal.	5.6 Lit. 1¼ Gal.	8.8 Lit. 1¾ Gal.
Indigo 20% paste	6.7 Lit. 1½ Gal.	3.7 Lit. ¾ Gal.	1.2 Lit. ¼ Gal.

After printing, the printed goods should be dried quickly, and aged as soon as possible, to prevent absorption of CO₂ after which the further operations may be carried on at leisure.

Hydrosulphite Process

This process is much quicker than Glucose process. In this, the reducing agent, the indigo and alkali are all printed together on unprepared white cloth. The goods are then aged for a short time after which they are washed off first in cold water, until the indigo is thoroughly re-oxidized and then in hot water and soap.

Hydrosulphite printing colour is as follows:

- (1) 200 parts of hydrosulphite NF (or

- 100% Concentrated product)
450 parts of alkaline dextrine paste
- (2) 150 parts of Indigo 20% paste (ground in gum)
200 parts of alkaline dextrine paste
- (3) Thickening 150 parts dextrine or British gum
(850 parts NaOH 70°TW.)

Print—Dry, Age & wash in copious supply of water.

Kalle's Indigo Salt Process

Correctly speaking this is not printing with indigo, but a special preparation— which is capable of forming indigo when treated with caustic alkalis. The salt is merely dissolved in water and thickened with gum or starch, printed

and then passed directly through a solution of NaOH where indigo is immediately developed. But there is a fear in this method of colour running before it is properly developed and so in the alternative method commonly employed the cloth is printed with thickened NaOH whereby the indigo is equally well produced or developed, without any fear of running.

Insoluble Azo-Colours (Ice-Colours):

These colours do not exist as such and have to be produced on the fibre itself from their components (and so can be truly termed as aero-photo developed).

They form a range of exceedingly fast colours, and include orange, red, pink, maroon, brown, chocolate, blue and black. The colours are produced by combination of various diazo bodies with phenols, the most important being B-nepthol in NaOH—which is prepared as follows (the Nephthol prepared must be freshly made)—

47	parts B-Nepthol
3	„ R-Nepthol
107	„ NaOH—50° TW
400	„ Hot—water
10	„ Tartar-emetic
12	„ Tartaric acid.

Make up 1000 parts with hot water. The cloth is then passed through a trough containing the above solution—the excess is squeezed out in a wooden mangle and then the cloth is gently dried. It is then ready for printing.

The following colours can be obtained:

- (1) Black—Diaminidine & Benzidine
- (2) Blue—Diaminidine
- (3) Brown—Benzidine & Orthonitrotoluidine
- (4) Chocolate—Benzidine
- (5) Pink—Azo pink 2 B
- (6) Orange—Orthonitrotoluidine
- (7) Maroon— α -Nepthylamine
- (8) Red—Paranitraniline.

Other nepthols and bases give a still greater variety of shades. Of these, the two most extensively used are 1 and 2 both of which are bright fast colours.

The preparation of a typical shade—say Paranitraniline Red, is made as follows:

Paranitraniline Red

36	parts Paranitraniline C
100	parts Ice
100	„ HCl—30° TW
70	„ Water
	Mix and add quickly
24	parts Nitrite of soda 93%
70	parts Water (cold)
	Just before printing add further
100	parts of Acetate of soda
100	„ „ Ice pieces
400	„ „ Tragacanth mucilage 12%

Print
Dry
&
Wash

No sooner these diazo compounds come in contact with Nephthol prepared cloth, the colour itself is formed and fixed and requires no further treatment except washing. The other bases are diazotised in similar manner.

Sulphur Dyes

Of late, these colours have assumed considerable importance in printing.

The general recipe for printing is as follows:

3	parts by weight of colouring matter
5	parts by weight of glycerine
8	parts by weight of water
5	parts by weight of China Clay beaten up with water.
4	parts by weight of concentrated Hydrosulphite NF 50 %
75	parts by weight of alkaline Dextrine thickening.
100	

The paste is printed on unprepared bleached cloth, gently dried and passed through rapid steam ager for 5 minutes; after that the cloth is passed in full width through washing and soaping. Finally dried and finished.

Aniline Black

Refer to Aniline Black Printing.

See also *printing, styles of printing, and finishing after-treatment.*

Discharge-style: Refer under Extract printing style.

Dobbie: An attachment to loom for weaving small figures. In construction and operation, this resembles a small Jacquard and if so the selection of healds that rise and fall for any picks, is made by cards. In other

types, the selection is frequently made by lags, into which pegs are inserted to patterns in a similar manner as cards are perforated. By appropriate lever action, these pegs bring corresponding hooks into contact with oscillating giraffe-bars and these elevate the desired heald-shafts. Rollers can be substituted for pegs in such machines and they could be made single or double acting.

See also *looms, weaving, jacquards*.

Doeskin: (a) Cotton fabric: heavy twilled with nap on one side, used as backing for artificial leather or sports-wear.

(b) Wool-twill: close & compact suedelike for sports-wear in 5 harness, satin weave and warp-faced—1.37m. (54").

Doffer: The part of carding machine which strips off cotton from the cylinder after carding.

See *carding*.

Doily: Old kind of wollen stuff; a small ornamented napkin laid on or under dishes.

Domestic: Name originally used in the sense of home made in U.S. especially to home-made cotton goods. In U.K. this signifies a kind of cloth of Mexican type, if exported. May be bleached or unbleached. Staple cotton fabrics like tickings, sheets, cottonade, etc.

Donegal: Originally donegal was homespun and homewoven by Irish peasants. The coarse homespun yarns were uneven and often with spots.

Donegal-tweed: plain or twill weave, of wool, rayon or cotton.

(Ireland) hand-woven with characteristic colour spots in lumpy yarns—now in machine imitation of the same.

See also *tweed*.

Douppione: Spun silks from double cocoons for rough, dull, weft yarns in dressgoods, and draperies of distinctive textures.

Dowlas: (Coarse linen cloth). The name given to plain cloth similar to sheeting, but coarser. It is made in several qualities from linen warp and weft to tow warp and weft and is princi-

pally used for aprons, petticoats pockets, soldiers' gaiters, linings and overalls. The finer qualities are sometimes used for workmen's clothing and heavy pillowcases. The modern dowlas is a good strong closely woven linen fabric.

Drab: Thick strong grey cloth, grey or pale brown in colour.

See also *grey-cloth*.

Drabber: The coarse linen fabric chiefly used for smocks and women's outer garments.

Dressing: Starch, gum and glue sizing for finishing fabrics.

See also *finishing*.

Drill: A cloth fabric made in both linen and cotton and usually bleached and finished stuff.

A stout twill linen or cotton cloth usually three threaded. Drill is so named because weave originally used in construction was three-leaf.

Drill (British): Term for all warp-faced fabrics, twill woven, irrespective of number of harnesses used.

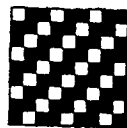
Florentine twill: 4-harness warp-faced twill. When single yarns are used, they are made with left-hand twill running towards the selvage.

Beatrice twill: 5-harness warp-faced twill.

Drill (American): 3-harness, warp-faced twill. Medium or heavy weight, strong fabrics of carded yarns.

Galatea: British, 3-harness warp-faced drill, woven with white and fast, coloured stripes, usually blue.

Weft-faced twill woven cloths are generally called twills. Warp-faced twills are called drills.



DRILL

Drugget: Woven or felted coarse woolen fabric chiefly used as carpet-covering; also called crumb-cloth.

Heavy coarse reversible rug woven in India—with cotton warp, and jute or camel hair weft.

Duck: Kind of coarse cloth for small sails, sacking, etc. Comparatively heavy and firm, plain woven cloth of cotton, with 6.5 oz. per sq. yd. weight.

- (a) Regular duck: both warp and weft yarns are plied and unsized.
- (b) Flat duck: warp yarns single and sized. 2 strands of yarns woven as one warp end, interlacing with one weft yarn, which is usually plied.

Dullness: As opposed to brightness, which can be controlled, pigmented. Process of giving permanent dullness to rayon. Finely divided Titanium oxides added to spinning solution before spinning yarns.

See also *delustring, bright filaments, pigment-print, solution dyeing.*

Dungaree: A sailor's cloth or demin. Coarse Indian calico—overalls of such cloth.

Twill weave, of cotton.

- (a) Four-leaf-warp twill with coloured weft yarns and white warp yarns—this is true dungaree.
- (b) A stout durable fabric of coarse, hard twisted, ply yarns, woven with white weft yarns and coloured warp—usually indigo-dyed blue.

See also *denim.*

Duplex printing:

See *reversible printing, printing.*

Duvetyn: (French word duvet—meaning dewy). Fabrics with characteristic suede surface, of wool, rayon, silk or cotton or mixture, with emerised nap.

Cotton duvetyn: Soft finished, twill-woven fabric which is napped, with a smooth, flat, downy surface and where the weave is masked.

Durable finish:

- (a) One that can stand laundering.
- (b) A more or less permanent finish.

See also *finishing, permanent-finish.*

Dyeing: The art of colouring textiles in such a manner that the colour may be fast or may not be ordinarily removed by such operations as washing, rubbing, sunlight, etc., to which the textiles are usually subjected.

The art of dyeing probably began with the dawn of civilization but it appears that the colours used in those days were mere stains which were fugitive and not very fast. Mostly natural dyestuffs were used. In 18th century, the art of dyeing made very rapid progress but the synthetic dyes were not introduced until 1856 when Sir W. H. Perkin prepared the first truly synthetic dye—mauvine. It is interesting to note that it was a drug (quinine) which showed the way to dye-synthesis. Evidence was available which showed that quinine formed traces of aniline on heating with caustic alkalis and working on this hypothesis, the enthusiastic 18 year old student W. H. Perkin, chalked out a plan for preparing quinine from aniline. In 1856, he obtained not quinine but a violet dye, which was called mauvine—after the flower of mallow. This is the starting point of synthetic dyestuffs.

Today, we have almost an embarrassing number—full range of dyes for almost every possible and probable shade.

The art of dyeing is a branch of applied chemistry in which a clever use of both physical and chemical principles is made in order to bring about a permanent union between the dyes and the fibres.

True dyeing therefore can only take place when the dye is in solution and/or finely divided or dispersed colloidal condition and the fibres are subjected to this dye in solution condition and then this dye is rendered insoluble or fixed by some means, when absorbed upon or within the fibres, or can be in direct contact with the fibres.

It would seem therefore that the fibres are subjected to the "half-reaction stuff" and not the end product, and that this half-reaction stuff is then made to develop into the end product after being absorbed by the fibres and subjected to further appropriate developing treatments.

There must always exist some marked physico-chemical affinity between the

fibre and the dye which would naturally depend upon the respective properties of both.

Classification of dyes

- (1) Physical dyes—direct or substantive dyes or water-soluble colours—selectively absorbed by

<i>Physical</i>	<i>Chemical</i>
direct	acid
	basic

fibres.

- (2) Chemical dyes—water-soluble. Acid and basic.
- (3) Insoluble dyes—deposited within the fibres.
- (4) Mordant dyes—producing lakes.
- (5) Pigment colours—attached to fibres by using binders.

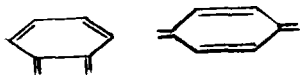
<i>Insoluble</i>	<i>Mordant</i>
azoic	chrome
ingrain	metallised
ice	basic
vat	
sulphur	
mineral	
acetate	

Classification according to dyeing mechanisms

- (1) Direct (cotton) colours.
- (2) Acid colours.
- (3) Basic colours.
- (4) Azoic dyes—(ingrain or ice).
- (5) Vat dyes—(Anthraquinones or Indigoid).
- (6) Sulphur colours.
- (7) Mineral colours—Prussian blue and mineral khaki.
- (8) Acetate dyes—(Tonamines and dispersion dyes).
- (9) Chrome dyes.
- (10) Metallised dyes.
- (11) Pigment colours.

Organic dyestuffs are molecularly complex but always contain "colour-groups" called chromophores.

- The Azo group —N=N—
- The Nitro group —NO₂
- The Nitroso group —N=O
- O and P Quinoid group



O AND P QUINOID GROUP

Such a group converts molecules into chromogen capable of producing colour but does not give dyeing properties. For this auxochromes must be introduced as—

- OH,
- NH₂,
- N(CH₃)₃,
- HSO₃, etc.

The more complex the molecule with a greater number of chromophores—the darker is its colour.

Dyeing Processes

- (a) Direct dyeing—
 - (1) Basic colours—for animal fibres.
 - (2) Acid colours—for wool.
 - (3) Direct cotton colours—for vegetable fibres.
- (b) Dyeing with reduced colour solution—
 - (1) Sulphur colours.
 - (2) Vat colours.
- (c) Producing colours on fibres (vegetable)—
 - (1) Aniline black.
 - (2) Insoluble-azo colours
 - (3) Mineral colours.
- (d) Mordanting and dyeing—
 - (1) Basic colours for cotton.
 - (2) Mordanting with metallised colours and dyeing.

Special dyeing processes are available for recently introduced synthetic fibres or hydrophobic fibres, although they

"DYER'S CHART"

Fibre	Acid	Basic	Direct	Chrome	Metal- lised	Var	Azoic	Ingrain	Sulphur	Acetate	Special	Bonded
Acetate	/									/		
Casein			S	/	/					S		
Cotton		/	/	/		/	/	/	/			
Cuprammonium		/	/	/		/	/	/	/			
Dynel		M	/	/		/	/	/		M		
Flax		/	/	/		/	/	/	/			
Glass											/	
Nylon	S	S		S	S					M		
Orlon		S	S			S				S		
Ardil	/		S	/	/	/	/	/	/	S		
Ramie	/	/	/	/	/	/	/	/	/			
Silk	/	/	S	/	/	S	/	/	/			
Soyabean	/		S	/	/					S		
Saran, Velon					Solution dyeing						/	
Vicara	/	/		/		/	/	/	/			
Viscose R	/	/	/	/		/	/	/	/			
Wool	/	/	S	/	/	S	/	/	/			

/ Means full range of the type. S means some of them but not all. M means most of them but not all.

act equally well in case of hydrophylic fibres. The following processes give a clear idea of the working.

- (1) **Cuprous ion method:** used in case of acrylonitrile fibres only.
- (2) **Pad-steam process:** dye is padded on to the cloth and then passed through a super-heated chamber at 121°C (250°F).
- (3) **Uxbridge - submarine system :** where the entire dyeing apparatus is kept under steam pressure so as to attain the temperature of 250°F.
- (4) **William's-hot-air process :** the process utilises hot oil in the bath instead of aqueous solution—thereby attaining the necessary higher temperature.
- (5) **Standfast-molten-metal-dyeing process:** The process uses molten metal (Wood's metal MP. 70°C) which can be heated to almost any desired temperature. The dye may be padded on to fabric or floated on top of the metal—The fabric is then passed through the molten metal bath which forces the dye into the fabric.
- (6) **Thermosol process:** when concentrated dyestuff is padded on to the fabric which is then passed through a hot air chamber at 205°C (400°F)—hot air permeates the dyestuff into the fibres.

All these processes were introduced after it was observed that dyes used in case of hydrophylic fibres were useless in case of synthetic fibres which are inherently hydrophobic. First this became necessary in case of acetate fibres.

In natural fibres the dyeing mechanisms were already well known and also indicated that methods employed for dyeing must vary with each fibre since the affinities exhibited by each fibre were different, with different dyestuffs: wool has greatest attraction for dyes and dyes readily; cotton has least attraction for dyes and needs pretreatments; silk occupies a place in between the two.

The accompanying "*Dyer's Chart*" will give an idea of fibres and the dyes used.

See also *converting, printing, finishing and respective readings.*

Dynel: A synthetic fibre made from petroleum, coal, air and natural gas. This is yet another synthetic fibre having many properties of wool and mostly used in clothing and wearing apparels.

Reaction chemicals are Vinyl chloride and polyacrylonitrile.

N. filament form of dynel.

Sunlight causes a slight loss of strength.

See also *man-made fibres, synthetic fibres, fibres, X-51, acrilan, vinyon,*

E

Effects of heat: For thermal stability of fibres, see page 74.

Egyptian cotton: Egyptian is derived from specie *Gossypium barbadense* Linn. Other authorities consider this variety to be a hybrid of *Paruvianum*. In length of staple Egyptian cotton is intermediate between Sea-island and the average Upland cotton. It has however certain distinct characteristics which makes it far more economically important. These special qualities are fineness, strength, elasticity and greater natural twist which help to make very fine and strong yarns—for better qualities of hosiery and for making fabrics with silk and wool and for making lace. It also mercerises very well.

Principal varieties are:

- (a) **Mitafifi:** Best known and most extensively cultivated, hardy and little affected by climatic variations. Regarded as standard Egyptian cotton.
- (b) **Abassi:** Variety obtained by seed selection. Lint is pure white, very fine and silky though less strong.
- (c) **Yannovitch:** Yields the finest and most silky lint of white E. cotton.
- (d) **Bamia:** yields brown lint, very similar to Mitafifi.
- (e) **Ashmoune:** Similar to Bamia.

Effects of Heat:

THERMAL STABILITY OF FIBRES

<i>Fibres</i>	<i>Loss of stress</i>	<i>Melts</i>	<i>Sticks</i>	<i>Decomposes</i>	<i>Contracts</i>	<i>Stretches</i>
Cotton	149°C (300°F)			150°C (302°F)		
Wool				130°C (266°F)	240°C	
Silk	76°C (170°F)			150°C (302°F)		
Acetate	86°C (226°F)	227°C (440°F)	176°C (350°F)			
Viscose	149°C (300°F)			176°C (350°F)		
Cuprammonium	149°C (300°F)			149°C (300°F)		
Nylon		250°C (482°F)				
Glass	316°C (600°F)	66°C (150°F)	Softens			
Polythene		116°C (240°F)				66°C (150°F) (5%)
Vinyl-chloride		149°C (300°F)				
Orlon, Acrilan		235°C (455°F)				
Dynel						135°C (275°F)
Dacron, Terylene		249°C (480°F)			238°C	
Vinyon	66°C (150°F)	200°C	66°C (150°F)		80°C	135°C (275°F)
Zein (Protein)	176°C (350°F)	243°C (470°F)				

Other varieties of minor importance are *Zifiri*, *Hamouli*, *Gallini*, etc.

See also *cotton*.

Eider (Down): A large marine duck (*Somateria Mollissima*), famous for its down which, for its extreme lightness and elasticity, is in great demand for filling bed-coverlets.

In Greenland and New Foundland, Eiders are plentiful and it is estimated that 75% of the total supply of down sent to Copenhagen comes from Greenland.

Eider-duck: A Northern sea duck, much sought after for its fine soft down which is used for stuffing quilts.

See also *quilt*, *padding*.

Elastic yarn: From core or cut rubber wound with cotton, rayon or nylon yarns for elastic fabrics (knitted or woven). Used chiefly in garters and socks with elastic tops.

See also *elastic fabric*, *core-yarns*.

Elastic fabrics: Cotton or rayon batiste, many times woven or knitted with elastic yarns.

See also *elastic yarns*, *core-yarns*.

Elasticity: The property of recovery or regaining the original shape when the applied external force is removed.

See also *resilience*, *stabilization*.

Elastique: Twill weave, of wool. A clear-faced, firm, hard textured, steep double twill. Diagonals from left to right. Made from hard twisted worsted yarns. Used for military suits, overcoats, etc.

Electric blanket: Two pieces of blanket fabric of any fibres or mixtures or blends or a double cloth provided with electric heating element made of flexible wires and especially insulated. Also made waterproof, flame resistant, durable and washable. Precautionary directions usually given.

Embossing: The art of producing raised patterns on the surface of textile fabrics, paper, leather or similar substances.

Embossing would refer to raised impressions produced by engraved dies

or plates pressed forcibly on the material to be embossed by mechanical means, depending upon the substance to be embossed. Embossing provides a very convenient and speedy method for producing elegant and ornamental effects.

Plain embossing: here the blocks used are grooved much deeper than those used for colour printing, so that they would hold the colour in depths for embossing and can hold colour cameo for the raised portion supplied by means of rollers in case of cameo-printing.

For embossing, copper cylinders with engraved designs are used which are mounted in calender-frames and these are made to press against rollers having the *receptive-yielding-surface*, so arranged that depressions in the engraved cylinder will exactly correspond with the elevations on those against which it is pressed.

Embossing and colour-printing are sometimes worked together by making suitably adjustments to printing machines, and using engraved rollers. The embossing rollers in this case have to be kept at high temperature while in operation.

See also *printing*, *finishing*, *finishing* (*special effects*).

Embroidery: The ornamentation of textile fabrics, or other materials, with needlework. The art dates back from when stitching began.

Embroidery of varying gradations of excellence are produced in vast quantities all over the world. (The fine shawls of Kashmir are world famous). The gaudy and sparkling effects are obtained by addition of broken pieces of mirrors or dazzle powder (made by pulverising mirror pieces or broken thermos flasks). In England embroidery was and is a favourite sparetime employment. The metallic embroidery of silk cloth can be seen in 13th & 14th centuries when English workmanship was at its best—then again in 18th and 19th centuries.

Today this art is practised all over the world.

See also *tapestry*, *brocade*.

Embroidery-Batiste: Organdy, pick, Jersey. Swiss designs in eyelets or solid-embroidery (done by machine) for neckwear, dresses, etc.

Emery paper or cloth: A type of abrasive paper or cloth of very hard material. The variety of corundum used as powder for polishing.

See also *abrasion, abrasive cloth*.

Emeraldine: Tendency to become green. A common defect observed in aniline-dyeing and printing.

See also *aniline dyeing, aniline printing*.

Emulsifying agents: See *soaps, detergents, syndets*.

Emulsion: Milky colloidal liquid prepared by mixing oil and water by means of emulsifying agent which combines with water by means of an emulsifying agent which combines with both.

See also *soaps, syndets, detergents*.

End-to-end cloth: Plain weave of gingham or Madras texture, usually made for men's shirting. The characteristic fine check effects are obtained by alternating dark and light warp yarns.

See also *chambray, madras, gingham*.

Engraving of copper rollers (for printing):

This engraving is one of the most important branches of textile-printing and on its perfection and exact working depends, almost entirely, the ultimate success of the design. There are three methods of engraving:

- (1) by hand.
- (2) by itching.
- (3) by machine.

(1) By hand: the oldest and of course the most obvious method, but very very slow. The design is transferred to roller from an oil colour tracing and then merely cut out with steel grazer. It is naturally the job of an expert. The process yields very fine results but is now employed only for very special work.

(2) By itching: In this case, an enlarged image is cast upon the zinc plate by means of an enlarging camera and lens or reflectors. The plate is then painted in required colours. This design is then transferred to varnished copper roller by a machine called the pantograph machine.

(3) By machine: This is again a specialised job and can be handled by experts only.

See also *printing*.

Eponge: Plain-woven, soft, loose or spongy fabric resembling ratine, of cotton, wool, silk, or rayon. Used for suits and dresses.

See also *ratine*.

Ercildun: Very fine, lustrous, pure white colour wool, derived from Ercildun sheep (Tasmania).

See also *wool, sheep*.

Esparto-grass: (*Stipa tenacissima*). A grass resembling the oriental grass of gardens. (Native of South Spain and North Africa). Attains the height of 0.91 to 1.22 m (3 to 4 feet). Leaves vary from 0.15 to 0.91 m. (6" to 3') in length. On account of its tenacity and flexibility, this is employed in making ropes, sandles, baskets, mats, etc. Esparto grass is 50 per cent fibres and 10 per cent straw and so have come to be regarded as a substitute for linen rags.

See also *vegetable fibres*.

Express stripes: Heavy (2-1) blue-white stripe denim for janitor's uniforms. Twilled, 0.57m. (20").

See also *hickory stripes*.

Extract printing style: (or discharge printing style). One of the most important, its range is very exclusive and modifications countless. It is used locally for destroying either the colours dyed on cloth or previously prepared mordants.

In both the cases, the resulting designs appear in white or colours, on a full rich background, the beauty of which is almost never equalled by direct printing. The result resembles something like white on black background that we get in reverse printing.

The discharging agents are organic acids, caustic-alkalies, oxidizing agents and reducing agents, each used for a specific mordant or colour to be discharged.

(a) Al and Fe mordants—discharging agent is citric acid or soda citrate with china clay as binder to prevent running.

Process: The cloth is padded with mordant solution, dried in hot air and then printed with thickened citric acid or soda citrate with china clay. It is then *aged*, 'dungen' once or twice, washed and dyed in the usual madder style. Wherever the discharge is printed, the mordant is dissolved out leaving a white design on the dyed background.

This process is usually followed in all cases.

(b) Tannate of antimony: discharge

agent is printing with NaOH—similarly discharged.

(c) Chrome discharge: goods are padded with chromium bisulphite, dried and then printed on with citric acid or NaClO₃ or K₃Fe(CN)₆. Then steamed, passed through chalk and water, well washed and dyed up in any mordant dyestuff.

(d) Turkey Red: can be discharged (both in white and in colour) by either oxidizing agents or caustic alkalies.

(i) Dyed cloth—printed with

White	2.72 Kg.	(6 lbs.) Citric or Tartaric acid
	4.54 Lit.	(1 gal.) Water
	1.81 Kg.	(4 lbs.) Dextrine

Boil together.

Run through bleaching powder solution at 18°TW.

The printed parts are completely decolourised.

(ii) Dyed cloth—printed with

Yellow	6.81 Kg.	(15 lbs.) Dextrine
	6.8 Lit.	(1½ gal.) Dextrine paste 30%
	11.3 Lit.	(2½ gal.) Water
	9.0 Kg.	(20 lbs.) Tartaric acid
	5.4 Kg.	(12 lbs.) Lead nitrate

dry
run through the bleaching liquor
chrome

(e) Alkaline discharge

Dyed cloth
printed with strongly alkaline discharge paste
passed through ager 2/3 times
washed with soda silicate

White	4.54 Kg.	(10 lbs.) Stannous chloride dissolved in
	36.3 Lit.	(8 gal.) Alkaline thickening
	9.0 Lit.	(2 gal.) Soda silicate 70° Tw.

Coloured discharges—The cloth is first passed through glucose solution and dried (before printing and after silicate treatment).

Chromed in bichromate, washed and dried.

Blue	6.81 Kg.	(15 lbs.) Indigo pure 20% paste
	.14 Lit.	(1/32 gal.) Turpentine
	.28 Lit.	(1/16 ,,) Glycerine
	6.8 Lit.	(1½ ,,) Dextrine
	31.8 Lit.	(7 ,,) Alkaline thickening

Yellow	13.6 Kg.	(30 lbs.) Lead hydrated 50%
	9.0 Lit.	(2 gal.) Water
	3.4 Lit.	(¾ ,,) Silicate of soda
	28.4 Lit.	(5½ ,,) Alkaline thickening

	Alkaline thickening	
	6.8 Kg.	(15 lbs.) Yellow dextrine
	36.3 Lit.	(8 gal.) Caustic soda 100°Tw.

Green	8 parts of yellow without silicate
	1 part of blue

(f) *P.-nitraniline-red discharge*: This is brought about by hydrosulphite-formaldehyde compound.

Dyed cloth is printed with the following:

11.34 Kg. (25 lbs.) Hydrosulphite NF or
5.6 Lit. (1½ gal.) Dextrine paste
heat till dissolved and then add :
.14 Lit. (1/32th gal.) Glycerine
20.1 Lit. (4½ gal.) Starch tragacanth thickening

Print, age twice, (4 minutes dry steam) wash well and soap.

(g) Indigo is discharged by oxidation by the following two methods:

(i) Steam discharge and

(ii) Chromate discharge.

(gi) *Discharge by steaming*:

Dry cloth

Print with—

12 lbs. citric acid dissolved in
7 lbs. caustic soda—70°Tw.
add

12 lbs. soda chlorate
5 gal. dextrine paste

Heat carefully—dissolve—then add:

1½ gal. dextrine paste
2 lbs. yellow prussiate of potassium

steam
wash.

Aluminium chlorate can be used but the process is much too energetic and tenders fibres.

(gii) *Chromate discharge*:

Dry cloth

Print

White 33.3 Lit. (8½ gal.) dextrine paste
5.4 Kg. (12 lbs.) sodium bichromate
2.3 Lit. (½ gal.) turpentine

Yellow 14.5 Kg. (32 lbs.) chrome yellow pigment
13.6 Lit. (3 gal.) albumen solution 50%
2.3 Lit. (½ gal.) tragacanth mucilage
1.2 Lit. (¼ gal.) oil (vegetable)
5.4 Kg. (12 lbs.) sodium chromate neutralised with
3.5 Lit. (¾ gal.) NaOH—70°Tw
2.3 Lit. (½ gal.) water

Dry

pass through

Black 454.5 Lit. (100 gal.) water

22.6 Kg. (50 lbs.) H₂SO₄—^{160°Tw}

22.6 Kg. (50 lbs.) Oxalic acid
Wash well and dry.

In these oxidation discharges, partial conversion of fibres (acted upon) into oxycellulose is inevitable. A second printing with thickening solution of NaNO₂ and after drying, running through H₂SO₄—50°Tw—can help considerably to minimise this effect.

(h) *Direct dyeing of substantive colours*: easily discharged by hydrosulphite and the process is the same as per p.-nitraniline red.

(i) *Manganese bronze*: discharges are effected by stannous chloride.

(j) *Sulphur colours*: discharged by chlorate or prussiate like indigo.

See also *printing, styles of printing*.

Extract wool: Made from woollen material contained in mixed goods from which vegetable fibrous matters have been destroyed by carbonising.

See also *burnt-out process, recovered wools, garnetting, recovered and re-used wools*.

F

Fabric: Cloth, goods or textile materials woven or knitted with yarns of any textile fibres.

Unwoven goods are also now recognized.

See also *weaving, fabric-headings*.

Facing silk: Black silk or rayon fabric of suitable texture for facing collars on men's dress coats. 0.71m. (28").

Fading: Loss of colour from dyed yarns or fabrics due to exposure, sun, laundering, bleaching operations, etc.

See also *serviceability of fabrics*.

Faille: Rib weave, of silk, rayon or cotton.

Soft but firm, ribbed fabric. Ribs run crosswise.

Warp-rib-weave formed by ply weft yarns.

There are more warps than wefts, is softer and with larger, flatter ribs than Grosgrain.

Silk-faille of unthrown silk with organzine warp and coarser silk weft.

See also *grosgrain, rib-weave*.

Felt: The fabric formed without weaving by means of natural tendencies of fibres of wool and certain kinds of hair, that interlace with and cling to each other.

(a) For hats: of rabbit fur, by applying heat and pressure. Inferior types also from wool. Beaver-fur, for superior qualities, called velour when napped.

(b) Wool-felts: from woollen fibres by treating with heat, pressure and moisture, 0.91 to 1.83 m. (36" to 72").

Thickness, weight and texture, varying according to ultimate use, as hats, piano-parts, or blackboard-erasers, etc.

(c) Fur into felt: this is comparatively of recent origin, although the use of fur pelts, as a body covering, is known from very early times since this was the only type of protective covering available in the days when weaving was not known or practised.

See also *felting, felted*.

Felted: A thick compact fabric constructed by compressing masses of loose fibres (wool/hair) by application of heat, pressure and moisture.

See also *felting and shrinkage, milling, non-felting wools, felt*.

Felting: For felting to be possible, a fibre must possess:

- (a) a surface-scale structure,
- (b) must be readily stretched and deformed, and
- (c) must possess the power of recovery from deformation.

One thing is quite clear—that property of felting in case of wool, resides in the surface-scale structure of the wool and removal of scales always prevents felting.

It seems therefore that the inevitable conclusion is—that the scales are

in some way directly responsible for the felting and shrinkage of wool-fabrics in the milling.

Felting and shrinkage: Carrotting process (of fur-fabrics). This process is used for enhancing the ability of fibres to felt. It is particularly suitable to rabbit and other furs.

It involves treating the tip-ends of the fibres with:

- (a) oxidizing agents like solution of mercuric nitrate in HNO_3 ,
- (b) reducing agents like sodium meta-bisulphite which ruptures bisulphite bonds.

In either case, the tips of fur-fabrics are coarser than the roots—and carrotting process makes these tips more flexible and deformable and hence they are able to follow the finer root-ends through entanglements which would otherwise have obstructed movement and felting. The important effect of the process is in attaining differential stiffness either through softening of the tip half of the fibre or hardening the root, half or full.

See also *milling, non-felting wools, felts and felted, fulling*.

Fibres:

Historical Progress of Fibres

B.C.

10000 — Furs were the first textiles used for body-coverings since the only occupation of man, in those days, was hunting.

7000 — Flax was in regular use—in Swiss dwellings.

3000 — Wool was an industry in Mesopotamia.

2500 — Silk in China.

1500 — Cotton was in regular use in India.

A.D.

1664 — Dr. Robert Hook suggested man-made fibres.

1855 — George Audemans — cellulose nitrate.

1857 — Schweitzer — Cuprammonium solution.

1889 — de Cordonnet — France — Rayon made commercially. de Cordonnet was known as father of Rayon industry.

1892 — Viscose Rayon in U.K.

1910 — Viscose Rayon in U.S.

1919 — Bemberg rayon.

A.D.

- 1924 — Acetate rayon.
 1935 — Lanital (casein fibre)—Italy.
 1936 — Aralac (casein fibre)—U.S.
 1938 — Nylon.
 1939 — Vinyon.
 1946 — Terylene in U.K.
 1948 — Vicara.
 1950 — Orlon.
 1951 — Acrilan, Dacron.
 1952 — X. 51
 1954 — Teflon.
 1958 — Fiber—K
 1959 — Lycra Spandex.

Fibre: A general term for certain structural compounds (a single strand or filament) of the tissue used in manufactures of cloth, paper, etc. Textile fibres are mostly products of organic world elaborated into their elongated forms.

Inorganic world also provides fibrous materials like asbestos and silicates and also a number of metals which can be drawn into continuous lengths in the finest possible dimensions and which can then be woven into cloth or gauze.

Common characteristics: Organic textile fibre groups are made up of colloids. Principally all these can be regarded as intrinsically devoid of structure (as against crystalloids that exhibit definite structure). These properties of matter which condition its adaptation to structural functions are homogeneous continuity of substance with a high degree of internal cohesion, elasticity and extensibility.

The colloidal matters are remarkable for their infinite diversity of variations in these vital properties (i.e. cellulose) and maintain their properties throughout even when transformed.

The animal fibres are essentially protein fibres—being composed of nitrogenous colloids having albumen, fibrines and gelatines as typical representatives. Their constitution is of a highly complex nature, as also their properties or characteristics. Much light has been thrown on their properties and their complex constitution only in recent years and so it is possible to prepare protein fibres synthetically.

Vegetable fibres are essentially cellulose and their derivatives are also typically colloidal bodies.

The conspicuous difference between these two typical colloidal groups (i.e. vegetable & animal) is their relationship with alkalis. Alkalis under certain conditions attack the animal fibres, resolve and finally dissolve them, and this action does not damage the fibre-constitution appreciably while the vegetable fibre is extraordinarily resistant to alkalis.

The animal fibres, although relatively few in number, as compared to vegetable fibres, are economically far more important.

Vegetable fibres are very numerous and they exhibit extremely diversified characteristics.

Mineral fibres: The only natural mineral fibres are asbestos and silicate (slag wool). Asbestos is by far the most important which is a kind of fibrous rock and which can be easily separated into long and white fibres. The most important characteristics of this fibre is that it is fireproof.

Synthetic or man-made fibres: These do not occur in nature, but are made in chemical laboratories where scientists are constantly experimenting for new types: These include:

- (a) Artificial fibres which are products of research carried on over a number of years e.g., rayon. These are versatile fibres and their properties are more or less controlled.
- (b) Synthetic: This is another step and are completely laboratory made and man-made.

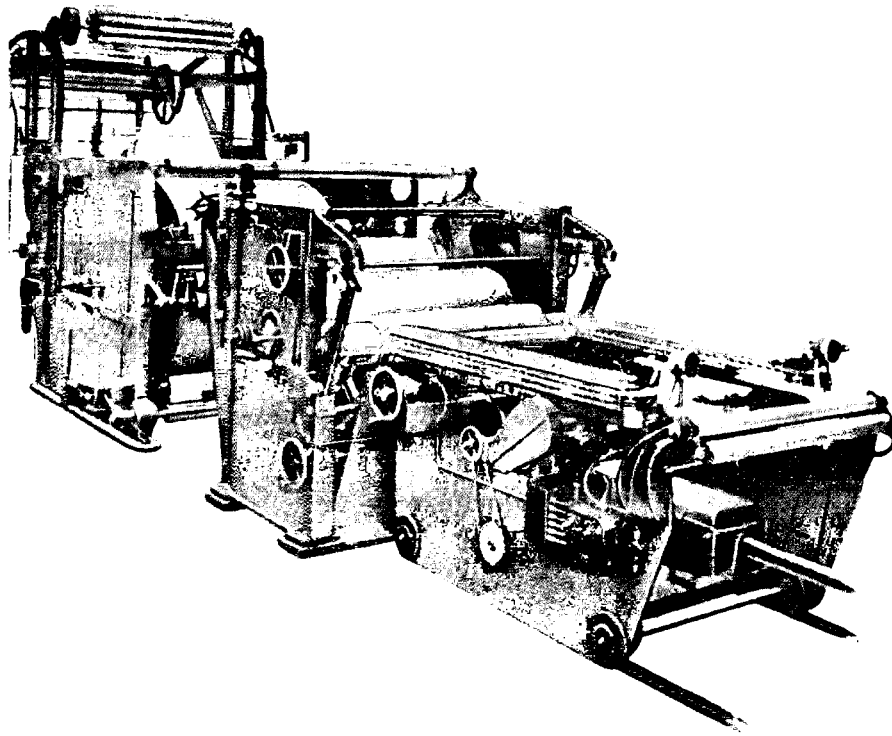
These include:

Fibre-glass, Nylon, Orlon, Dacron, Acrilan, Dynel, Saran, Velon, Vinyon, etc.

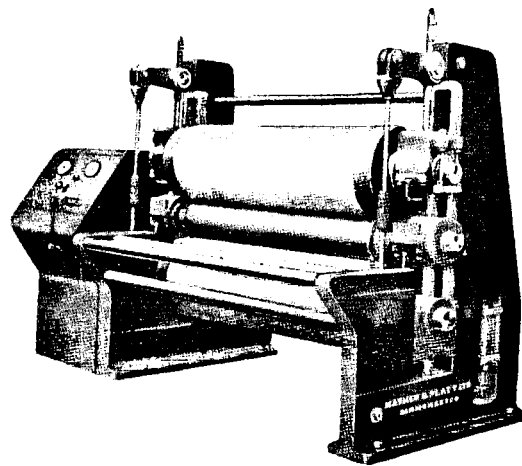
All textile fibres whether natural or man-made, consist of long-chain molecules and these molecules lie along the fibre-axis. This is a fundamental characteristic of all textile fibres.

To qualify as a satisfactory textile fibre—the fibre must satisfy some of the rigid standards and requirements, as expected of a textile fibre.

These requirements are: Physical—strength, toughness, flexibility, pliability, elasticity, fineness, density. Strength—elastic properties, extensibility, elastic recovery, rupture. Optical properties—refractive index, polarization. Warmth.



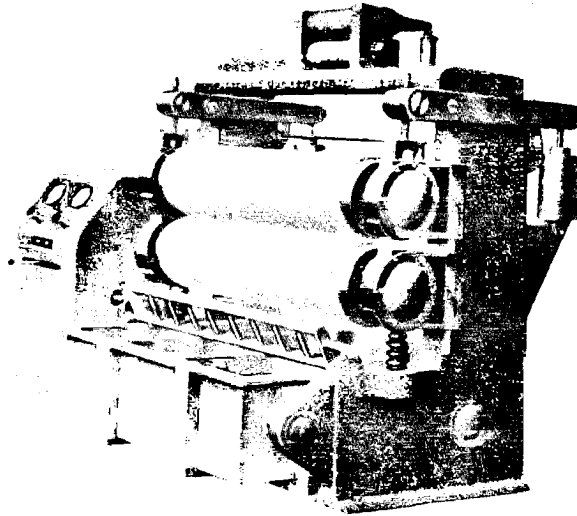
SANFORIZING RANGE USED FOR PRE-SHRINKING OF CLOTH



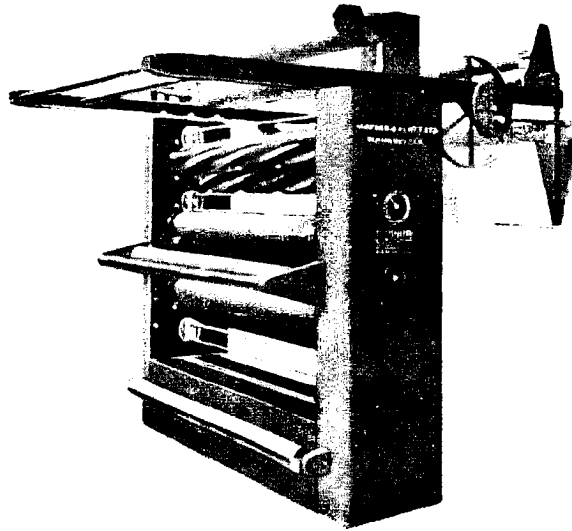
SCHREINER CALENDAR
FOR PATTERN EMBOSING

(By courtesy of Mather & Platt Ltd.)

ROLLER WASHING
MACHINE



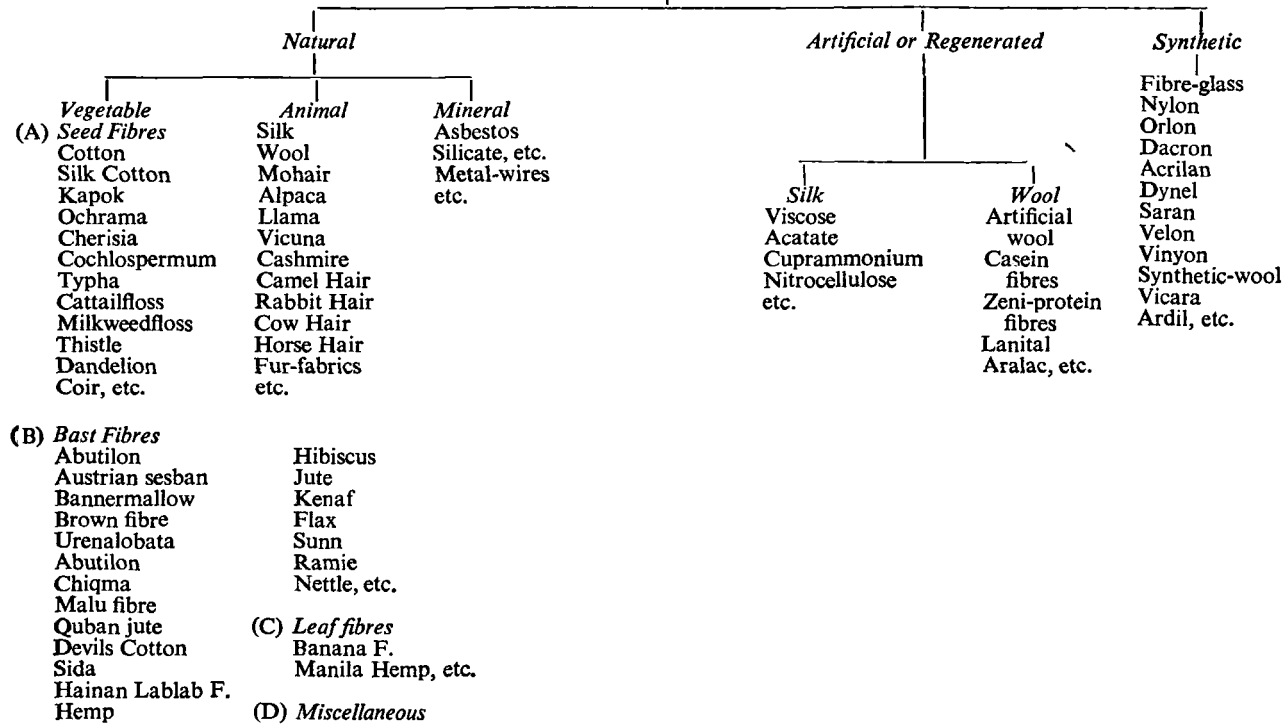
VERTICAL BRUSHING
AND MOTE-CLEARING
MACHINE



(By courtesy of Mather & Platt Ltd.)

THE 'FIBRE' KINGDOM

TEXTILE FIBRES



Chemical properties: Moisture regain, wet-strength, breaking load, extension at break, imbibition of water, dimensional changes due to hygroscopic nature.

Chemical actions: of acid, alkali, oxidizing agents, reducing agents, inorganic salts, organic solvents, and resistance of fibres to chemicals.

Biological: Characteristic—T/S & C/S which make identification by microscope possible.

The Table of Fibre-properties records most of the requirements.

Fibres to fabrics: Processes of turning fibres into fabrics are naturally determined by the structural features of each fibre.

The essential requisites for fibres to be spun into yarns include, length at least 5 mm., pliability, cohesiveness and sufficient strength, elasticity, fineness, uniformity, durability, lustre and natural twist.

The following are the common treatments:

- (a) Fibres in continuous lengths: the yarns are produced by assembling together the fibres or units of threads which are wound together and suitably twisted. Fibres treated thus are silks, synthetic fibres, etc.
- (b) The fibres of variable lengths have to be treated by more or less elaborate processes of combing and carding to make these units lie parallel and uniform, then these are drawn into continuous slivers which are then drawn and twisted into yarns.
- (c) Fibres of still shorter lengths are treated in various ways for the production of fabrics in continuous lengths. The shorter fibres are agglomerated by both dry and wet processes to felts.

See also *weaving, spinning*.

Fibre-glass: Synthetic mineral fibre made from the same materials which make the ordinary glass, viz., soda, lime-stone and sand. It is fire, chemicals and heat-proof. Fabrics made from these are curtain, daperies, mail-bags, bed-spreads, wall coverings, lamp-shades, table-cloths, etc. Many times it is woven into special types

of industrial-fabrics, which are especially required when fire or chemical resistance is desired.

See also *glass-fibre, slag-wool, angel hair, fire proofing*.

Fibre-reactive dyes: Dyes whose fixation is effected by a direct chemical linkage between fibre and dye.

See also *procion*.

Fibre-rug: Yarns made of twisted paper and woven with cotton warp, plain, twilled, figured, reversible.

See also *fibre yarns*.

Fibre yarns: Twisted paper used as spun yarns for bags, rugs and backing.

Fibroin: The chief chemical constituent of silk, cobwebs and horny skeletons of sponges. Fibroin is analogous to dermal products like hair and which forms about 80 per cent of the entire mass (Probable formula is $C_{15}H_{25}N_5O_5$). It has characteristic silkish appearance and is insoluble in water and alcohol; but dissolves in concentrated alkaline solution, mineral acids, and cuprammonium.

See also *silk, sericin*.

Filament: Slender threadlike object; a fibre; a silk or man-made fibre characterised by extreme length being commercially utilised for making yarns, either with or without twist or with a very low twist.

See also *yarns*.

Filling: (a) Used to increase the weight of fabrics.

(b) *Weft*—Term used in U.S. for weft yarns. Yarns running from selvage to selvage and at right angles to warp.

See also *weft*.

Filature: The reeling of silk and the place where processing is done.

Filatory—a machine for forming or spinning threads.

See also *silk (reeling), sericulture*.

Filter-felt: Materials of various fibres or weaves, used for filtering. Nylon, glass-fibre, etc., are useful as these are inert to chemicals.

PROPERTIES OF FIBRES

(CS) Cross Section	Cotton		Wool		Silk		Viscose R		Acetate R		Nylon		Terylene Dacron		Orlon		Dynel	
	Bean shape	Acids	Oval shape	Alkalies	Triangular	Serrated	Leaf shaped	Round	Round	Dogbone	Round	Round	Round	Round	Dogbone	Ribbon		
Solubility																		
Burning Test																		
Tenacity	3.5		1.4		4.9	2.1	1.3	5.0										
Elastic modulus	55		33		85	65	31	24										
Rupture	0.11		0.36		0.82	0.26	0.25	0.86										
Extension	7.3		38		26	21	29	20										
Density	1.52		1.32		1.35	1.52	1.33	1.14										
Moisture-regain	8.5		16		11	11	6	4.2										
Wet-dry-ratio	110		85		85	50	62	90										
Heat of wetting	13.5		27		16	25	8	7.3										
Tensile strength	90,000		22,000		73,000	58,000 39,000	Weak 22,000 St. 136,000	Strong 110,000							66,000			
Refractive Index	1.557		1.552		1.565	1.534	1.474	1.550							—			
Sp. gravity	1.52		1.32		1.33	1.52	1.33	1.14							1.18			
Imbibation of water relative percentage	45		50		degummed	100	30	13							—			
Friction coefficient	0.22		0.11		0.52	0.43	0.56	0.47							—			

Finishing: (a) Carrying the process to perfection. (b) Giving last touches.

It is convenient to make the classification of finishes for different kinds of fabrics.

It must be appreciated that greater number of such processes, especially in case of natural fibres, are empirical in character and the underlying physico-chemical principles are not fully understood even today. Thus it is almost impos-

sible to obtain the same results twice with any confidence. Even in the same works, two apparently identical lots worked on the same machine and on the same formula, many times may give appreciably different results. (Under such circumstances, why not call them as chance-reactions).

The following table can give some idea of the finishes (machines and methods) used in case of different fibres—fabrics.

FINISHING PROCESSES FOR FABRICS (*Alphabetical*)

<i>Fabric Finishes</i>	<i>Functions</i>	<i>Fibres</i>
1. <i>Beetling</i>	gives lustrous appearance	C, L.
2. <i>Brushing</i>	removes short, loose fibres	W, C, L, S, R.
3. <i>Burling</i>	“ knots in yarns	W.
4. <i>Calendering</i>	straightens, smooths, embosses	C, L, S, R.
5. <i>Carbonising</i>	eliminates vegetable matters	W.
6. <i>Crabbing</i>	permanently sets the weave	W.
7. <i>(Dry) decatizing</i>	“ “ “ lustre	W, S, R.
8. <i>Fulling</i>	renders fabrics compact and shrinks	W.
9. <i>Gigging</i>	raises the fibres	W, S, R.
10. <i>Kier-boiling</i>	prepares fabrics for bleaching	C, L.
11. <i>Napping</i>	raises the fibres	W, C, S, R.
12. <i>Perching</i>	examines and repairs the fabrics	W.
13. <i>Pressing</i>	smoothens and imparts lustre	W, S.
14. <i>Scouring</i>	removes dirt, oil and sizing materials	W, C, L, R.
15. <i>Shearing</i>	cuts the surface-fibres	All fibres.
16. <i>Shrinking</i>	corrects length and width	W, C, L, R.
17. <i>Singeing</i>	burning or removing surface-fibres and lint	W, C, L, R.
18. <i>Starching</i>	improves body, feel and adds lustre	C, L, R.
19. <i>Steaming</i>	shrinkage and conditioning	W, S, R.
20. <i>Tentering</i>	straightening and drying	All fibres.
21. <i>(Wet) decatizing</i>	setting nap and adding lustre	W.
22. <i>Weighting</i>	compensating boiled out gum	S.
<i>Special (functional) finishes</i>		
(a) <i>Absorbency</i>	absorbing and dispersing moisture	C, L, R.
(b) <i>Crease-resistance</i>	resisting crease and crushing	C, L, R.
(c) <i>Fire-resistance</i>	prevents from burning, chars but does not burn	All fibres.
(d) <i>Germ-proofing</i>	destroys germ-growth	All fibres.
(e) <i>Glazing or lustring</i>	giving lustre or shine	C.
(f) <i>Delustring</i>	making dull or reducing lustre	R, N, and other high lustre fibres.
(g) <i>Moth-proofing</i>	prevents moth attacks	W, S.
(h) <i>Mildew-resistance</i>	resists parasitic growth	W, C, L, R.
(i) <i>Starchless</i>	remains crisp without starch	C, L, R.
(j) <i>Water-proofing</i>	complete protection from water	W, C, L, R.
(k) <i>Water-repellent</i>	resists moisture	All fibres.
(l) <i>Anti-crease</i>	prevents creasing	C, L, R.
(m) <i>Anti-static</i>	eliminates electric charges	S, R, and synthetic fibres.
(n) <i>Anti-septic</i>	prevents bacterial attacks	Organic fibre.
(o) <i>Anti-slip</i>	prevents slipping tendency	Slippery fibres.

Finishes:

Pretreatments which prepare the fabrics for finishing.
Most wools are scoured while cotton and linen are Kier-boiled.

<i>Wool</i>	<i>Cotton</i>	<i>Linen</i>	<i>Rayon</i>	<i>Silk</i>
Scoured	Kier-boil	Kier-boil	Brushing	Calendering
Brushing	Bleaching	Beetling	Calender	Degumming
Burling	Brushing	Bleach	Embossing	Pressing
Carbonising	Calender	Boiling	Gigging	Shearing
Crabbing	Desize	Calender	Moiring	Singeing
(Dry) decating	Emboss	Drying	Napping	Sizing
Gigging	Mercerise	Shrinking	Shearing	Steaming
Napping	Moiring		Shrinking	Tentering
Pressing	Napping		Singeing	Weighting
Scouring	Shearing		Tentering	
Singeing	Shrinking		(Wet) decating	
Shrinking	Singeing			
Tentering	Starching			
(Wet) decating	Tentering			
	Weighting			

Finishing—Processing in correct sequence.

<i>Process</i>	<i>Cotton</i>	<i>Linen</i>	<i>Silk</i>	<i>Rayon</i>	<i>Spun</i>
Singeing	—/	—/			—/
Calendering	—/	—/	—/	—/	—/
Moiring	—/		—/	—/	—/
Embossing	—/		—/	—/	—/
Gigging	—/		—/	—/	—/
Napping	—/		—/		—/
Shearing	—/	—/	—/	—/	—/
Brushing	—/	—/	—/	—/	—/
Weighting			—/		
Tentering	—/	—/	—/	—/	—/

Cotton processing from beginning to end: inspect and mend; singe; desize; bleach, dye, print; mercerize; starch, calender; tenter; nap; shear and brush; moire; emboss; shrink.

Functional finishes: crease resistance; water resistance; spot and stain resistance; water-proofing; absorbency; crisp finish; fire resistance; resistance to flame; resistance to perspiration; moth, mildew and germ proofing;

final finishes.

Animal fibres: wool and hair.

Pretreatments: Burl—to inspect and mend. To scour—to clean the fabrics; Carbonize—removal of vegetable matter by burning.

Wet-finishes: Singe—to burn off loose fibres. Crab—to set warp and weft. Gig and nap. Wet-decating, shrink. Bleach, print, dye—to make fabric white or coloured.

Dry finishes: Shear and brush—to cut and brush off the fibres. Tenter—to stretch, straighten. Press—to smooth the fabric. Steam—to shrink. Dry-decating—to add lustre.

Functional finishes: Water-proofing, water-repellency. Crease-resistance. Moth and mildew proofing. Germ-proofing. Fire-proofing.

Silk fabric finishing from beginning to end: Singe; degumming; bleach—dye—print; nap; shear and brush; size; weighting; calender; tenter; functional finishes

Finishing (after printing): Treatment of cloth after printing.

After printing, many different treatments are necessary for finishing and these differ according to the colours used.

The following are these treatments:

- (1) Steaming: or ageing. This is absolutely necessary in case of certain styles of printing. In fact, without this, many styles of printing are not complete.
- (2) Ageing. In many styles, a super-ageing after the steaming process becomes necessary as without this the reactions are many times incomplete and colours may be washed away in washing.
- (3) Dugging is also absolutely necessary. Attempts are made to replace this but so far, the results obtained are not at all satisfactory.
- (4) Tartar-etic treatment. Only used in case of fixation of tannin mordants and basic aniline colours printed with tannic acid. The formula for the solution, through which the cloth is made to pass is as follows:
0.91 Kg. (2 lbs.) tartar-etic
0.91 Kg. (2 ,,) chalk
72.73 Lit. (16 gal.) water at 65°C
- (5) Chroming. Used in case of aniline black, catechu-brown and lead salt colours.
- (6) Washing. Most important process upon which depends a good deal of ultimate success.
- (7) Soaping. Also equally important for quality work. Alizarine dyes, steam reds, aniline black and

ice colours can withstand hot and strong soaping and are improved by it. But direct colours, basic colours and pigments require only moderate soaping.

- (8) Chemicking. A solution of bleaching powder—about $\frac{1}{4}$ Tw with addition of a little optical bleach, is used. This process removes all traces of colours after soaping.
- (9) Final finishing. In this the printed cloth undergoes various operations—the more important being softening, stiffening, embossing, polishing and smoothening.

Finally the printed goods are cut (into desired lengths), wound round flat boards, tied up, labelled and packed.

See also *printing*.

Fire-proofing: Fire was always a major problem in textile especially with vegetable fibres—fire-proofed fabrics still burn but the flame is localized and does not spread.

Earliest attempt made in fireproofing was in 1650. Alum was used as fireproofing material in 1740, Amm. phosphate in 1786 and this still holds a unique place in fireproofing.

To qualify as a compound for fireproofing, it is essential that the compound does not attack the fibre. Such compounds are many and these can be roughly divided into 2 broad categories.

- (1) Soluble salts—dried within the fabric.
- (2) Insoluble Co.—precipitated on the fabric.

The following inorganic mixtures have been used:

- (i) Borax + NH_4 salt
- (ii) NH_4 phosphate
- (iii) Borax (70%) Boric acid (30%)
- (iv) NH_4 sulphonate & NH_4 phosphate—popular in U.S.
- (v) Boro-phosphates.

This product contains Borate & Phosphate but the acidity disadvantage is eliminated.

Permanent fire-proofing: (1) Perkins method—Cloth treated with Sodium stannate, and then immersed in $(\text{NH}_4)_2\text{SO}_4$ solution; hydrated SnO is deposited in fabric (2) Zinc borate. (3) Synthetic

resin — NH_4 - monohydrogen phosphate + Urea formaldehyde.

See also *finishing*.

Flannel: Woollen or worsted fabric, plain or twill woven, with characteristic yarns. Also of mixtures or blends of different yarns.

- (a) Baby-flannel: soft, white, woollen, plain or twilled.
- (b) Dress-flannel: of various weights, compositions and textures. Twilled or plain—0.69m (27"), 0.91m (36"), 1.37m (54"), 1.52m (60").
- (c) French-flannel: soft and fine wool. Twilled.
- (d) Shirting-flannel: light-weight, of woollen or other fibres.

See also *flannellette*.

Flannellette: Soft, cotton fabric with nap on one side. Usually striped or printed—0.69m (27")—0.91m (36").

Used as outing flannel, kimonoes. See also *flannel*.

Flax: Second most important fibre to cotton — Plant : *Linum usitatissimum*.

Linen flax—a plant which is raised for its valuable fibre, since flax can make finest linen. This important natural fibre *stands second only to cotton*. The flax fibres are strong, fine and have a silky lustre.

Plantation: Is annual in growth reaching upto 40" in height. This will grow in almost any climate and soil suitable for cultivation. Harvesting takes place as soon as the stems turn yellowish and seeds turn light brown. Rippling (by hand or machine) separates seeds from the plant which are the source for linseed oil.

Retting: Separates fibre from the woody stem and also from one another. This consist of mild hydrolysis of the gummy materials which hold the fibres together and is carried out with weak alkalies and bacteria which ferment these gums.

Average 9000 lbs. of flax plant can be harvested per acre which may yield upto 500 lbs. of air-dry linen fibre.

Flax-fibre is an aggregate of long and thin fibre-cells ranging from 6" to 40" in length and diameter from 10 to 20 mms. The colour of linen is almost white with a characteristic silky lustre—hence its use in textiles—for special

effects in lustra-damasks. Its tensile strength is upto 1 lakh per sq. in., sp. gr. 1.56 and shows very little loss of strength when wet.

The average chemical composition of raw flax and boiled linen:

Raw Flax %	Constituent	Boiled Linen %
71-72	Cellulose	82-83
16-17	Total-Water	12-13
9-10	Substances (Intercellular)	2-3
2-3	Fats and waxes	2-3
1-2	Mineral ash	5-1

In India and U.S. this plant is grown chiefly for seed. There are many kinds and qualities of linens which range from very heavy to very fine. Heavier linens include sail cloth, canvas, tarpaulins, sacking and carpeting, etc.

Medium-weight-linens are duck, huckaback, crash, tickings, sheeting, collars, table-cloth, bed-sheets. Light-weight-linens: Principal uses of this are household goods, sheeting, pillowcases, napkins, handkerchiefs, towels, etc.

Linen is "cottonised" in order to increase its fineness, flexibility and spinnability. The fibres are treated with NaOH and are then mechanically crimped.

Miscellaneous linen articles include quite a variety of things such as bed-sheets, bowstrings, carpets, artists canvas, thread, lace, table-cloth, handkerchiefs, suits, draperies, dresses, towels, fine shirts, neckties, collars, upholstery fabric, etc.

Recently however demand for linen textiles in general has receded although the total world consumption of linen textiles has increased. This decline is quite conspicuous and it cannot fail to attract attention and this second to only cotton (king-fibre) also is losing its place of importance and its so far tenaciously held kingdom. Substantial research for better production methods, economy in cultivation and almost total economic utilization of waste, are needed to reorganize the losing empire of this King-Fibre. The virtues of this fibre are too well-known and well appreciated and it may still be possible to retain and also regain its losing empire if better methods are found and made available.

(Linen manufacture must be read with *flax*).

See also *vegetable fibres, fibres*.

Fleece (Wool fabrics):

- (a) A coat of wool shorn from a sheep, at one time. Fleece-wool is shorn from living animals.
- (b) Wool-fabric, a deep napped, pile-faced wool fabric.

See also *napped fabrics*.

Float: (a) Yarns left unbound in weaving for specific reasons of effecting certain designs or textures. See also *clipped-dot*.

- (b) Defects in cloth due to loose yarns floating on surface.

Fluorescent dyes: Having the peculiar properties of fluorescence, the peculiar colour appearance exhibited by certain substances exposed to sunlight and especially observable in dilute solution.

These dyes absorb radiations in ultra-violet regions and give it out at longer wavelengths in visible region.

Optical bleaches absorb ultra-violet radiations and emit light in the blue or violet end of the spectrum. The invisible light thus becomes visible and the material appears much brighter.

See also *optical-bleaches, luminiscence, iridescence*.

Fold: Yarns of strands with practically no twist. Layers of cloth on bolt.

Flat-fold: goods rolled without doubling.

Book-fold: folded once lengthwise and twice crosswise, in such a manner that it would always open bookwise from the centre.

Linen-fold: when used for linen damask, cotton and linen are rolled right side out on bolt. Wool and rayon usually opposite.

See also *yarns (novelty), respective headings*.

Footing: A narrow net 0.03m or more (1" or more) used for trimmings, etc.

Forestry-cloth: For U.S. forest service. Flannel twilled and in olive drab colour, 1.37m (54") to 1.52m (60"). See also *olive-drab*.

Foulard: A soft, light, twilled silk fabric. A silk handkerchief, used for dresses, kimonoes and neckties, etc.

French-merino: A fine twilled cloth of merino wool.

Frieze: (Frieded: napped). Twill or broken twill-weave. A coarse woollen cloth with a nap on one side (probably connected with frizz—to curl). A thick, very rough woollen cloth of very lasting quality and with a heavy nap forming small tufts or curls. Manufactured in Ireland. See also *napped fabrics*.

Frise: Pile-weave. Of wool, rayon, silk, cotton, linen, etc. A heavy piled fabric with loops uncut or partly cut to form a pattern. A durable closely woven fabric made plain or jacquard.

Fulling: To shrink the wool fabric and to make it compact. Fulling or felting or milling is a finish peculiar to wool. Action of moisture, heat and pressure, on wool-fibres, causes the wool to shrink, the weave to close up and gives a closer and fuller body to fabrics.

Fabric is dipped in soap-water or weak acid solution and then pounded and pressed. The moisture makes the fabric less elastic and more plastic. Heat speeds up this action and pressure on bundles of fibres causes the fibres to move towards the roots and as they travel they contact and intermesh with scales of the adjoining fibres, forming a close and compact mass. Machines are of two types:

- (a) rotary-fulling machines.
- (b) harness-fulling machines.

See also *finishing, felting, milling, shrinkage*.

Fur: The four most important groups (of fur bearing animals) are:

- (a) Carnivora: Bears, wolves, racoons, foxes, sables, martens, skunks, kolinsky, fitch, fishes, ermines, cats, otters, furseals, lions, tigers, leopards, jackals, etc.
- (b) Rodentia: Beavers, musk-rats, marmots, hamsters, chinchillas, hares, rabbits, squirrels, etc.
- (c) Ungulata: Lambs (all countries), mouflou, guanaco, goats, ponies, etc.
- (d) Marsupialia: Opossums, wallabis kangaroos, etc.

Names of some of the more important fur-bearing animals:

Angora Goat, Angora Rabbit, Astrakhan, Badger, Bear (Australian black, brown, grizzly, Isabelline (white), Beaver, Caracul, Cats (civets, house) Cheetah, Chinchilla, Deer, Dog, Ermine, Fisher, Fitch, Fox (blue, common cross, grey, Japanese, kit, red, silver, white), Genet, Goats, Guanaco, Hamster, Hare, Horse, Jackal, Jaguar, Kangaroo, Kolinsky, Lambs (Astrakhans, Peruvian, broadtail, Shiraz, Bokharan, Caracul lamb, Mongolian), Llama, Leopards, Lions, Lynx, Marmot, Marten (American, baum, black, Japanese, Stone), Mink, Mole, Monkey, Mouflou, Musk-ox, Musquash or musk-rat (brown, black, Russian) Nutia, Ocelot, Opposum, (American, Australian, Ringtailed, Tasmanian, Grey Black) Otter (River, Sea), Ounce (Leopard) Platypus, Pony or tartar foal, Puma, Rabbit, Raccoon, Sable (American, Canadian, Chinese, Japanese, Russian), Seal-fur, Seal-hair, Sheep, Skunk, Souslik, Squirrel, Tibet-lamb, Tiger, Vicuna, Wallaby-Kangaroo, Wallaroo-Kangaroo, Wolf, Wombat, Whales.

Preparing and dressing: Evaluation of furs is an art and practice alone can decide or judge the merits of Pelts. A lot of anticipation and knowledge also is necessary to determine what the condition of pelts will be, whether the skins will turn out soft and strong and whether the hair is in best condition for strength and beauty, etc.

The method of dressing of fur skins is totally different from that used in making hides and leather. Unlike hide, tannic acid should never be used for fur skins since it hardens the pelts and discolours and weakens fur. The chief aim in dressing fur skin should be to retain all the natural colour and oil of skin and to render it as supple as possible. This is generally accomplished by treating the skin in an alkali-bath and the moisture of the pelt is worked out mostly by crude wooden spatula and hand. It is then rubbed over by blunt wooden instruments so as to remove all superfluous flesh and unevenness. Special type of grease is then

rubbed in and the skins are then subjected to slow but continuous beating by special machine. This process with a little beating by special machine, thoroughly cleans the fur of any external greases.

After this dressing furs alter in shape and decrease in size.

Manufacturing specialities: Upto end of 19th century most of the manufacturing in fur-fabrics was done by hand. Then through the introduction of fur-sewing machines (German and American) fur work is now much better and also cheaper. But still certain parts of the garment have to be sewn by hand (viz. sleeves and collars), but for straight seams machine stitching is better and quicker.

Hatter's fur-shawls: The hat trades are the biggest customers for fur-pieces. The best felt-hats being made from beaver and musquash wool and cheaper hats from the nutia-hair or rabbit wools. In weaving, the most valuable pieces are Mohair—from Angora and Vicuna.

Frauds and Imitations: Considerable opportunities exist in the fur trade for cheating since decision of judgment of best furs is a matter of considerable experience. Most serious fur trades are selling sables—that have been topped. Many times the manufactured products are misnamed as follows:

Sold as Sables	Marmot-dyed
	Fitch-
	Rabbit- "
	Hare- "
	Musquash "
Sold as Mink	Marmot-dyed
	Musquash-,,

Sold as "Natural"—dyed and manufactured articles of all kinds.

Sold as "Real" and natural—white hair substituted in foxes and sables.

Goat skins dyed and sold as leopard, tigers, etc. Considerable experience is necessary to detect the frauds and imitations.

See also *animal-fibres, respective headings.*

Fur fabrics: Woven or knitted pile-fabrics which try to imitate fur.

See also *fur.*

Furlike-coating: Piled fabrics which resemble furs.

Fustian: A kind of coarse twilled cotton fabric (including moleskin, velv-

teen, corduroy, etc.).

See also *corduroy*, *weaving*.

Fuzzy: Characteristic hairy appearance caused by broken fibres.

G

Gabardine: Wool, Rayon, Cotton—Twill weave.

(a) Worsted, steep, pronounced warpface, right-hand twill, 63° angle, 11 harness weave—1.37m (54"). Clear or napped for men's wear or uniforms.

(b) Cotton, mercerized, 2 ply yarn light weight, for women's wear. Also men's 0.91m (36")—1.32m (52").

(c) Nylon or Terylene blended with wool for suits, slacks, etc. 1.37m (54").

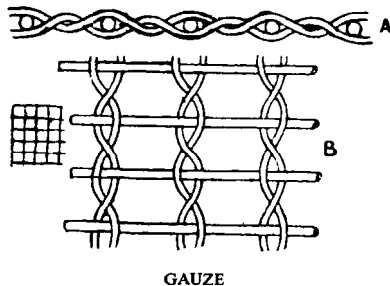
(d) Spun Rayon, simple twill, 3/4 harness, 0.91m (36"). (Not true gaberdine).

See also *twill-weave*, *poiret-twill*.

Garnetting: A shredding process—an operation in woollen manufacture whereby cloth rags or 'Wastes' are reduced to fibre stage, suitable for reworking into yarns or cloths.

See also *carbonizing*, *re-used wools*, *reprocessed wools*, *recovered wools*, *finishing processes*.

Gauze: Plain woven, open-fabric similar to tobacco-cloth or cheese-cloth used for bandages, curtains, trimmings, etc. See also *cheese-cloth*, *tobacco-cloth*.



Georgette: Originally thin silk crepe fabric of dull texture of S & Z twisted yarns in the gum. When de-

gummed—the crepe appearance is produced. Plain woven—0.76m (30") for women's wear.

Now also produced in rayon—with S and Z crepe-yarns.

Nylon similar to rayon.

Gig: A teasel machine used for producing nap in finishing.

Gigging: To raise the fibres. To produce nap used in case of wool, spun rayon, spun silk, casein or protein fibres.

Gigging or napping are fibre-raising operations which although similar, produce different surface textures. Both these help in masking the weave, in flannel or (wool) broadcloth. These processes also give the fabric softness and depth.

Gigging machines: Have cylinders on which frames are mounted. These frames contain rows of teasels. These teasels help in raising the fibres.

See also *gig*, *napping*, *teasel*, *finishing*.

Gingham: A kind of woollen or cotton cloth usually woven from coloured yarn into stripes or checks. Manufactured chiefly as dress material. The cloth is usually light or medium weight and woven of dyed or white yarns either single or multicoloured and in stripes, checks and plaids.

Fine gingham has combed yarns. Mercerized.

Lower grades, carded yarns, 0.86m (34")—1.12 m (44").

Uses: dress materials.

Varieties: Nurse's gingham; Zephyr and twine; thinner and more delicate may be carded and have embroidered designs.

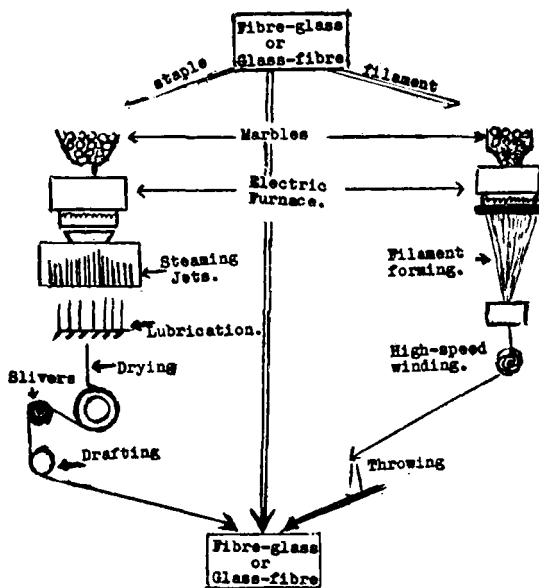
Glass-fibre: (Or fibre-glass). A man-made fibre made from the same materials as used in case of glass manufacture. This is used for drape-

ries, curtains and especially valued for its fire-proof and chemical resistance properties.

See also *man-made fibres, synthetic fibres, fibres, fibre-glass, mineral fibres.*

kept there until optically white and glazing effects can be seen, then taken out, dried and calendered.

See also *mercerization, finishing and silk finishes, cuprammonium.*



GLASS-FIBRE

Glazing: Finishing especially cotton which requires additional treatment to add the property of glazing, making it lustrous.

Fibres like cotton which do not possess the natural lustre like ramie have to be given a glaze to make them more attractive and the treatments are:

- (1) Mercerisation—treating cotton material with 10 per cent NaOH solution and boiling.
- (2) Artificial mercerisation by cuprammonium process (refer to heading).
- (3) Treating yarns with the following formula: Stearic acid, NaOH, Borax, Optical bleach.

A single final treatment with this product may be sufficient. The fibres or fabrics are to be passed in the solution or emulsion and

Glucose: ($C_6H_{12}O_6$) obtained by boiling starch with dilute mineral acids.

Glue: An adhesive substance obtained by boiling the skins and hooves, etc., of animals.

See *adhesive, gelatine, gum.*

Goat: (Felts, hairs, and fur). Goat proper, the name of a well known domesticated ruminant (*Capra hircus*).

For textile purposes the following are important:—

Angora Goat—(refer to heading).
 Maltese Goat—Hair is long and cream colour, usually harmless breed.

Syrian Goat—Excessively long hair.
 Kashmir Goat—Same as Angora.
 Nubian Goat.

Theban Goat
Nepal Goat
Chinese Goat
Wild Goat (*Capra hircus*)

Ibex Group:

Alpine wild goat—*Capra Ibex*
Sind Ibex
Niigiri Ibex
Siberian Ibex — *Capra Siberian*
Nubian Ibex — „ *Nubiana*
Simien Ibex — „ *Vali*
Caucasian Ibex— „ *Cocerica*
Spanish Ibex
Markhur Himalayan wild goat—
Capra Falconeri.

As source of important fur, goat size varies greatly. The European, Siberian and East Indian kinds are almost never used for rugs, and the skins are chiefly dressed as leather usually or finished like leather for books and furniture and kids and hides for boots and gloves while the finer wools are woven into various materials. Russian hair are dyed black for fur and carriage rugs since their brittleness with poor under-wool, is not durable.

China exports many such skins in black, white and grey, usually ready dressed or dyed brown with bear imitations which are used in Europe as leather.

Angora (Central Asia) has curly, fleecy silky white wool from 0.10 to 0.18 m (4" to 7") long. The fur is however not so much in demand as Mohairs which is spun and woven into fabrics.

Mongolian Goat has a very soft silky under-wool and after the top-hair are removed and it is dressed, it is sold as imitation mouflou. Tibet Goat is similar to Angora in its fineness of wool and is used in making Kashmir shawls.

See also *angora goat, animal fibres, fur*.

Gossamer: A thin, sheer silk fabric of the gauze type used for veils, handkerchiefs, etc.

Grass cloth: Cloth of linen, Ramie fibres. Cloth hand-made and with a slight twist.

The name given to the different kinds of coarse cloth the fibre of which is almost never that of a grass, as in summer cloth which is made

from ramie, which is not a grass at all but a nettle.

Technical Grasses: The group of plants possessing certain characters common with and belonging to the family Gramineae of the class Monocotyledons, but in practice the word grass is used in connection with so many plants resembling grass which are really not grass at all and of which the more important are:

- (a) China Grass—Ramie—*Bohmeria Nivea*
- (b) Esparto Grass.

See also *fibres, respective headings, vegetable-fibres, rope*.

Grass rug: Formerly done with woven twisted grass and cotton warp. Now instead of grass twisted paper fibres are used.

See also *fibre-rug*.

Grenadine: A circular fabric loosely woven with hand-twisted yarns that are dyed before weaving.

Curtain grenadine—often has a clipped or swivel dot or dobbie patterns Uses, neck-wear, dresses, curtains.

Grenadine is usually a thin silken cloth for ladies dresses, shawls, etc. It is of leno-weave, but finer than marquisette.

A loose, open, leno-weave fabric usually with dyed-yarns, stripes or checks; curtain fabric has dots or a dobbie-pattern.

See also *clipped dot, swivel dot, leno-weave, marquisette*.

Grenfell-cloth: Close and plain woven, water repellent, wind-proof cloth of Egyptian cotton used for shower curtains, upholstery, etc.

See also *water-repellency, wind-proofing, Byrd's cloth, Shirley-cloth*.

Grey-goods (Gray cloth), the comprehensive term which includes unbleached cotton cloths generally. The word actually is a misnomer while the appropriate term would be yellow goods, as this would describe the condition more correctly. The major bulk of Lancashire export trade is in grey goods.

See also *finishing, converting*.

Grosgrain: Rib weave, silk, rayon, cotton.

Hard finished, closely woven ribbed fabric. Ribs running crosswise, formed by a number of weft yarns, weaving as one. It is warp rib weave with ply weft yarns. Ribs are heavier than poplin, but more rounded than faille.

Originally silk grosgrain was of organzine warp and coarser tram weft. Uses, Women's swim suits, neckties, ribbons, etc.

See also *faille, poplin, rib weave, silk (organzine and tram)*.

Guanaco: A wild llama, size 0.76 — 3.0m. (30"—115"). Is a specie of goat, native of South America. It has a very long neck and exceedingly soft woolly fur of a light redish fawn colour with white flanks. Usually available in smaller quantity, ready-dressed and made into rugs. Dressing makes it hard and brittle. The wool resembles that of vicuna, but is slightly coarser and redder.

See also *vicuna*.

Gum: A substance which exudes from certain trees and plants. The generic

name given to a group of amorphous carbohydrates of probable formula $(C_6H_{10}O_5)_N$ which exists in almost all plant juices and in many trees occurs as exudations. They are almost entirely water soluble and with it form a thick mucilage.

Gums are tasteless and odourless and many of them are colourless.

The more important genus are: Gum arabic, gum senegal and gum tragacanth. All these are used in calico printing as thickening agents and adhesives.

See also *acacia, glue, adhesives, thickening agents, dextrine*.

Gun-cotton: A Nitrate of Cellulose prepared by saturating cotton with HNO_3 .

Gun cotton is chemically nitrocellulose. The characteristic difference between gun cotton and collodian cotton is the insolubility of the former in ether or alcohol. Collodian cotton is nitrated cellulose of a lower degree of nitration and is sometimes referred to as soluble cotton.

See also *cellulose, nitrocellulose, collodion, cotton, nitrated cellulose*.

H

Habutai: A soft silk fabric or silk crepe usually employed as a favourite ground for Yuzan dyeing process.

See also *yuzan process, pongee, dyeing*.

Hackling: The first preparatory process consisting of combing, disentangling, laying smooth and parallel the bleached fibres of linen and also splitting up and spreading the ultimate filaments or threads of fibres which have been stuck up together.

Hackling was originally a hand process. Very important and requiring much dexterity and judgment and for these reasons, hand hackling is still practised. Hackling by machines: In construction these machines employ almost identical principles of hand hackling.

See also *flax, linen manufacture*.

Hair: Commercially of considerable importance as it forms the basis of

variety of manufacturing items.

Pig-hair: Bristles are stout, elastic hair from certain breeds of pigs. Russian varieties are finest and are chiefly employed in making clothes brushes. Sable, camel, badger and cat hair is used in making artists paint brushes.

Hair of various animals which is too short to be spun is utilised in the manufacture of felt. Important of these are of rodent class especially rabbits, hares, beavers, etc. The furs are largely employed in making felt hats of finest quality.

Cow-hair is used in the making of roofing-felt, covering of steam-pipes and other purposes such as coarser friezes, railway rugs and inferior blankets. Tail-hair is employed for stiffening cushions and upholstery. It is also used in official wigs for legal professionals like lawyers, barristers, etc,

Horse-hair is also in great demand for various purposes.

See also *furs, wool, animal fibres, horse-hair*.

Hair canvas: Interlining fabric (Hair Cloth). Cotton fabric—stiff and wiry with horse-hair. Plain or twill woven. See also *horse-hair*.

Hair-cloth: Cotton fabric, stiff and wiry with horse-hair weft. Plain, twill or herringbone for tailors' interlining.

See also *horse-hair*.

Hair-fibres: (See animal fibres).

From Angora goat, camel, Kashmir goat, Alpaca, Vicuna, etc. Very often blended with wool.

Handkerchief-linen:

(a) For lingerie, neckerchiefs, table linen, plain woven or barred, bleached dyed or printed—0.91m. (36").

(b) Men's usually cambric; women's usually lawn.

Hand block printing: Textile or calico printing. The earliest (considered to be) most artistic, simplest but slowest of all the printing methods.

Blocks: Are usually made of wood 0.057 to 0.076 m (2" to 3") thick and are made perfectly smooth and flat. Designs are then drawn on it in such a manner as would leave the design to be printed in raised position while the unwanted parts are cut out (the whole block when finished gives the appearance of a zinc or copper printing block or letter press type). A separate block for each colour is necessary. It is very difficult to get fine details in wood and also to protect them in wear and tear of printing is still more difficult. For these reasons, now a days, blocks for hand printing are made by photo-zinco process which make it possible to render finest effects or details photographically and these are then mounted on wooden blocks (the same as printing blocks) Stereos and duplicates can be made as often as desired by casting.

For hand block printing, the essential things are—(1) engraved block and (2) printing table and (3) colour sieve.

Hand block printing process is carried

out substantially in the same manner as printing on paper or cyclostyling.

If pattern is of several colours, the cloth is first printed throughout with one colour, then dried, rewound and printed with the second colour, the same operation being repeated until all colours are printed.

See also *printing*.

Hand printing: (Khudi). Here also blocks of either wood or processed photo-zinco blocks are made and printing is done by hand. The cloth is laid on a flat surface (being previously prepared for printing) and the areas are marked on it where the impressions are to be printed and then the block is stamped on it. After every stamping, the block is re-inked on the inking pad which carries the desired printing ink and is again stamped on the next area and the process is repeated until all the marked areas are printed.

(The process can be compared to rubber stamping).

See *printing methods*.

Handloom: The weavers' loom worked by hand as distinguished from power-looms.

A handloom has the warp coiled evenly upon a weighted beam to prevent warp from being given off too freely. From the beam, the threads pass alternatively over and under 2 lease-rods, then separately through the eyes of shedding harness—in pairs between the dents of the reed and finally they are attached to the cloth roller.

For small patterns healds are used while for larger ones jacquards are used. The weaver depresses or releases the threadles according to the pattern. When a threadle is pressed down, one pair of shafts will be lifted up above the other and the warp threads will ascend (or descend) with the heald to form a shed for the shuttle (which contains the weft to be passed through); thus providing a clear way for the shuttle to move from one end box to another. And the process repeated again and again.

See also *weaving, loom, jacquard loom and power loom*.

Hank: A coiled or spun skein—a loop of strings Yarns are reeled into hanks for preparing or finishing process. Count of yarn made from different fibres are differently expressed.

Cotton Hanks based on number of hanks 840 yards per lb.

Linen—open No. of leas—274m (300 yds.) per lb. (0.45 kgs.)

Worsted—No. of hanks 512m (560 yds.) per lb. (0.45 kgs.)

Spun silk—No. of hanks 768m (840 yds.) per lb. (0.45 kgs.)

Wool—No. of hanks 291m (320 yds.) per lb. (0.45 kgs.)

See also *count, denier, etc.*

Hardanger-cloth:

Mercerized cotton, basket-weave 1.02 m (40")

For Norwegian Hardanger white embroidery.

See *embroidery, scrim, theatrical gauze.*

Harris tweed: Commercial name for Scotch-wool, hand spun, hand woven and dyed in the homes of Islanders of Harris or other islands of outer Hebrides. For men's suits and overcoats. Also women's wear. Plain or twill, 1.52 m (60").

See also *heather-mixture.*

Heald or headle: A series of vertical cords or wires each having in the middle a loop to receive a warp thread and passing round and between parallel warps.

See *loom.*

Heat-sealing: Process of joining together seams of garments made of thermo-plastic materials by heat-fusing instead of the usual stitching.

See also *heat-setting, thermo-plastic fibres.*

Heat-setting: Taking advantage of the property of obtaining plaits and creases on some synthetic fibres. Nylon and dacron are heat-set more readily than acrylic fibres. Heat setting should be preferably done at a much higher temperature than that to which the fabric is likely to be put to use.

See also *thermo-plastic.*

Heather-mixture: Name suggesting the colour of heather-fields in Scotland. Coloured yarns and fibre-mixtures
See also *argyle, home-spun.*

Heber-lein: A durable finish—chemical process in case of cotton and rayon, perfected by Swiss chemists, which include—durable crispness, transparency, anticrease, shrinkproofing.

See also *Swiss.*

Hemp: (*Canabis sativa*). The plant is famous for:

- (a) the valuable fibre, and
- (b) a narcotic drug (*Bhang, Ganja* and *Charus, etc.*).

The hemp of commerce are bast fibres of *Canabis sativa*. However, some totally different plants are also included under the common heading or general name. In some cases the fibres are obtained from stem while in others from leaves. Sunn hemp—Manila Hemp, Sisal Hemp, Phormium (which is also known as New Zealand flax or hemp but which is neither a flax nor a hemp), and also the Deccan Hemp (brown or Bombay Hemp) or Ambari Hemp, Pite Hemp (*Agave Americana*), Bow-string Hemp (*Sanseveira Leytonica*) Canada Hemp (*Apocynum Cannabinum*) and Kentucky Hemp (*Urtica Canabina*).

Hemp plant proper: Grows in almost any climate, on rich weed-free alluvial soil and reaches to a height of 1.22 to 3.66m (4 to 12 ft.). It has rough green stems.

India, China, Russia, France and Italy are chief sources of this fibre.

To separate fibres from stem and from each other retting and skutching operations have to be performed (the same as linen). Hemp fibres have the length from 0.05 to 0.06 m (2" to 2.2") and diameter from 15 to 50 μ . First grade hemp fibre is rather light in colour having a very fine lustre. Tensile strength is 3628.8 kg per 6.45sq. cm. (80,000 lbs. per sq. inch.) Principle uses of hemp are cordage, and hemp ropes are of considerable value in industry. At one time, it was also extensively used for making sail cloth, sheetings, covers, packing, sacking, etc., and much

of the finer quality is still made into cloth. British Navy still uses hemp cloth. Certain curtains are also made of hemp yarns.

Cottonizing: Hemp can be cottonised by chemical reagents and in this process while losing strength gains in softness and lustre.

The average chemical composition is as follows:

Constituents—%
Cellulose—90-92
Inter-cellular substance—5-7
Water—1-2
Aqueous extract—0.3 to 0.5
Wax—1.0 to 1.2
Ash—0.3 to 0.8

The fibres are bast fibres having celluloses associated with peptic cellulose.

See also *vegetable fibres, bast fibres, fibres.*

enequen: Often mistaken as sisal hemp. The fibre, probably derived from *Agave Fourcroides* or *Ixtle* — perennial plant which grows in Mexico and West Indies. This is also an agave fibre which occurs in leaves and the method of separation is the same as sisal hemp, as also the appearance and structural features and microscopic characteristics (which resemble more closely Manila hemp), but the tenacity of henequen fibre is slightly inferior while length and fineness are slightly superior. Chemical composition is same as sisal. Both Henequen and sisal are used for cordage, twines and coarser fabrics.

In both cases, the yield per acre is estimated at half ton per acre and only about 4 per cent of the weight is available for fibres (10,000 leaves yield about 25 kg. (55 lbs.).

Its fibres are considered smooth, clean and in strength second only to manila hemp.

See also *sisal hemp, vegetable fibres agave fibres.*

Henna: A vegetable dye for dyeing hair red—*Lawsonia alba*.

See also *natural dyes, vegetable dyes.*

Henrietta: A fabric resembling Cashmere, now obsolete.

See also *obsolete.*

Herringbone-twill: The peculiarity of this are the arrowhead lines.

A twill in which the diagonal lines are arranged to form a continuous zigzag pattern, resembling arrowhead or herringbone.

See also *twill-weave, weaving.*

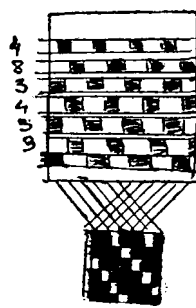
Hessian: (American Burlap, Indian Gunny). The name of jute fabric. The plain cloth in various degrees of fineness, quality and width. Commoner variety is usually 1.02 m (40") wide, weighing 0.30 kg. (10½ oz.) per 0.91m (yard). In its finished state contains approximately 12 threads and 12½ picks per 0.03m (1").

This cloth is employed for innumerable uses especially for packaging goods, bags for sugar, flour, coffee, grain, etc. Bags made from this cloth or from bagging, sacking or tarpaulin form the most convenient and cheapest covering for almost any kind of goods which are not damaged by crushing.

Hessian cloth is either left in its natural colour or sometimes dyed black or tan or other such colours and as such used as cheap lining for clothing, shoes and bags. When dyed in artistic shades, the cloth forms and is used as an attractive decoration for platform or wall decorations. Linoleum depends upon certain types of this cloth. It is the foundation product for rugs and other floor-coverings

Dundee (U.K.) and Calcutta (India) are the two important manufacturing centres where practically every type of hessian is manufactured.

See also *sacking, tarpaulin, burlap, bagging.*



HESSIAN

Hickory-stripes: Blue or brown and white stripes used for shop uniforms. Twill, 0.71m. (28"). Similar to express-stripes.

See also *express-stripes*, *cottonade*.

High-tenacity rayon: Rayon yarns of unusual strength for rough and tough uses like tyre-cord and parachutes for dropping cargo.

See also *rayon*, *tyre-cord*, *fibre-properties*.

Holland: A fabric for window-shades. See *silesia*, *shade-cloth*.

Home-spun: Plain-weave of wool, rayon and cotton. Coarse, loosely woven material of tweed type (made in imitation of home-made cloth), with characteristically irregularly mixed colour-yarns and rough finishes. Used for sportswear, and women's coats, draperies, etc.

See also *Argyle*, *heather-mixture*, *tweed*.

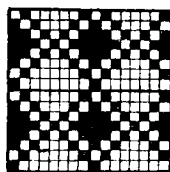
Honeycomb or waffle cloth: Name of a weave and also of a cloth.

Honeycomb weave is of the particular arrangements of crossings of warp and weft threads which form cells resembling those of a honeycomb. The bottom of cells is formed by threads and picks which weave 'plain' while ascending sides are formed by gradually increasing length of floats of warps and wefts.

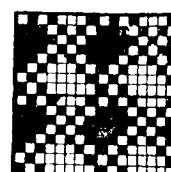
Small figures of patterns woven in square ridges and furrows suggesting honeycomb. In perfect honeycomb, it will be seen that the highest number of successive whites are 7, while those of the blacks are 5. 2 of each of these form the top and the number goes on decreasing as it reaches the bottom. The weave produces a reversible cloth. It is used in fancy goods, tweeds, etc., and is also used in the manufacture of cotton or linen towels and other fabrics, such as children's blankets which are loosely woven pique and other novelty fabrics, cotton towelling like Huck

or Huckaback, and coarse heavy cotton drapery fabrics.

See also *weaving*.



A



B

HONEYCOMB

Hooked rug: Hand-hooked rug of woollen yarn or cotton fabric stripes or the machine made Hopsacking imitation. (2) Chinese imported rugs of wool.

See also *rugs*, *hopsacking*.

Hopsacking: Basket weave. Wool, Rayon, Cotton, Linen.

An open basket weave fabric of coarser yarns woven with 2 warps and 2 weft or 3 by 3 basket weave. It is hard, of rather dull texture and very durable. Uses: sports wear, draperies, etc.

See also *osnaburg cloth*.

Horse hair: The tail and main hair of horses is in great demand for various purposes. The long tail hair is especially valuable for weaving into hair cloth. Main hair and shorter tail hair are prepared and curled for stuffing sofas, couches, etc. which are covered with cloth manufactured from long hair. Besides these, horse hair is woven into crinoline for ladies bonnets. Plaited into fishing lines or woven into bags for oil or wine presses and straining clothes for brewers and various other uses. South America, Germany and Russia are the principal sources of horse hair and sorting, cleaning and preparing them for various uses were industries of considerable importance.

Horse hair is also considerably employed in the manufacture of bows for string musical instruments.

Hair chosen is best white and must be perfectly cylindrical and smooth.

(About 200 hairs make 0.015 m. ($\frac{1}{4}$ ") wide ribbon of the bow). The process of cleaning consists of first thoroughly scouring the hair with soap and water to remove the grease—then steeping in bran water thus freeing from all heterogenous matter still adhering to it and a final rinse with slightly blued water. Prepared thus, the hair must offer least resistance and must glide smoothly from root to tip, but when passed in opposite direction, it must feel slightly rough.

See also *hair, animal fibres, hair-canvas, hair-cloth*.

Hose or Hose Duck: The name of a dress article used as a covering for legs or feet. The word has been used for various forms of long stockings covering both the feet and legs. The term was also used in the sense of a kind of gaiter covering for the whole of the lower limb. The term is also applied to certain objects resembling such covering of tubing like flexible canvas.

Hose pipes: Name given to a flexible piping by means of which water can be conveyed from one place to another.

Manufacture of various types of hose naturally depends upon the strength of material and the specific desired ultimate use. The simple gardening hose is often made with India rubber composition. Fire hose used by fire brigades requires a much more substantial combination and therefore the most satisfactory material flax is used although cotton is also

extensively used. Hose fabric is essentially circular although it appears flat when weaving. The commonest type of hose pipe is made on principle of double plain weaving, the cloth being perfectly plain, but woven in such a manner that it is without any seams.

Hose pipes are sometimes woven with 3 leaf twill on both sides or occasionally 4 leaf twill. They are usually lined with rubber from inside which affords less friction to flow of water and also further protection for being leak-proof. Great care is to be exercised in the manufacture since the slightest mistake makes the article entirely useless and therefore checking and re-checking are absolutely necessary.

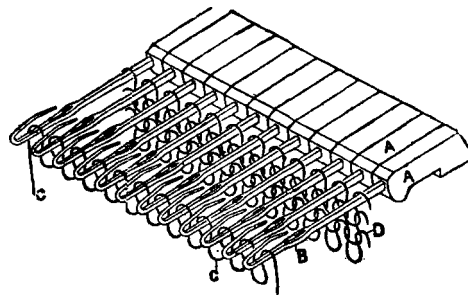
See also *hose*.

Hosiery: The name is probably derived from hose (stockings) which was the earliest garment made by this process. Textile fabrics knit or built on the loop structure principle.

Knitting is comparatively more modern than weaving and the elastic structure of knitting makes it ideally suitable for all kinds of body or underwear. Knitting or loop structure by mechanical means can be divided into three groups:

- (1) Framework knitting,
- (2) Warp knitting,
- (3) Combination of 1 and 2.

Framework knitting: In its simplest form consists of rows of loops supporting each other, built from one continuous thread of yarns running from one side to the other and back.



KNITTING FRAME

Warp knitting: Consists of rows of loops, but the number of threads used is more than one and probably equal to the number of loops in the width of the fabric. The threads run lengthwise thus affording greater scope for appearance in open work and colour than framework.

Machinery: Rev. William Lee (1589) introduced the first mechanical device employed in production of looped or knitted fabric and this machine is the origin of hosiery or such machines even of the present day. Lee's machine was remarkably complete and ideally adapted for the purpose. The main principles of Lees machine are the basic principles of most of the rotary or power cranes of today. A number of improvements were made from time to time by Strutts (1758), Dausen (1791), etc., but only flat web could be handled in this mechanism and it was necessary to secure the web. There was of course a natural demand for a device by which seamless garments could be fabricated, and it is remarkable to note that such a device was patented as far back as 1816, by Sir Mark Brunel. This device is practically the origin of loop wheel circular frame of today and from which all the circular automatic power machines for making plain or ribbon seamless hose have been developed. A great many varieties of machines are now available for the production of practically all kinds of plain and fancy hosiery. Also a large variety of sewing, seaming and linking machines are employed for the purpose of putting together or joining all kinds of hosiery which have almost entirely superseded all sewing by hand.

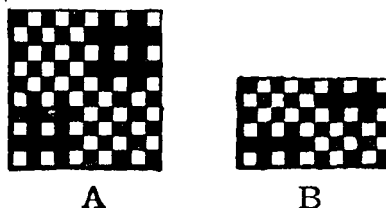
See also *knitting and 1589, 1758, 1791, 1816 (Textile Times)*.

Hospital gauze: See *gauze, absorbent cotton and surgical cotton, weaving*.

Huck or Huckaback: A towelling cloth, it is more employed as such in the linen trade than any other weave, the chief factor being its capacity to absorb moisture.

Cloths made with huck or huckaback or similar such weaves (honeycomb, etc.) are particularly well adapted for the purpose of absorption of moisture as flat sur-

faced cloth like plain cloth is not so satisfactory.



HUCKABACK

The foundation of huckaback is plain and therefore sound in structure. (Refer to figures A & B). The only variation being, at fixed intervals some warp threads float on the surface while at the same time the number of weft threads float at the back, thus giving similar appearance on both the sides. [Figure A is ordinary huckaback while figure B is double weft called Devon or medical huck].

See also *towelling, tereck-cloth, honeycomb, weaving*.

Hydrochloric acid: HCL—one of the strong acids.

See also *acids, chlorine*.

Hydrogen peroxide: H₂O₂—A very powerful bleaching and oxidising agent.

The use of H₂O₂ as bleaching agent is becoming increasingly important and it is now almost a universal and most versatile bleaching agent.

It can be employed at high temperature.

History:

Discovered by Thenard—1818

Employed as bleaching agent for silk—1878.

For cotton—1920.

Generally available in the market accordingly to strengths—as 10, 20, 100 volume strength, etc. The number roughly gives the number of times its volume the O₂ given—as 10 vol. gives 10 times its own volume of O₂. 10 vol. peroxide contains 3 per cent of H₂O₂ by volume. Commonly available H₂O₂ is slightly acidic for stability and so for bleaching action, this must be made

slightly alkaline. Also it is observed that certain chemical compounds exert a specific action (almost like catalytic action). The more notable is sodium silicate and tri-sodium phosphate. Certain metals bring about rapid decomposition of H_2O_2 , copper being the

worst. However, aluminium, iron, and lead can be used with advantage with silicates. In bleaching cotton H_2O_2 acts best between 80° to $85^\circ C$ temp., since below $80^\circ C$ the effect is inadequate and above $85^\circ C$, O_2 loss is rapid.

See also *bleaching agents, bleaching*.

I

Ibex: Genus of goats inhabiting the Alps and other mountainous regions.

See also *goats, fur*.

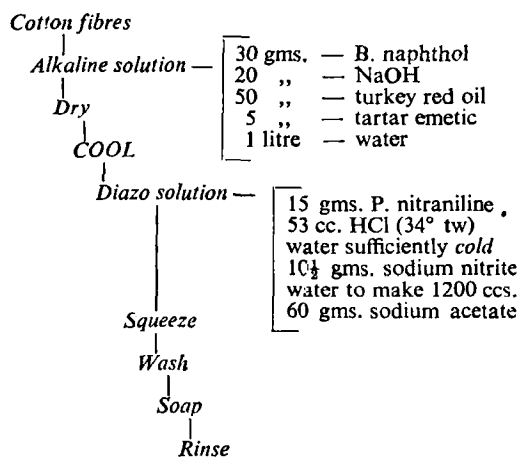
Ice-colours: Produced as insoluble colour precipitates by adding the diazo compound to an alkaline solution of a phenol or to an acid solution of an amido compound.

The diazo compound is prepared by allowing the solution containing the nitrous acid to act upon a

solution of primary aromatic amine at *ice cold temperature*.

The colours obtained vary according to the diazo compound as well as the amine or phenol used. The same method can be used to produce precipitate upon the cotton fibres by subjecting these to impregnation with alkaline solution of phenol, then drying and subsequently passing into cold solution of diazo compound.

The actual process is as follows:



Colours develop almost immediately, but it is advisable to keep material in solution a little longer.

Results are obtained by substitution:—

p. nitraniline	—brilliant red
m. nitraniline	—yellowish orange
naphthylamine	—claret red
amido-azo-toluene	—brownish red
benzidine	—dark chocolate
dianisidine	—dark blue

See also *insoluble azo colours, dyes, developed colours, printing*.

Iceland wool: (From sheep of Iceland), long lustrous hair—for shawls and scarfs, hand-knitted, warm, very lustrous and resilient.

Illusion: A transparent tulle. A delicate kind of thin skin network fabric of very open structure used for trimmings and veils.

See also *tulle, maline, veiling*.

Imitation goods: Goods made to appear like original or genuine but rather

poorer in quality (As imitation Beaver). It is moleskin where the fabrics are so constructed as would imitate the fur of respective animals. See also *fur, moleskin, artificial goods*.

Impregnated fabrics: Fabric with interstices between the yarns, completely *filled up* with impregnating compounds throughout (not to be mistaken for sized or coated materials where the interstices are incompletely filled).

See also *coated fabrics*.

Indelible ink: Ink or compound that cannot be removed by ordinary operation like washing, or even bleaching.

Therefore used as marking inks in laundering.

See also *marking inks, aniline-black, prussian-blue*.

India-print: Cotton fabrics, hand-block printed.

See also *printing*.

Indigo: The violet blue dye obtained from indigo plant or prepared synthetically.

One of the most important dyestuffs. Indigo is insoluble and therefore it could be of no value in dyeing unless by some means it is rendered soluble. There are two ways in which this is done: (1) Indigo-Extract and (2) Indigo-White reduction.

First method:—Indigo-Extract—The method consists of dissolving the indigo in very strong H_2SO_4 , whereby it is converted into indigo tin-disulphonic acid (Indigo-Extract)—which is readily soluble in water. This substance belongs to acid-colour-group hence it is applied to animal-fibres (wool and silk) by boiling in a solution of colouring matter slightly acidified with H_2SO_4 . It must be noted, however, the indigo-extract method can only be applied to animal fibres and also although the colours are bright they are fugitive to light and are discoloured by alkalies.

The second and by far the most important method is based on the fact that under influence of reducing

agents (or substances capable of yielding H nascent) indigo blue is changed to indigo-white which is soluble in alkali and the solution thus obtained called a "VAT".

Indigo-VAT-dyeing method:—If textile material (fibres) are steeped in a clear yellow solution of reduced indigo—then exposed to air—the indigo white, absorbed by the fibres is oxidized and reconverted into indigo-blue upon or within the fibres which thus become dyed blue.—This process is called the Indigo-VAT dyeing.

The VAT method is applicable to all fibres and the colours obtained are very fast.

Cotton:—Cotton is dyed by (1) "Lime & Copperas VAT" (2) "Zinc powder VAT" or (3) "the Hydrosulphite VAT."

(1) "**Lime & Copperas VAT**":—The ingredients are quicklime, $FeSO_4$, and finely ground Indigo-Lime; decomposes $FeSO_4$, and precipitates Ferrous hydrate. This quickly reduces the indigo to indigo-white which dissolves the excess of lime present.

(2) "**Zinc powder VAT**":—The main ingredients are zinc powder, lime and indigo. In presence of lime and indigo, zinc takes up O_2 from water and liberates H_2 which reduced the indigo to indigo-white.

(3) "**Hydrosulphite VAT**":—Main ingredients are hydrosulphite of soda, lime and indigo. Here again hydrosulphite takes up O_2 from water and liberates H_2

Preparation of hydrosulphite of Soda:

Zinc powder 5.90 kg. (13 lb.) is made to act upon cold conc. solution of Bisulphite of soda 77.28 litres (17 gal) taking care to avoid excess of air or heating to prevent decomposition. The solution obtained is neutralized by lime; after settling clear liquor is used for VAT.

The chief advantages of this Vat are (1) it is easily prepared (2) there is very little sediment, (3) it can be employed in both dyeing wool as well as cotton.

When reduction and complete solution of Indigo to Indigo-white is effected in the Vat, the fibre material

is immersed and moved about for some time, in the clear liquor, then squeezed and exposed to air in order to develop the blue colour on the fibre.

Thio-indigo Red (Paste)—Artificial colouring matter of Indigo series—used in the same way as indigo-yielding shades which range from dull pink to claret red. The colours obtained are remarkably fast.

Indanthrene (Paste)—An anthracene derivative formed by action of KOH on B-amidoanthraquinone. It is reduced by hydrosulphite of soda yielding Blue Vat in which cotton or other vegetable fibres are dyed in the same manner as Indigo Vat. It yields on cotton reddish shades of blue—which are extremely fast, so much so that when once developed and fixed on cotton, they cannot be removed again from the fibre by any known means. Other Vat colours of this series, having same method of application, are:—flavanthrene (yellow) viridanthrene (green), fuscanthrene (grey-brown) violanthrene (dull violet) and melananthrene (grey to black).

See also *miscellaneous colours, dyes, dyeing*.

Induline: Name of various coal tar derivatives or colours used in dyeing cotton, wool and silk dark blue colours resembling indigo.

See also *indigo*.

Industrial fabrics: A variety of fabrics employed for various mechanical processes such as buffing (cotton), filter cloth, conveyer belts, etc.

1. Most of the fabrics from man-made fibres like dynel, dacron, nylon, orlon, etc., are ideal as industrial fabrics.

2. Fabrics which when processed or treated become part of other product as window shades and imitation leather.

See also *mechanical fabrics*.

Industrial cleaners: See *soap, soda, syndets, scouring agents, detergents*.

Ingrain: Yarns dyed before knitting.

See also *warp-prints, stock-dyeing*.

Insect repellent: Special treatment like moth-proofing, mildew-proofing, etc.

See also *finishing, moth-proofing, mildew-proofing, antiseptic*.

Insoluble azo colours: See *ice colours, azo colours, dyes*.

Interlining fabrics: (in tailoring).

- (a) Canvas—interlining, used in men's and women's coats.
- (b) Hair-cloth or canvas, various combinations of hair or wool or rayon, used in place of horse hair. 1.57 m (62").
- (c) Fabrics of cotton, wool or blends, light weight, napped, plain or twill for women's coats. 0.91 m (36").

A layer of woven or unwoven fabric between the outer cloth and lining of garments for giving stiffness or warmth.

See also *hair-cloth, canvas, armo*.

Irridescent: (i) Colour effects obtained by contrast colour or stripes.

See also *two-toned*.

(ii) Luminescent or phosphorescent colours

See also *optical bleach*.

J

Jackonnet: A cotton fabric, stouter than muslin.

See also *muslin, leno*.

Jaquard loom: The famous apparatus designed by Mr. Joseph Marie Jacquard (1752-1834), invaluable in weaving finer kinds of figured silk fabrics.

Carpets: Before the existence of stream-driven carpet making machines

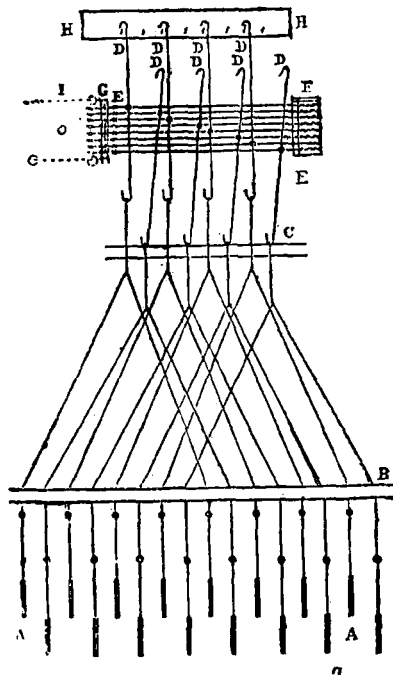
in England, Jacquard apparatus was used for the weaving of patterns. English enterprise in developing this invention, took lead in perfecting Jacquard weaving carpet looms (steam-driven).

Lace: The real impetus to lace making machines was given by application of Jacquard loom apparatus to these machines. This enabled manufacturers to produce all sorts of patterns

in thread work and in imitation of hand-made patterns.

Jacquard Machine: The first most important invention applied to hand-looms. In this, warp threads are raised by rows of upright wires or hooks which are bent on both ends and are supported by bottom boards which are perforated to permit neck-cords from the harness to be attached to hooks.

The horizontal needles (E) are provided with a loop (to permit to and fro movement) and a coiled-eye (to receive hook). These needles lie outside as shown in figure.



JACQUARD LOOM

Griffe: Frame can be lifted or lowered by treadle operated by weaver. Elevation of griffe lifts all the hooks and correspondingly all the warp threads are passed across the warp. The griffe is then depressed and the operation is repeated with new combination of lifted threads. Jacquard may contain

from 100 to 1000 hooks. Two or more machines can be attached to a single loom. Innumerable attempts have been made so far to improve these machines, but Jacquard still remains essentially unchanged. It still holds its unique place in textile equipment with a very good promise of not being replaced by another so very efficient machine.

See also *weaving, hand-loom, dobbie.*

Jaspe: Having a structure ornamented with veins.

Jaspe cloth: Plain weave, cotton or rayon. Coloured warps with single colour weft produce multi-coloured stripes. The yarns are hard twisted which gives a firm, hard, durable fabric.

Jean: A kind of twilled cloth woven with one end up and two ends down. As there are more picks (or weft) per inch than ends (or warps), the diagonal lines pass from selvage to selvage at an angle of less than 45°. The weft surface of the cloth is usable.

Uses: Workmen's clothing, foundation garments.

See also *jeanette.*

Jeanette: Technically exactly the opposite of Jean, i.e., two ends up and one end down and the diagonals passing from selvage to selvage at an angle greater than 45° and the warp making the usable surface of the cloth.

See also *jean.*

Jerkin: A short close fitting jacket usually made of leather and may be without sleeves. A typical male upper garment.

A jacket, a short coat or closed waist-coat.

Jerkinet: Women's outer jacket.

Jerry: Machine for finishing cloth.

Jersey: The finest part of wool (combed wool). A plain knitted fabric of wool, cotton, rayon or synthetic fibres—originally made on circular knitting machine but now on tricot.

Uses: lingerie, dresses, sweaters, gloves, etc.

- (a) The close fitting woollen shirt or a kind of undervest (usually worn in rowing).
- (b) A type of weft-knit fabric (where a broken yarn causes a runner.) Plain-knit, not ribbed.

See also *weft-knit*.

Jute: A third most important vegetable fibre occupying a place of importance next to cotton and flax. The fibre is obtained from the following two species of *Corchorus* (Teliaceae):

Corchorus capsularis
Corchorus olitorius

The products of both these are so similar or alike as far as the fibres are concerned that neither commercially nor agriculturally is any distinction made between them.

Corchorus is a native of Bengal. However, it now grows in tropical and sub-tropical regions of India and also in Panama and Florida.

A successful cultivation of the plant depends upon a hot moist climate with a good deal of rain. Too much of rain hampers the growth while a very dry season is positively dangerous. The climate of Bengal and East Pakistan appears to be ideal for its growth.

Jute plant is annual and reaches a height between 5 to 15 feet. It has red and green stems and bright green leaves. For plantation, the seeds are simply scattered on a well ploughed soil, *they are not even covered*. Transplantation and weed removal however is necessary, and starts when the plant is about 0.08m (3") tall.

The harvested stems have to be retted and scutched to separate fibres from stem and from each other (retting process similar to flax or hemp). The stalks (tied in bundles) are soaked in water and allowed to rot for about a week when the fibre is loosened from the outer bark and also from other fibres and this separates the fibres which are then washed and dried.

Characteristics: The important characteristics which decides the qualities of jute are colour, lustre, softness, strength, length, firmness, uniformity and absence of knots. The best qualities are a clear whitish yellow colour with fine silky lustre, soft and smooth to touch and fine long uniform fibres.

Fibres are from 1.83 to 3.05m (6 to 10 ft.) long (in exceptional cases upto 4.5m (15 ft)). The fibre is considered inferior to cotton and flax in strength and tenacity owing to its characteristic cell-wall structure. Fibre cells have an average length of 0.02 to 0.05m and a diameter between 20 to 30 μ . The c/s is polygonal and Lumen is wide as cell wall. Chemical composition of raw and finished jute :—

Constituents	% in Raw	% in Finished
Cellulose	64-65	61-62
Inter-cellular substances	24-25	21-22
Water	12-13	9-10
Water solubles	3-4	1-2
Wax and fats	less than .5	0.5 to 1.

Jute is much more woody than flax or hemp. Fibre bleaches easily only upto a degree which is sufficient for dyeing, but it is very difficult to obtain pure white by bleaching.

The very striking and remarkable property of jute (which is also of considerable practical interest) is its hygroscopic nature, that while in dry atmosphere it possesses less than 6 per cent of moisture, under damp conditions, it can easily absorb upto 23 per cent. Jute is used in coarse and woven goods, such as bagging, burlap, carpet backing, canvas twines and cordage. Its principle uses are—(1) Gunny bags, (2) Strings, ropes and cords (3) Net like bags for wood, hay, etc.

Dundee (U.K.) and Calcutta, (India), are the principal manufacturing centres for gunny bags. Dundee manufactures Hessian, Bagging, Tarpaulins, Scrims, Brussels-carpets, Wilton rugs, imitation Brussels and several other types of carpets, mattings and rugs. Calcutta mostly gunny bags.

Manufacture of jute is essentially similar to flax and hemp. Essential processes are:

Batching, softening, moistening, breaker card-rollers, combing and framing-out, sliver-roving and spinning operations.

Jute is also employed as base for cheap imitations and also artificial wool.

See also *fibres, vegetable fibres, bast fibres, artificial wool, hessian, burlap*.

K

Kandahar: A carpet wool variety from India.

Kapok: (*Ceiba pentandra*). A tree from tropical America. Grows freely in any soil. Is extensively cultivated in Java along highways as a support for telegraph and telephone wires. The silky fibre is known as cotton-wool. Silk-cottons are of less importance as textile fibres. Kapok is a seed-fibre like other cottons or silk-cottons, and is chiefly employed as bottom insulation for refrigerators.

See also *vegetable fibres, seed-fibres, fibres, silk-cottons*.

Kasha: A fine, soft, napped dress fabric of wool from Paris.

Cotton: plain woven, napped on reverse side for lining. 0.91m (36").

Suedelike: made of rayon or silk or blend.

See also *napped fabrics, suede*.

Kashmir shawls: The chief industry of Kashmir was weaving... the most famous being the Kashmir-shawls which became a fashion in Europe in Napoleon's time but received a setback in Franco-German War. Now Kashmir carpets have taken their place. A square and oblong article of textile. The Kashmir shawls are characterised by elaborate designs in "cone" patterns, the prominent features are glowing harmony and brilliance, depth and enduring qualities of the colours. The basis of these excellent qualities is found in very soft, very fine, short flossy under-wool (*Pasmina*), found on the shawl goats (*Capra Hirus*) of Tibet.

There are two principal classes of these shawls:

- (1) Loom woven shawls: sometimes woven in one piece but more often in small fractions which are then sewn together with such precision that the sewing is practically invisible.
- (2) Embroidered shawls in which minute and elaborate patterns are worked on plain ground of *Pashmina*.

See also *Cashmere, Kashmir-shawls, carpets, Paisley-shawls*.

Kemp or Kempy wool: (Kemps or dead hairs). In ill bred wool, there may be found 'Kemps'; straight, coarse, dull fibres which show conspicuously in wool and become even more prominent in manufactured or dyed goods, as these will not take in a dye.

The coarse rough hairs of wool.

The knotty hairs which will not felt.

Kemps are results of imperfect medullary developments due to neglect or disease.

See also *animal fibres, wool-processing*.

Kenaf fibres: A light yellow to grey coloured soft fibre like jute. Fibres are 1.5 to 1.8m (5-6 feet) long and are derived from the inner bark.

Chiefly employed in coarser textiles and cordage. Known by various names like Ambari, Bimlipattam, Deccan Hemp, etc.

See also *bast fibres, vegetable fibres, fibres*.

Keratin (wool-keratin): Wool or hair fibre substance. Protein from these hairs. Composed of histidine, lysine and arginine in ratio of 1:4:12 approximately.

Wool-Keratin: Wool (as also other proteins) can be decomposed into a number of amino-acids (at least 17). It is reasonable to assume that this substance is composed of these amino-acids and are linked together to form peptides.

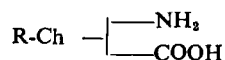
From the study of these various amino-acids, more or less satisfactory structures of wools have been established:

Average Amino Acids in Wool Keratin:

1. Glutannic acid	15.3%
2. Cystine	13.1%
3. Leucine	11.2%
4. Arginine	10.2%
5. Serine	7.5%
6. Aspartic acid	7.3%
7. Glycine	6.5%
8. Proline	6.5%
9. Theronine	6.6%
10. Valine	4.7%
11. Tyrosine	4.5%
12. Alanine	4.4%

13. Phenylalamine	4.0%
14. Lysine	2.5%
15. Methionine	0.7%
16. Histidine	0.7%
17. Tryptophane	0.6%
etc.	

The general formula suggested for all these amino-acids is—



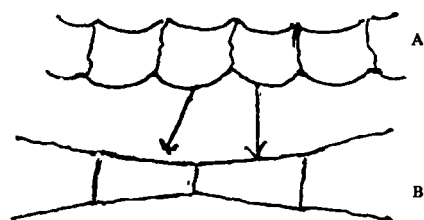
Where only the side chain R differs.

The (Wool) Keratin has both diamino-acids as well as dicarboxylic acid and the main peptide-chain acid and basic side chains.

Thus the presence of cystine assumes a greater importance since it is diamino-dicarboxylic acid and so must participate in the structure of polypeptides—in such a manner that both an amino group and a carboxyl group are fixed into the peptide chain.

It appears that elastic properties of wool are somehow associated with the stretching and releasing of wool fibres in the folded molecular chains (as against silk or cellulose having extended chain-molecules).

Ashbury termed the folded form of Keratin as A Keratin and extended form as B keratin.



A AND B KERATIN

Ashbury and Speakman, have done rotatable research work in connection with Keratin and their research study with acid-alkali relation and x-ray examination showed new light.

See also *wool*.

Kersey: Twill woven, of wool.

A highly lustrous, heavy, firmly

napped, tightly woven, wool fabric, well-filled and sheered, where nap obscures the weave. It is similar to melton but heavier.

Originally a woollen cloth made in Kersey (Suffolk). Its manufacture was regulated by Statutes, for weights, textures, etc.

Used for military, civil uniforms, overcoats, etc.

See also *melton*.

Khaki: A drab or dull dusk colour used for military uniforms.

See also *mineral khaki*, *olive drab*.

Klear-Flax (TM): For linen rug. Made on powerloom. Plain woven in tweeds or small checks. Durable, reversible. Rug-size.

See also *rug*.

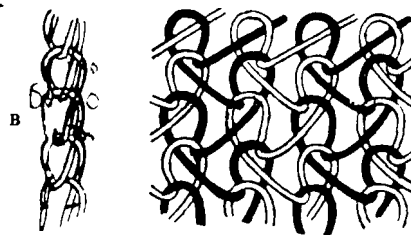
Kolinsky: Or Red Sable Fur.

See also *sable (hair and fur)*, *fur*.

Knit: To form into a knot, or to unite with a network. **Knitting:** network formed by knitting.

See also *knitting*.

Knitting: Process of producing a fabric by interlacing one or more yarns, as opposed to weaving.

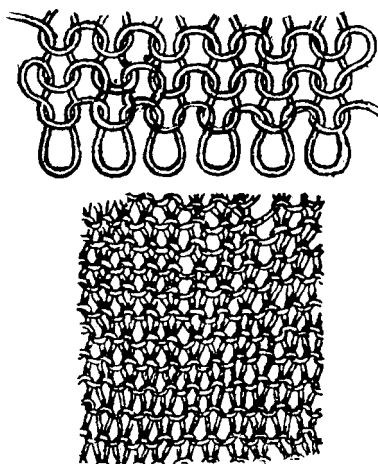


KNITTING (WARP)

A knitting (warp)—knitting by forming loops from parallel warp yarns has less strength than circular or weft knit fabrics.

See also *tricot*, *milanise*.

A knitting (weft)—yarns are fed to needles in weft direction.



KNITTING (WEFT)

Knitted fabrics—terms

Knitting—art of constructing fabric with needles (inter-looping yarns

to form succession or connected loops).

Loops—a small length of yarn taken at some point distance from the end and drawn through and around some object, usually another loop.

Stitch—the loop on the needle (the needle loop) plus previous loop (the sinker loop) equal to one stitch.

Course—term used for loops lying side by side across the weft-knitted-fabric.

Wale—loops lying one above the other lengthwise of the weft-knitted-fabric.

Needle-types—spring, latch, etc.

Basic machines—flat-bed, basic, link-to-link, warps, tricot, milanise, simplex, Rachel, etc.

Circular machines—plain, rib, link-to-link.

Basic-stitches—weft-stitch, plain, rib, purl, warp-stitch.

Basic stitch variations—Tuck, Eyelet, Rack, Warp, Float, Plate, Interlock, Double-knit, Cut-pressure.

See also *net, needle-work, hosiery*.

L

Lace: Ordinarily open work formed of threads of fibres where sometimes gold or silver threads are looped or plaited or twisted together by hand.

The three broad distinctions are:

- (1) Needle point lace with needles.
- (2) Pillow lace done with bobbins pins or cushions.
- (3) Machinery imitations of both 1 and 2.

Lace making implies the production of ornaments and fabrics concurrently, but without a pattern or design, lace fabric cannot be made.

In lace-making—warp yarns run crosswise.

Weft yarns run lengthwise.

Twisting together warps and wefts to construct fabric.

Lace-making machines—Levers, Bobbinet, Nottingham, Schiffi, etc.

Lace-types'—Handmade, Needle point, Bobbin, Crochet.

Machine made types—Levers, Bobbinet, Schiffi, Nottingham, braiding.

See also *hosiery, knitting, bobbinet, needle-work, picot*.

Lacquer finish: A chemical treatment producing a thin film on surface of cloth—decorative effects (like metallic patterns or flock-printing) are possible. It is however not so durable in laundering.

See also *finishing, finishing (special finishes)*.

Lame: A metallike or glittering fabric with Jacquard woven patterns in low relief and the cloth is similar to Brocade. Ground weave of plain, twill or satin, with Jacquard pattern—Silk, rayon with mohair.

Uses: Evening wear, blouses, trimmings, etc.

Lampass: (*i*) A silk damask similar to brocatelle, but with a trend to make

the designs more natural. A notable feature here being the ground is different in colour from that of the ornament on it. The texture is of taffeta quality.

(ii) A drapery fabric similar to brocade in Jacquard weave with repp ground and satin like figures formed by warp yarns with contrasting figures of weft yarns.

See also *brocade, brocatelle*.

Laminated fabric: For non-wilting collars for men or women's fabric, belts, made by fusing together, layers of cloth by acetate and heat.

Durable to washing.

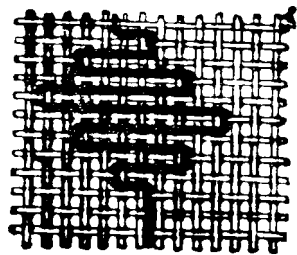
See also *non-wilt-finish, heat-setting*.

Lappet (weaving): Diapering the surface of a plain or gauze fabric with supple figures effected by drawing certain warp threads into transverse position and then lifting them over a weft thread to fix them in texture. After this they are moved in opposite direction and again lifted over the following pick.

The limitations of lappet figuring are controlled by the fact that the material between two binding points must float loosely.

Simple and complex textures have been manufactured on simple machines. Lappet looms have a series of needles fixed upright in laths, and placed in grooves, in front of reed—each needle carries a thread, which does not pass through the reed and so by giving laths an endlong movement and lifting the needles for each pick, their threads can be laid crosswise in the web—to design.

See also *weaving, woven designs*.

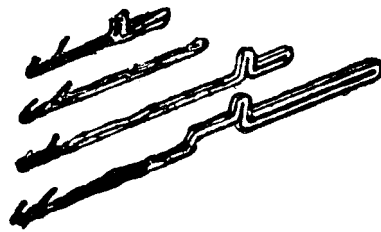


LAPPET

Latch-needle (Hosiery frame): One of the most important inventions in connection with hosiery machines was the self-acting latch-needle (Matthew Townsend & David Moulding—1858).

The needle consists of a stem having a butt at lower end by which it receives its knitting action from cams, the upper end being turned into a hook attached to stem and near the hook is the spoon-shaped latch which closes over the hood when required—which gives the needles their individual knitting action. The needles are thus made self-acting, in that, these are made to draw in their own loop.

See also *hosiery, knitting*.



LATCH-NEEDLES

Lawn: Plain weave of cotton or linen.

A very thin fabric made from level linen or cotton yarns. Plain woven and lightly polished combed or carded yarns with soft but stiff finish, used for light dresses and trimmings and for handkerchiefs. Lawn and cambric often mean the same fabric—a sort of fine linen or cambric.

Originally made at Leon (France), for delicate clothings.

See also *cambric*.

Leaf fibres: Leaf fibres arranged on the basis of importance in terms of world production.

Sisal	390 (1000 of tonnes)
Abaca	157
Henequen	105
Palma ixtle	15
Cantala	3
Fique	40
Phormium	18

Caroa	10 (1000 of tonnes)
Letona	4
Mauritius	2
Cabuya	1
Others	?

See also *vegetable fibres, agave fibres, banana fibres, fibres, abaca (Manila-warp)*.

Leather-cloth: (*Leather-fabric*) or *Artificial leather*:

Under these names, comes a material having more or less leatherlike surface and which can be used for upholstery or leather bags or such other materials.

There is a considerable diversity in the manufacture of such materials. Commoner varieties, however, consist of web of a calico, coated with boiled linseed oil mixed with dryers and lamp black or other pigments. Several coats of this or such mixtures are given and are uniformly spread, smoothed and *compressed on the cotton surface by passing in between metal rollers*, and special finishing coat of copal varnish is given when glossy-enamelled appearance is desired.

For obtaining special effects (like grained-morocco-surface effect) the material is made to pass between suitably embossed rollers. When artificial leather is used as soles of shoes, powdered scraps and leather cuttings are mixed with a solution of gutta-purcha (or oxidised linseed oil or dissolved resin, which is used as a binder), dried and compressed.

See also *linoleum*.

Leno: A muslin composed of an odd number of picks of a plain weave followed by one pick of gauze. It is heavier than gauze in texture and the cracks are transversely further apart.

Leno indicates both a fabric as well as a type of weave.

A kind of fancy gauze used for veils, curtains, etc.

See also *grenadine, marquissette, gauze muslin, Dacca-mulls*.

Lincoln-wool: (*Lincoln Longwool Ram*). Lincolns are from old native breed

of Lincolnshire and improved by Leicester blood. They are hardy and prolific, but do not quite match Cotswolds. Lincoln's wool has a broad staple, and is denser and longer. The fleece is heavier than any other British breed. For these qualities, breeders all over the world, favoured this breed for crossing with Merino ewes.

See also *Leicester, cotswold, merino*.

Linen: (*Flax yarns and fabrics*). Prior to development of cotton, linen held the place as king of fibres. But the inventions of Arkright, Hargreaves and Crompton and others in cotton spinning gave a death-blow to linen industry which now occupies a position next to cotton.

Manufacture: The flax fibres are received in bundles from flax-mills. The preparation of yarns from flax-fibres consists of (1) hackling, (2) preparing, and (3) spinning.

The processes are:

- (1) Hackling—disentangling fibres and combing them out, laying the fibres smooth and parallel, and splitting these into ultimate filaments.
- (2) Preparing—from fibres to perfectly levelled and uniform and continuous ribbons called slivers.
- (3) Spinning—from roving lower counts—dry spinning higher counts—wet spinning the machinery is similar to cotton spinning
- (4) Reeling after spinning.
- (5) Drying the wet hanks.
- (6) Bleaching.

Flax spinning (1) line
(2) tow

- (1) Line spinning
 - (a) picking and roughing. Sorting to size
 - (b) hackling or combing. Separating the tow
 - (c) sorting according to quality
 - (d) spreading—into gill boxes and drafting into slivers
 - (e) drafting
 - (f) wet spinning by roller drafting
- (2) Tow spinning
 - (a) blending or mixing
 - (b) carding on rollers

- (c) drawing and doubling, in gill boxes
- (d) combing—Heilmann comb
- (e) drawing and doubling—drafting to roving
- (f) dry spinning

Weaving—the various operations like winding, warping, dressing, beaming, drawing-in etc. are essentially similar to cotton weaving.

Fabrics: Linen fabrics have several advantages over cotton. The cloth is much smoother and more lustrous and presents a “woolly” surface. It also does not soil easily and retains or absorbs moisture. It is cool, clean and healthy for bed sheets and clothes. It is therefore ideal for shirt fronts and collars and it is almost the only material fit for lace making.

Linen fabrics are numerous both in varieties and difference in qualities,

appearance and applications.

Linen fibre stands second to cotton in competition for the crown.

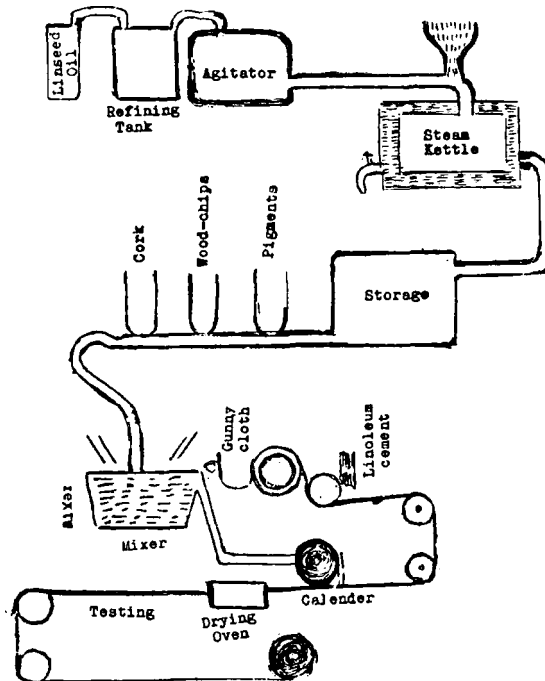
(Flax must be read with linen)

See also *sail-cloth, canvas, tarpaulins, towelling, duck, huckaback, crash, tick, dowlas, osnaburg, diapers, dimity, damasks, vegetable-fibres.*

Linoleum: Preparation used as a floor cloth. (Linseed oil is chiefly used in its manufacture.)

A water-proof floor covering made from powdered cork and linseed oil spread over a back-ground of gunny cloth. Linseed exposed to air forms a rubbery film. This is mixed with powdered cork, Kaurigum resin and some coloured pigments. It is then spread evenly over a gunny cloth and pressed.

See also *carpets, leather-cloth.*



LINOLEUM

Linsey: Cloth made of linen and wool.

Linsey-woolsey: made of linen and wool, now obsolete. A thin coarse stuff of linen and wool mixed.

See also *blending, obsolete*.

Lint: Linen scrapped into soft woolly substance, for dressing wounds. Raw cotton ready for baling.

Linters: The fuzz of cotton seed.

Short cotton fibres still adhering to cotton seed, after the first process of ginning.

See also *cotton*.

Llama: One of the two domesticated breeds of camel tribe of South America bearing hair. These are (1) Alpaca and (2) Llama. Both these are camel-like ungulates derived from wild Guanaco. Lamas are used for both the hair as well as beasts of burden.

See also *animal fibres, furs, alpaca, guanaco*.

London-shrunk: (TM). Name of a process for preshrinking of cloth. A treatment given to fabrics for shrinkage by tailors, especially for woollen goods. This consists of ordinary hot and cold water treatment, drying and pressing.

The process is sometimes repeated when it is called *Double shrunk*.

In India, cotton clothes are treated in the same manner for effecting preshrinkage.

See also *finishing, stabilization of fabrics, shrinkage control, sanforized, rigmél*.

Long-cloth: A plain cotton cloth originally made in comparatively long pieces (in India)—but now generally bleached and the term is applied to a number of varieties. It is heavier than cambric but finer than Mexico. Used for shirting and underwear.

See also *Mexico, cambric*.

Long staple cotton: Egyptian or Sea-Island cotton.

See also *cotton*.

Loom: A machine for weaving fabrics

by intersecting the longitudinal warp to the transverse weft.

Originally these were operated by hand but now there are power looms which work on power on more or less the same principle.

See also *handloom, weaving*.

Lustre: Lustre is one of the major, non-functional appeals, characteristic of textiles. Lustre defies measurement but is always in strong demand—a quality which is favoured in various degrees by consumers.

most lustrous medium non-lustrous
silk cotton wool

In textiles, lustre is a form of light-reflection which originates from the fibres which make up the yarn or fabric. The appeal is more psychological and the effect may vary from person to person.

(For illustration, See under *Delustering*).

Physical (Light-reflection): When a beam of light strikes the surface of a material it may, (i) either be reflected or (ii) it may pass through the fibre-breadth, or (iii) it may be absorbed and turned to heat.

Naturally when totally reflected—that fibre would be considered most lustrous, as in case of (i), and least lustrous, as in case of (iii).

It is observed that lustrous effects in textiles depend upon the length of the cylinder X, and naturally the more regular the length—greater will be the reflection and the fibres would be more lustrous. And obviously, any irregularities in the shape of the fibre cylinder would diffuse or otherwise interrupt the continuity of the light reflection.

Cross-section: It is therefore obvious that cross-section shape of the fibre would have important influence on its lustre, and that surface-reflection has greater significance than any other type of reflection. Observations with cross-sections of different fibres support this theory and demonstrate that rounder the C/S. and smoother the surface, greater is the lustre.

But it is also seen that these cannot be the only criterions and that the origin of textile lustre is far more complex than simple specular reflection from fibre-surfaces, although, however,

the influences of both fibre-surface and shape cannot be altogether disregarded. There are other fibre properties, which are perhaps equally important and these also must be taken into consideration.

It is observed that cotton fibres, mercerised without tension, improve in shape but there is no improvement in lustre. This naturally raises the doubt as to whether shape is really important or that importance must be attached to other inherent light-scattering influences within the fibres.

Uniformity seems to be the basic requirement in obtaining good lustre in textiles.

This uniformity can be felt in
fibre cross-section
yarn construction
fabric construction

Lustre arises from the uniform reflection of light and any irregularity or unevenness in any of the three (fibre, yarn or fabric) tends to break up, in some way, the desired uniform reflection.

Evidence of this can be seen in the crimp or kinkiness in fibres (which can be considered an irregularity). Any irregularity, therefore, whether inherent or introduced, markedly reduces the lustre. Evidence of this can be seen in mercerisation of cotton with high tension. The lustre is markedly improved.

Wool is inherently kinky or crimped but of course nobody expects lustre in wool.

See also *delustring, pigment printing, brightness, dullness*.

Lustring: 1. Brightness or gloss.

2. The property of being lustrous.

3. Steam process for improving permanent gloss and smoothness of woollen goods.

See also *lustre*.

"Lycra" Spandex Fiber (Du Pont):

Background

The seventh textile fiber to be developed by Du Pont.

"Lycra" is a multifilament bundle joined together to form a monofilament yarn that stretches and snaps back into place like rubber. It is stronger and more durable than con-

ventional elastic thread, weighs a third less, gives longer wear, and has from two to three times as much restraining power. As a result, it provides softer, lighter, and sheerer girdles with the kind of figure control heretofore confined to heavier, bulkier garments. It also makes possible girdles and brassieres that, with proper temperature controls, can be both machine washed and machine dried with complete safety.

The groundwork for the development of "Lycra" was laid by a Du Pont research team seeking ways to produce a fiber that would have the elastic qualities of rubber, but at the same time would be a textile fiber in the truest sense. This pioneer work ultimately led to the discovery of a product known in its experimental stage as Fiber K.

In April of 1958, Fiber K was introduced for trade evaluation and during the next year and a half was tested extensively by foundation garment manufacturers. Plans for its commercialization and adoption of the trademark "Lycra" were announced in October, 1959.

Chemical Composition

The fiber-forming substance in "Lycra" is a long-chain synthetic polymer comprised of at least 85 per cent of a segmented polyurethane. This means that it is a 100 per cent man-made elastomer and does not contain any natural rubber.

Apparel Uses

At the present time, "Lycra" is found in products such as girdles, bras, swimsuits, support and surgical stockings, men's sock tops, and football pants.

Main Characteristics

Sock tops of "Lycra" have lasting stretch, snap-back and stamina plus resistance to such foes of elastic as laundering, perspiration, and detergents.

"Lycra" opens new fields in fabric construction and styling not attainable with conventional elastic yarns. It can be used "bare" or covered. "Bare" means that it is not wrapped with a covering yarn such as nylon before it is knit into fabric. Natural elastic yarns and other spandex fibres usually are used with covering yarns, primarily because of their relative lack of strength

and uniformity as compared with "Lycra". Whether "Lycra" is used with or without a covering yarn depends

on the fabric construction and holding power desired.

See also *synthetic fibres, fibres*.

M

Mackinaw: Heavy napped fabric made from reprocessed or reused wool or cotton or rayon. Twill woven and made water-repellent. Used for workmen's jacket or overcoats—1.37 to 1.42m (54" - 56").

See also *water-repellency, reprocessed wools*.

Mackintosh cloth: A kind of water-proof cloth, chiefly used for rain-coats and children's bed cover. The process of water-proofing, however, is by rubberizing the fabric (invented by Charles Mackintosh). Fine poplin made water-repellent by this process. See also *waterproofing, water-repellency*.

Madras cloth: Originally a large handkerchief of silk and cotton, usually in bright colours, worn as headwear by sailors. Originally made at Madras—India.

At present the name stands for two different cloths.

- (1) Shirting. (2) Curtain.
- (1) Shirting (Madras)—a soft cotton fabric of Gingham type with woven designs on a plain ground—mercerised and preshrunk. 0.91m (36").

Now may contain rayon and nylon and figures include cord, stripes, checks, leno-patterns, skipdents, etc.

- (2) Curtain (Madras)—A thin fabric of cotton and rayon with designs; (dobby or Jacquard woven designs, in marquisette). The yarns which make the designs are cut so that the ends outline the edges of design which gives rough or shaggy effect on one side. 0.91m (36")—1.27m (50").

Maline: A fine stiffer sort of net of silk, nylon or rayon for veiling, millinery and trimmings. 0.69m (27"). See also *illusion, tulle, veiling*.

Manila hemp: Or Abaca (*Musa* textiles). A most important of all cordag

fibres. (A native of Phillipines). A banana fibre. It is a perennial plant which can be grown in almost any soil and reaches a height from 4.57 to 7.62m (15 to 25 feet). The fibres are obtained from the leaf-stocks (from base of the leaf to its tip). Each rhizome bears about 12 to 20 clusters. The plant is solely grown for its important fibre, requires little attention and when about 3 years old, develops flowers which is the most favourable condition for cutting the stocks for fibres.

Manila hemp fibres are lustrous, white, light, stiff—very strong and durable. For separating the fibres from the surrounding matter, they are decorticated—either by hand (capacity one person doing about 5.45 to 6.0kg. (12 to 13 lbs.) a day or by machines (in wet state). They are then washed and dried.

Outer-layer fibres are hard, strong and fully developed and chiefly employed for cordage, while those of the inner stalks are increasingly thin, fine but weak—they are used without spinning or twisting for making exceedingly fine, lengthy and transparent yet strong textiles—in making dress materials and ornaments.

Muslins and such cloths made from manila hemp are exceedingly fine and are mostly used for shirts, veils and handkerchiefs.

The average length of cell is 0.02 to 0.13m (1" to 5") and the diameter is 16 to 32 microns. Cross section is elliptic or oval. Lumen is large and open and strength is upto 4536 kg. per 6.45 sq. cms, 100,000 lbs. per sq. in. The average composition of manila hemp is as follows:

Cellulose	64%
Incrustation	22%
Water	11-12%
Aquous extracts	0.5 to 1%
Wax and fat	0.5 to 1%
Ash	7%

The peculiarity of this fiber is—while in dry state, it has 12 per cent water—

in damp state it can absorb moisture as far as 40 per cent (Dealers in raw fibres must note this fact).

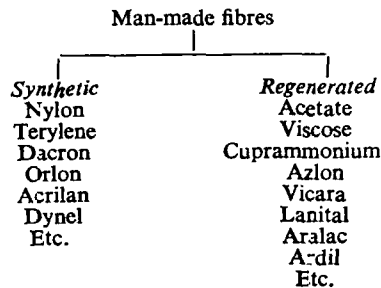
The fibre is very very valuable and so freely adulterated with phormium (New Zealand hemp) or Russian hemp. Enormous opportunities and scope for research exists for better and more production of Abaca.

- (a) Enormous land can be used for cultivation,
- (b) better cultivation methods can increase production,
- (c) more perfect machines can increase production and stop waste of hand-processes.

See also *banana fibres, vegetable fibres, fibres, Abaca (Musa textiles)*.

Man-made fibres: synthetic fibres
artificial fibres
regenerated fibres

Under this heading, it is customary to treat, not only synthetic but also the regenerated fibres, since these are also man-made although they take the raw materials from nature.



See also *synthetic fibres, respective headings*.

Marquisette: Open fabric of Leno construction from yarns of cotton (mercerised), rayon, nylon, etc., or fibre-glass. Dots on figures may be worked with extra weft yarns, as clipped-dot.

Boston-net—coarse with 3 weft and 2 warp.

Originally marquisette was a silk dress fabric.

See also *leno, sable (TM)*.

Matelasse: A sort of weave which produces padded or quilted texture. 4 sets of yarns are necessary for this

construction. A double woven fabric with a raised or puckered surface. Warp yarns in both fabrics are controlled by Jacquard. The two fabrics are woven together with extra crepe yarns.

Cotton matelasse—has quilted appearance.

Rayon and silk matelasse—has puckered or blistered patterns.

Uses: Silk and rayon for dress-suits, Cotton matelasse for bedspreads.

See also *quilted*.

Matting: A general term referring to many coarse woven or plaited fibrous materials used as floor or furniture coverings. It is also used for wrapping heavy merchandise.

Coir matting: a coarse, rough kind of carpet made from coconut fibre. Large quantities of coconut fibres are woven in heavy looms and then cut up in various sizes and the edges bound by a kind of rope also made from the same material. These mats may be in one or several colours, and of various designs. Names are also sometimes printed on the matting especially when used at the doors and as floor matting. Wirewoven materials are also used for door or floor matting.

Various other kinds of matting are extensively used in India and the materials used are—

- Typha elephantina—bulrushes.
- Typha augustifolia—bulrushes.
- Phoenix sylvestris—date palm.
- Chaerops ritchiana—dwarf palm.
- Borassus flabelliforma—palmyra palm.
- Cocos nucifera—Coconut (most important).

- Padanus odoratissimus—screw pine.
- Saetharam munja—munja grass.
- Cyperus textiles—mat grass.

Many of these grass-mats made in India are admirable examples of fine workmanship and elegant designs.

Several useful articles are made from these palms and grasses.

See also *coir, carpets, vegetable fibres, grasses*.

Mattress pad: The padded formation of a bed made of canvas or such stout material stiffened with wool, hair flocks, straws or cotton. The

term is often applied to under mattresses stuffed with cotton or other substances.

Wire mattresses: net work of wire stretched on a light wooden or iron frame (either a separate piece or a component of bed itself).

See also *stuffed goods*.

Mauritius hemp (Piteira):

Fourcrea—are family of hard fibres growing in tropical area of western hemisphere. The most important of these is notably Mauritius hemp obtained from *Fourcrea gigantea*—a perennial plant. This is a leaf fibre. After decortication, washing and drying, the fibres are separated. Fibres are 0.91 to 1.52m (3 to 5 ft.) long, almost white, strong and somewhat lustrous bundles with average of 0.05–0.20 in length and 15 to 25 microns in diameter. They are principally used for cordage, twines, bagging and fabrics.

Average composition:

Cellulose	65%
Lignineous matter	18%
Hydrolysable matter	12%
Water	6%
Ash	1 to 1.5%

(Properties very much resemble those of Sisal).

See also *vegetable fibres, piteira, fibres*.

Mechanical fabrics: Fabrics from various fibres used for various purposes.

Cotton for laundry supply trade
Nylon for parachute and tyre cord
High tenacity Rayon for parachute and tyre cord
Fibre-glass for insulation (both Electrical and Thermal)
Asbestos for fire-proofing
Synthetic fabrics for filtering, etc.

See also *industrial fabrics*.

Melton: Twill or satin weave of wool. Thick, heavy well-fulled or felted fabric, having smooth surface. Napped.

Uses: Overcoats, jackets, uniforms.
See also *kersey*.

Mercerized cotton † Yarns—mercerization. Mercerizing. A process dis-

covered by John Mercer (1844) which relates to treating cotton (also other vegetable fibres) with strong NaOH or other re-agents whereby morphological and chemical changes are effected in the fibre.

If a cotton piece (bleached) is dipped in solution of caustic soda (50°TW), it rapidly changes appearance—becomes stiff and translucent. It shrinks considerably, becomes stronger and acquires an increased affinity for dyes. Altogether mercerized cotton undergoes considerable morphological and chemical changes—the lumen becomes much reduced and the fibres losing its characteristic band-shaped appearance, become rounded.

Similar effects are also possible by the following re-agents:—

- (1) NaOH—50° TW
- (2) H₂SO₄—109° TW
- (3) Nitric acid—83° TW
- (4) Zinc chloride—145° TW

A definite compound corresponding to the formula C₁₂H₂₀O₁₀Na₂O is formed—when cotton is dipped (by washing) in NaOH and is subsequently decomposed into hydrated cellulose—C₁₂H₂₀O₁₀.H₂O. The most important application of mercerization is imparting a permanent lustre to cotton goods. This production of permanent lustre on cotton by mercerization is a simple process effected in two ways:—

- I. Cotton is treated fully stretched with NaOH 50°TW—then washed in water while still in stretched condition; after washing for some time tension is relaxed and it is observed that cotton acquires a permanent lustre.
- II. Cotton is immersed in NaOH—50°TW—then taken out—stretched slightly beyond its original length and then washed until tension relaxes.

All types of cottons are not equally suitable for mercerization. On long-staple cotton, a brilliant lustre can be obtained on multifold yarns, but single yarns are only slightly improved in appearance. Same is the case of yarns from ordinary American cotton.

Temperature of caustic soda has a remarkable influence on the process, a good lustre is obtained at lower temperature—sometimes ice-cold.

See also *cellulose, rayon-viscose manufacture, benberg, cuprammonium, finishing.*

Merino wool: Merino—a Spanish name for a breed of sheep and so applied to a woollen fabric. Merino is white short-wool sheep and is bred chiefly for its wool. The wool is close and wavy in staple (reaching about 0.10m (4") in length, and surpasses that of all other sheep in fineness. The term "Merino" is widely employed in textile industries with varied meanings. Originally it meant wool of merino sheep—but being shipped from Botany Bay the name was replaced by the term "Botany Wool". In knitting—this term implies the meaning that an article is made from very best soft wool. In hosiery—merino is used for fibre-mixtures of cotton and wool as against all wool.

See also *wool, fur, animal fibres, fibres, botany-wool.*

Mesh fabrics: Usually of open knit construction for underwear, sweaters, etc.

Mesh gloves and hose are usually made of cotton, rayon or nylon.

Open mesh fabrics for summer wear are made from cotton or rayon and are usually in leno or basket-weave.

See also *leno, basket-weave.*

Metallic cloth: Where a metallic yarn is added to conventional fabrics—such as soft silk with gold or silver plaited fine copper wire or aluminium foils with plastic fibres—a decorative fabric is made with core yarn of conventional fibres around which a strip of metal is wound.

Metallic print: Designs made with lacquer by stencilling and then coated with gold or silver or copper powder—dazzle powder is also sometimes used.

Mildew & rotproofing: As these pests are practically everywhere, they are bound to grow in textile materials.

Mildew proofing—protection of textiles by preventing growth of micro-organisms.

Rot-proofing — protection from moulds and bacteria of textiles exposed out of doors. This should also include exposure.

The actual destruction of textile materials is brought about by enzymes—secreted by these micro-organisms.

Wool: Bacterial decomposition of wool is in wet stage. Resistance to mildew can be effected by use of chrome in dye-bath.

- Antiseptics—are also of value
- Sodium fluoride
- " silico fluoride
- Salicylanitide
- Another theory suggests the modification of wool-keratin by treatment with aliphatic-dihalide. This treatment renders wool immune to mildew attacks.

Cotton: An ideal material for mildew growth, and so requires greater attention for proofing.

- Antiseptics are used for proofing.
- Zinc-chloride was used for mildew proofing—(0.8%).
- Salicylanitide—(0.01%)
- Mercaptobenzthiazole (0.02%)
- p-nitrophenol (0.02%) — popular in U.K.
- Product G 4—popular in U.S.

See also *finishing (special finishes).*

Milling: Wool's one most important characteristic is its ability to felt. This ability forms the basis of 'permanent finish'. All wools possess this property in varying degrees. (Merino—superior to crossbred which is superior to long-lustre wools). Also it is observed that the loosely-spun yarns felt more readily than hard-twisted (worsted) yarns. The arrangement of parallel fibres is less responsive than intersecting and projecting fibres and similar weaves also show similar response and plain weave is less readily milled than twill.

The scale-structure and flexibility (in wools) are the two main

features which enable this felting property.

Heat, moisture and pressure cause the fibres to move and get entangled. The fabric becomes thicker and denser as it shrinks in area owing to increasingly matted structure. The pressure in milling machine forces the fibres together in closer contact whereby the scales of adjacent fibres find some mutual friction—with pressure the fibre stretches and contracts in the direction of its roots when pressure is released.

There are 2 types of milling

- (a) stock—when material is pounded by hammer,
- (b) rotary—fabric is treated in rope form.

Three essentials in milling are moisture, heat and pressure.

Alkaline milling: Caused by Na_2CO_3 or soap. Fabric is wetted with Na_2CO_3 (3%) at 40° C temperature.

Soap milling is however more common (11%); after milling goods are scoured.

Acid milling: Not practised in case of vegetable fibres.

—Goods have to be scoured thoroughly before acid milling.

H_2SO_4 (0.5%) is the common acid used for this milling.

Acid milled fabrics are rather stronger than alkaline milled.

See also *felting, finishing (special finishes), wool, permanent set, non-felting (wool)*.

Mineral colours: These include Chrome Yellow, Iron Buff, Prussian Blue, Manganese Brown, Mineral Khaki and other treatment fluids—affecting various mineral colours.

Chrome-Yellow: only useful in cotton dyeing as a self-colour or for conversion to Chrome Orange or in conjunction with indigo, for production of fast green colours. Cotton is first impregnated with solution of Lead acetate or nitrate:

Cotton
Impregnation with Pb (Lead) compound.

Squeeze.

Passing through Na_2SO_4 or limewater to fix lead on fibre as sulphate or oxide of lead.

Passing through Potash bichromate where colour changes to rich orange.

Iron Buff: virtually an oxide of iron.

Cotton: Impregnated with solution of FeSO_4 (Ferrous Sulphate).

Squeeze.

Passing through solution of NaOH or Na_2CO_3 .

Expose to air.

Pass through dilute solution of bleaching powder.

Prussian blue: Applicable to wool, cotton and silk alike. See Heading.

Manganese Brown or Bronze: Applicable to wool, cotton and silk. The animal fibres are readily dyed by boiling with a solution of KMnO_4 , which being absorbed by fibres is readily reduced to insoluble brown Manganic hydrate.

MgSO_4 is added to this bath—to counteract the detrimental effect of KOH which is generated from permanganate.

Cotton: Is first impregnated with solution of manganous chloride, dyeing and passing into hot solution of NaOH —which puts manganous hydrate on the fibre.

Short passage in cold solution of bleaching powder whereby manganous hydrate is oxidized and converted into brown Manganic hydrate.

Other Mineral Colours: The following 2-dip treatments are worth considering in case of mineral colouring especially 'cellophane'.

The following salt solutions in 1-2 per cent strength are used, the "Cellophane" is dipped in one first, drained and then in the other:—

- | | |
|----------------------------|----------|
| 1. Ferric Chloride | } Blue |
| Pot. Ferrocyanide | |
| 2. Cadmium Sulphate | } Yellow |
| Sodium Sulphide | |
| 3. Pot. Antimony | } Orange |
| Tartrate Hydrogen Sulphide | |
| 4. Ferric Chloride | } Orange |
| Soda Ash | |
| 5. Pot. Permanganate | } Brown |
| Soda Ash | |

6. Gold Chloride	} Purple	(b) H ₂ SO ₄ (168°Tw) 20.86 Kg.
Tannin		(46 lbs.)
7. Silver Nitrate	} Brown	(c) Sugar or Jaggery 6.35 Kg.
Tannin		(14 lbs.)
8. CuSO ₄	} Red-Brown	(d) Water 90.92 Lit. (5 buckets)
K ₃ Fe CN ₆		<i>Mixture 2.</i>
9. Cobalt Chloride	} Light Purple	(a) Fe SO ₄ 8.17 Kg. (18 lbs.)
k ₄ FeCN ₆		(b) Water 54.55 Lit. (3 buckets)
		<i>Mixture 3.</i>
10. Pot. dichromate	} Light Green	(a) NaOH 4.54 Kg. (10 lbs.)
SO ₂		(b) Water 45.40 Kg. (100 lbs.)
11. Lead Acetate	} Yellow	
Pot. Dichromate		
12. Nickel Chloride	} Pink	
Dimethyl Glyoxime		

Mineral-khaki: The process and principles of mineral-khaki are substantially the same as aniline-black, the only difference being that here drying can be done in steam chambers and in fact it is better than sun-drying.

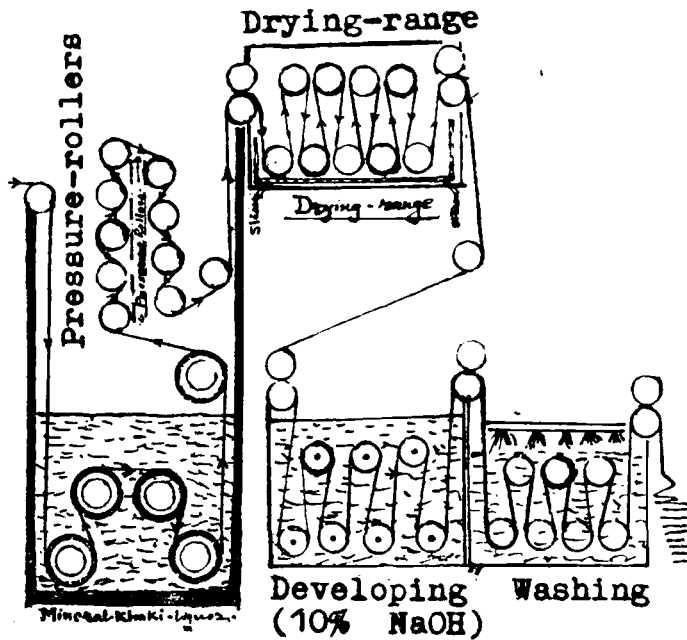
Preparation of the treatment fluid:—

Mixture 1.

(a) K₂Cr₂O₇ 25.40 Kg. (56 lbs.)

The reaction of (1) is very very violent when a, b, and c, are mixed together and the mixture actually comes to boiling state. The addition of water must be done drop by drop and continuously until all the water is added and the reaction finally stops.

Great care and caution must be exercised in this preparation and this should preferably be made in smaller quantities and in a glass (hard glass) or enamel pots and then added together as the product after reaction is perfectly stable.



MINERAL-KHAKI

When the reaction comes to normal, mixture No. 2 may be added and the mixture of 1 and 2 adjusted to 48°Tw.

The mass, when mixtures 1 and 2 are added together, assumes a rich deep bottle green colour and is then ready for mineral-khaki treatment.

The actual process of mineral-khaki dyeing can be done in the following manner.

Cloth—perfectly washed and bleached in the usual manner so that this should have no starch or any other adherents.

Dry—this cloth must be perfectly dry as any water in the cloth may dilute the mineral-khaki liquor and may give uneven results.

Treatment with mineral-khaki liquor—by passing the dried cloth in the tank containing this liquor.

Drying—most important and on which ultimate success depends. This drying may be done in steam chamber or in the open. Drying must be complete.

Development Treatment—with mixture No. 3.
wash—wash—wash

Wash—thorough washing must be done to remove all the superfluous development liquor
wash—again

wash—at least three washings are necessary

Drying and finishing
Plaited down

See also *miscellaneous colours, aniline-black, dyeing, mineral colours, prussian blue.*

Mineral fibres: There is only one natural mineral fibre—*asbestos*. In the artificial mineral fibres are included silicates, slag-wool, metallic threads, etc.

(a) Natural—*Asbestos*.

(b) Artificial:

(1) Silicates (Glass)

(2) Slag-wool.

(3) Metallic threads drawn and used which include gold and silver (Jari threads).

(4) Glass products in fibrous forms.

See also *asbestos, slag-wool, jari (gold and silver threads), fibre-glass, fibres.*

Miscellaneous dyes: Developed directly on fibres on exposure to air or oxygen. The more important of these are aniline-black and mineral-khaki. Indigo is also included in this group.

See also *dyes and dyeing, aniline-black, mineral-khaki, indigo, aero-photo-developed colours.*

Mixtures: As against blends. Mixing fibres together. Fabrics of two or more dissimilar fibres.

Combination of yarns—as cotton warp and worsted weft, etc., or fabrics with blended yarns—blending being of two or more fibres (combined so as to enhance properties over individual fibres)—before spinning.

This mixtures or blending of fibres is often mistaken or confused with combination or core yarns. It must be noted that a combination or core yarn is distinctly different and should not be confused with mixture or blends.

See also *blending of fibres, combination yarns, core-yarns.*

Modified fibres: Man-made fibres whose properties can be modified or controlled by chemical treatments.

See also *pigmented, brightness, dullness, delustring.*

Mogador: Tie-silk. Originally from Mogador (Morocco). The Natives wear turbans of heavy ribbed silk in checks or stripes.

Mohair: Hair of a variety of goat—called Angora goat. A typical mohair fibre is 15 to 16cms (6 to 7 ins.) long, very lustrous owing to its physical structure, 0.003 to 0.004 mm (1/660 to 1/800 of an inch) in diameter, soft and elastic and usually of a clear white transparent colour. There are many varieties of mohair from best

as described to lowest varieties of Kemp or Kempy-wool or the so-called 'Van Mohair'. Mohair is obtained from Angora goat, but when the demand for mohair exceeded the supply, great deal of crossing of Angora goat with commoner goats was inevitable and was done. In fact it is said that the original Angora has practically disappeared after 1870.

Fabric mohair: mohair fabrics were in use in Europe and England from early 18th century, as can be seen from Pope's allusion—

"And, when she sees her friends in deep despair

Observes how much a chintz exceeds mohair."

Raw mohair was exported from Turkey to England by about 1825 and from that date remarkable progress was made in its manufacture into yarns and fabrics. England always maintained supremacy in the manufacture.

See also *angora-goat, animal fibres, fibres, 1825, 1827, 1839, 1870 (Textile Times)*.

Moire: Finishing on carded silk, cotton, rayon. (Plain woven fabrics). Effects produced by engraved rollers, heat and pressure.

See also *scratch-moire, finishing, percaline*.

Moisture-regain:

Fibre	% of Moisture
Cotton	8.5
Silk	11
Flax-hemp	12
Jute	13.8
Wool	16
Carded woollen	17
Worsted yarns	18
Viscose-rayon	11
Cuprammonium	11
Acetate	6
Nylon	4.2
Casein fibre	13
Vinyon	0
Terylene, Dacron	0.4

See also *conditioning, fibre-properties, serviceability of fabrics, water proofing*.

Moleskin: A term used for heavy stout cotton fabric of leathery consistence woven as a satin twill on a strong warp. It is used by outdoor working men as it is exceedingly durable. It is also used for gun-carriage covers and such like other purposes where rough use and resistance is desired or is of primary consideration. Used as base for adhesive plaster and leather. 0.91m (36").

Momme: Measure 1/1000 Kwan (Japan) used in case of Pongee and Habutai. See also *pongee, habutai*.

Mommy-cloth: Made of linen, cotton or rayon. (When woollen is called Granite-cloth). Towelling with a rough, pebbly surface produced by irregular weaving.

Monofil: Any single filament. Monofilaments with denier higher than 14.
—Horsehair is the natural monofilament.
—Coarse viscose filament is similar to horsehair; woven into braids and sewn for women's hats.
—Plastic monofil—Nylon, Saran, etc.

Mordant colours: The mordant colours are remarkable for their fastness to light, washing and other operations. Employed by themselves, mordant colours are useless since, firstly, they are not at all attracted by fibre, and secondly they only yield fugitive stains.

Their importance and value as dyestuffs are due to the fact that they act like weak acids and also have the remarkable property of combining with metallic oxides to form insoluble "Lakes".

The main object in mordant dyeing therefore is to put and fix these "coloured lakes" upon or within the fibre. For these, two operations are necessary, viz. (I) mordanting and (II) dyeing.

Mordanting: The operation fixes upon or within the fibre, the necessary metallic oxide or insoluble basic salt, which is called mordant. The term is also applied to metallic salts used. The mode of application of mordants varies according to nature of fibre and the metallic salts. The chief mordants are chromium, aluminium, tin, copper and iron.

Wool: The method of mordanting—chiefly depending upon the property of decomposing metallic salts when boiled in their solutions. The decomposing is probably due to fibre itself which is probably of the nature of an amino acid. Bichromate of Potash is chiefly the mordant used and frequently the “Assistants” used are sulphuric acid, cream of tartar, tartaric acid and lactic acid, etc.

Silk: Can be mordanted in the same manner as wool but mostly it is treated like cotton. Silk is steeped for several hours in natural or basic solution of Chromium chloride, Alum, Ferric sulphate, etc. Then rinsed in water, and passed into a cold dilute solution of Silicate of soda so as to fix the mordant on the fibre as insoluble silicate.

Cotton: Does not (like wool and silk) possess the power of decomposing metallic salts.

Two chief methods employed are: (1) Oleate and (2) Tannate. First method is to fix metallic salts on the fibre as an oleate and consists of impregnating the cotton with a solution of Turkey-red oil. The oil prepared material is then dried and passed into a cold solution of metallic salt (like Aluminium acetate or Chromium chloride). The mordant is then fixed upon the fibre as a metallic oleate—after passing through water containing little chalk or Silicate of soda to remove acidity and a final rinsing. The cotton is ready for dyeing.

(2) The second method is to fix metallic salts on the fibre as a tannate instead of oleate. This is effected by steeping cotton into cold solution of tannic acid or in cold decoction of some tannin, e.g., tea leaves, Hirda, Behada, in which the cotton attracts a considerable amount of tannic acid. After squeezing the material is steeped for an hour or so in a solution of metallic salt and finally washed.

It is interesting to note that whether the metallic oxide is united with the fibre substance (as in wool or silk) or precipitated as tannate, oleate, silicate, etc. (as in case of cotton or silk) it still has the power of combining with colouring matter in the dye bath to form “coloured lakes” on the fibres.

Dyeing: After mordanting, the dyeing consists of working the mordanted

material (fibres) in a solution of necessary colouring matter, the dye bath being gradually raised to boiling point. During this time, the metallic oxide attracts and chemically combines with the dye-stuff (colouring matter) producing a coloured lake upon the fibre, which is thus dyed.

Mordant Colours are:

(a) Natural mordant colours.

(b) Artificial mordant colours.

The Natural Mordant Colours: It is interesting to note that almost all the natural or vegetable dyestuffs used belong to this class. These are Madder, Cochineal, Peachwood, Sapanwood, Limawood, Camwood, Barwood, Sanderswood, old-Fustic, young-Fustic, Quercitron Bark, Persian berries, Weld and Logwood, etc.

Madder (*Rubia tinctorum*): dried ground roots. Active colouring matter alizarine and purpurine. With different mordants, it yields very distinct colours, all fast to light and soap. Red with aluminium, orange with tin, reddish brown with Cr, purple and black with iron.

Cochineal: dried scales of insect which lives on *Coccus cacti*. Active colouring matter—Carminic acid. It dyes purple with chrome mordant, crimson with Al, scarlet with tin, grey or slate with iron. Chiefly used for dyeing scarlet or crimson on wool.

Soluble Redwoods: (Peachwood, Sapanwood, Limawood); so called because of the solubility of the colouring principle they contain. These are now little employed since the colours are fugitive.

Insoluble Redwoods: (Canwood, Barwood and Sanderswood); so called because their colouring principles are sparingly soluble in boiling water. These are also now little employed since colours are fugitive.

Fustic: a yellow dyestuff of wood of Dyer's mulberry (*Morus tinctoria*). It is still very important and a largely used dyestuff, being cheap and colours obtained are fast to light and other operations. Active colouring principles are morin and maclurin. With Cr mordant it yields olive-yellow. with Al yellow, with tin a bright yellow, and with iron, olive green.

Quercitron Bark: inner bark of an Oak tree (*Quercus Tinctoria*). Colouring

principle—quercitrin. Boiling mineral acid decomposes this and produces the true principle quercitrin. It dyes somewhat like fustic. (Commercially quercitrin is called flavin).

Persian berries: dried unripe fruits of *Rhamnus*. Colouring principle is Xanthorhamnin. Action of fermentation and acids yields true dyestuff rhamnetin. General dyeing properties similar to quercitron.

Weld: dried plant (*Reseda Luteola*); colouring principle Luteolin. Dyeing properties similar to quercitron bark.

Logwood: (heartwood of *Haematoxylon campechianum*). Colouring principle haematoxylin—true colouring matter haematin. It yields with Cr and Al mordants dark blue or even black; with tin, dark purple and with iron, black.

Artificial Mordant Colours: Artificial mordant colours—well represented by Alizarine (the madder root colouring matter), which was the first natural dyestuff prepared artificially from coal-tar product Anthracine in 1868.

All mordant colours possess one property in common, viz., of combining with metallic salts and producing 'lakes' which readily adhere to the fibre.

List of most important colours, arranged according to colour they give with Al as mordant, unless otherwise stated:

Red: Alizarine, Anthrapurpurin Flavopurpurin, Purpurin, Alizarine-Bordeaux, Alizarine Carnet R, Alizarine maroon, Alizarine scarlet, Cloth red, Diamine fast red, Anthracene red, Chrome red, Chrome-Bordeaux, Salicine red, Frio chrome red, etc.

Orange and Yellow: Alizarine orange, Alizarine orange G, Alizarine yellow paste, Alizarine yellow A, Anthracene yellow, Galloflavine, Alizarine yellow GG, Alizarine yellow R, Diamond flavine, Chrome-yellow D, Crimson yellow, Fast yellow, Diamond yellow, Benzo-orange-R, Cloth orange, Carbazol yellow, Chrysamine, Milling orange, etc.

Green: Coernlein, Coernlein S, Alizarine green S, Fast green (Fe), Naphthol green (Fe), Dioxin (Fe), Gambine (Fe), Azo-green, Galland green, Alizarine,

green G and B, Acid alizarine green, Alizarine-cyanine, Alizarine viridine, Diamond green, Chrome green, etc.

See also *dyes, dyeing, (respective headings) natural dyes, vegetable dyes.*

Mordant Printing:

Printing of Mordants:

Other mordants like Madder Style
tannic acid,
B-Nepthol, etc.

(a) *Madder Style*: In this style, the only mordants are Al and Fe. Al alone yields various shades of red and pink when dyed in madder or alizarine. Fe alone yields in the same dyestuff shades varying from black to pale lavender.

Al + Fe combination yields various shades from claret to chocolate.

Both Al + Fe mordants consist of the acetates of the metals. The Fe mordant which gives best results is known as "Black liquor". Al acetate is known as "Red Liquor". It appears that these crude liquors give better results than the pure acetates and so these are employed as such.

Mordant printing presents many difficulties but if the following points are observed most of them can be surmounted:

- (1) After printing the cloth must be gently dried or otherwise the mordants may become dehydrated and show patches instead of even colouration.
- (2) Dyestuff may not be used in excess.
- (3) Temperature of dyebath must be kept as low as possible and consistent with fixation of colour.

The goods are printed with mordants (Al/Fe) acetate and then aged in moist chamber for 2/3 days. In this operation—the ageing which is volatilization of acetic acid leaving the hydrated oxide on fibre goes on slowly and evenly. After hanging and ageing, the last traces of acid are removed and the hydroxide is thoroughly fixed by dung—(A process in which the goods are passed through a mixture of cow-dung and chalk at 50°C temp.). The dunging

continues for about 1½ hours, at the end of which the mordants thoroughly get fixed and also all thickenings are thoroughly washed, thus leaving the cloth in best condition to absorb dye-stuff. The dyeing is carried out by

working the goods at 60°C in a mixture of Alizarine, chalk and glue size for nearly 1½ hours. They are then washed, soaped and chemicked or bleached—again they are washed—soaped and washed.

A SIX-COLOUR, SINGLE DYEBATH SCHEME

	Red	Pink	Chocolate	Dark Purple	Violet	Black
Al Acetate 6°Tw	54.55 Lit. (12 gal.)	13.63 Lit. (3 gal.)	48.4 Lit. (10½ gal.)			
Fe Acetate 24°Tw _j	—	—	2.3 Lit. (½ gal.)	4.54 Lit. (1 gal.)	2.3 Lit. (½ gal.)	36.36 Lit. (8 gal.)
Water	—	36.36 Lit. (8 gal.)	—	50.0 Lit. (11 gal.)	52.2 Lit. (11½ Lit.)	18.18 Lit. (4 gal.)
Dextrine	—	16.33 Kg. (36 lbs.)	—	—	16.32 Kg. (36 Lbs.)	—
Acetic acid	—	4.54 Lit. (1 gal.)	—	—	—	—
Tin Crystals	.66 Kg.	.33 Kg.	—	—	—	—
Cotton seed oil	1.1 Lit.	—	1.1 Lit.	1.1 Lit.	—	1.1 Lit.
Starch	7.26 Kg. (16 lbs.)	—	7.26 Kg. (16 lbs.)	7.26 Kg. (16 lbs.)	—	7.26 Kg. (16 lbs.)

These mordants are printed on white bleached cloth, dried, hung 2/3 days, dunged, dyed, washed, soaped, washed again—chemicked, and finished.

(I) Printing sequence:

Print white bleached cloth as per chart—

Dry and Hang 2/3 days

Dunging

I In Vat.

- 100 gal. of water (454.00 Lit.)
- 10 lbs. of chalk (4.54 Kg.)
- 50 lbs. dung at 60°C (22.68 Kg.)

II 100 gal. water (454.00 Lit.)

- 5 lbs. chalk (2.27 Kg.)
- 25 lbs. cow-dung (11.34 Kg.)

Wash

Dye on weight of cloth
4½% alizarine (blue shade) 20%
1½% lime acetate 28°TW
10% glue solution 15%
in sufficiency of water
temp. cold.

Wash

Soap thoroughly

Wash

Chemick—weak bleaching powder.

Finished.

The Printing of Other Mordants:
Most important are tannic acid, chrome mordant and B-Nepthol.

For Tannic acid printing the following is used.

2.27 Kg (5 lbs.) tannic acid dissolved in
4.54 Lit. (1 gal.) acetic acid and added to
40.91 Lit. (9 gal.) starch and tragacanth paste.

The goods are printed and afterwards simply dried and tannic acid is fixed by passing through the solution:

2 oz. tartar emetic—58.31 Gms.
1 ,, chalk—29.1 Gms.
1 gal. water at 60°C—4.54 Litres.

After washing, they may be dyed in any of the basic aniline colours. Chromic mordants—various such mordants are employed especially chrome-chromates and acetates. Chromate is fixed by boiling in washing soda.

See also *printing, styles of printing*.

Mosquito curtain (net): An arrangement of netting set over a bed or in a window, etc., to keep mosquitoes out.

See also *net, gauze*.

Moth-proofing: The ravages of clothes-moth are well known from earliest times and probably when fibres began to be woven.

(a) clothes-moth—3 common types
(b) carpet beetle

These are mainly responsible for the damage.

The simplest method (of stopping this damage) practised was the exposure to sunlight and open air since these pests are fond of dark—and they require warm atmosphere—and so cold storage is practised for furs and wool.

Some volatile compounds like Naphthalene balls are also used since these products are obnoxious to moths.

For permanent moth-proofing however the fibres have to be impregnated with substances which are non-volatile and which render the fibres unsuitable as food to moths. Many synthetic organic compounds are used for this treatment and this started from a very interesting old fable that moths don't eat green-coloured materials. IG chemists, working on this hypo-

thesis, discovered that the factor responsible for this is martins yellow (2.—4 dinitro-a-naphthol). Other dyes are also found to be effective but stress was laid on colourless dyes or compounds which could be absorbed by wool and held within the fibre.

Popular market brands are:

—Eulan (I.G.)
—Mitin F F (Geigy)
—D D T (, ,)

It was also discovered that inorganic compounds containing Fluorine also showed moth-proofing properties—

—Eulan Extra 1—double fluoride of Al+NH
—Larvex (Na-silicate-fluoride)
—Kydo (Ammono-fluor-antimonate), etc.

It is also suggested that changing the keratin structure would have moth-proofing quality.

See also *finishing, special finishing*.

Mourning crepe: Crisp, dull, black silk, pressed in engraved rollers. Dull and black finish.

See *crepe*.

Mungo-fibres: Wool fibres recovered from rags of hard woollens or hard twisted worsted fabrics.

—Shorter and less preferred than shoddy.

See also *shoddy, noils, recovered wools*.

Musa-fibres: See *banana fibres, musa textiles (Abaca), manila hemp, leaf fibres, vegetable fibres, fibres*.

Muslin: A light cotton cloth (said to have been first made at Mosul and hence the name).

Muslins have been made in various parts of India in large quantities. Some of these Indian muslins are of finest quality and are usually costly.

Arni-muslin—made in South India.

Dacca muslin—made in Bengal and East Pakistan.

European muslins of many kinds (both plain and fancy cloths and

- printed calicos) are now made in Europe and America.
- Swiss-muslin—a light cloth woven in stripes, made in Switzerland.
- Book muslin—a fine yarn, woven in Scotland.
- Mulls (mulmul), jaconets, lenos, are sometimes called muslins.
- See also *Dacca mulls, jaconets, leno, obsolete.*
- Multi-filament yarns:** Made up of many filaments, consisting of less than 3 denier. Fine yarn having greater resilience.
- See also *yarns.*

N

- Nainsook:** ("Pleasing to eyes"). A jaconet bleached and finished soft. Used in India.
- Fine, soft-finished, plain-woven, white cotton fabric with polish on one side. Used for infant wear, lingerie and blouses.
- White cotton fabric like lawn or long-cloth, fine, soft-finished with polish on one side, bleached and dyed in pastel shades, light weight with combed yarns.
- British nainsooks are known as white shirting. Finer grades are mercerised or schreinerized. Used for night-gowns, lingerie, blouses etc. 0.91m (36").
- See also *jaconets, lawn, shirting, pajama-check.*
- Nankeen:** A buff coloured cotton cloth first made at Nankin (China). Used for making clothes especially breeches.
- Nap:** A pile on cloth—the surface of short fibres raised by special processes—differing with different fabrics and then smoothed and cut.
- The word formerly meant roughness on textiles before shearing.
- See also *finishing, piled fabrics, napping, gigging.*
- Napkin:** A square of damask or other linen used for wiping hands or face and used as table napkins at meal times.
- Napping:** The process raises the fibres, and is similar to gigging only here instead of teasels, steel wires are used and action of napping is more powerful than gigging.
- Napping produces deeper pile than soft-raising.
- See *finishing, nap, gigging.*
- Natural fibres:** Fibres that occur naturally or in nature (as against artificial or man-made or synthetic). These include:
- (1) vegetable fibres
 - (2) animal fibres
 - (3) mineral fibres
- See also *fibres, each respective heading.*
- Natural dyes:** See *vegetable dyes.*
- Navajo rug:** Navajo is a North American Indian tribe living in Arizona and Mexico. They are well known for their beautiful blankets.
- See also *rugs.*
- Needle work:** (a) Plain needle work (b) artificial needle work: (i) embroidery (ii) decorative-applique, quilting, couching, patch.
- Plain:** The more important stitches are tacking, running, hemming, feather-stitch and herringbone (all are almost similar) while in buttonhole the thread is looped at each stitch—as also in chain stitch, repairing clothes and household linen—the principle stitch is darning, grafting being its substitute. Chain stitch produces a broken surface—in sharp contrast against long and short stitch, split stitch or satin stitch embroidery. Satin stitch is best suited to express colour effects and in that case serve as a contrast to long and short stitch. Buttonhole stitch prevails to greater extent in relation to art needle work—called Greek laces—and also predominates in making needle point lace.

Couching is another important branch of needle work with gold and silver threads. When these metallic threads are arranged to lie close together and simply stitched flatly to foundation material it is called flat couching (laying). This work is many times done with floss silk.

Applique: or applied work—as well as patch-work—is stitching stuffs together according to decorative design.

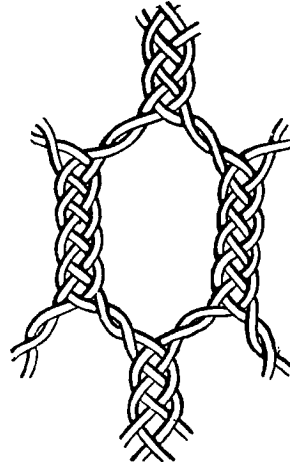
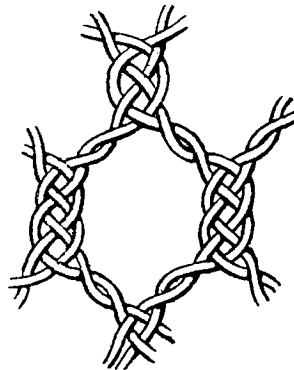
Quilting: also a branch of needle work rather than embroidery. Good quilting is done with chain stitching on the inner side and design in short stitch outside.

See also *lace embroidery, latch, net.*

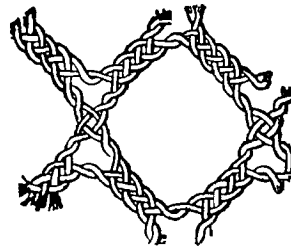
Net: A fabric of thread, cord or wire, the intersections of which are knotted so as to form mesh. This can be done by hand (Hand-netting) or by machine, using Jacquards or Patersons machine.

Net is twisted fabric and made of cotton, linen, silk, rayon or nylon. (1) Blend-net—white silk. (2) Bobbin-net—hexagonal meshes. (3) Cable-net—cores of cotton mesh cords. (4) Filet-net—square mesh. (5) Novelty-nets. (6) Nylon-nets—same as cotton or rayon. (7) Point-d'esprint—narrow width, cotton net. Snowflake like white dots. (8) Rayon-net—same as silk but slightly stiffer.

See also *knitting, lace, jacquard, point d'esprint.*



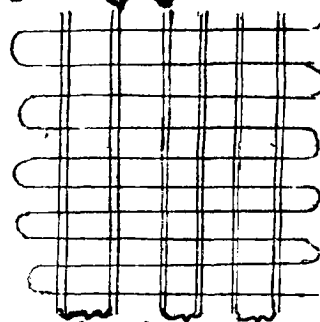
HEXAGONAL MESHES



SQUARE MESH

Ninon: Sheer, plain woven fabric of rayon or nylon. Chief characteristics are: (a) warp in pairs and (b) spacing between pairs of warp yarns.

Warp in pairs



Spacing between warps

NINON

Nitro-cellulose: See *collodion, gun-cotton*.

Noils: (1) Short pieces of wool (short fibres) separated from longer fibres by combing, in preparing tops for worsted yarns.

(2) Rayon—short knotted fibres, rejected in combing.

(3) Silk—wastes from manufacturing processes.

See also *tops, wool-manufacture, mungo*.

Non-felting wool: The 2 great defects with 2 major textile fibres are:

(a) Wool—shrinks while

(b) cotton—creases.

Wool-shrinking is due to:

(1) relaxation of extensions in manufacturing processes

(2) felting of wool-hairs

1 is called relaxation shrinkage

2 is called milling shrinkage.

Relaxation: wool gets considerably stretched in manufacturing operations—a shrinkage occurs when this stretching is relaxed (when wetted in laundering, viz., London-shrunk bring about relaxation).

Milling: matting and consolidation of wool in laundering is known as felting—this is due to fibre-entanglements.

Non-felting Processes: (mainly for knitted materials).

See *milling*.

Many chemical processes are available and all these aim at altering the surface properties of wool.

To get a completely non-felting wool—some wool properties must be sacrificed.

Wet Chlorination: Common practice of removing felting property is by chlorination. The action of chlorine was first commercially recognized by about 1900. The process consists of steeping wool for $\frac{1}{2}$ hour in acidified solution of Sodium hypochlorite from which Cl_2 is liberated. (About 2 to 5% of active Cl_2 on weight of wool is required). Chlorination takes place very rapidly and the results are many times uneven.

This is followed by washing in water—then treating with Sodium bisul-

phite and again washing. Chlorination is a non-controlled process—although some finishers still prefer this old method.

(a) *Negafel:* Process in modern developments in controlled chlorination and uses formic acid to produce Cl_2 from Sodium hypochlorite—(pH 4).

(b) *Hypak Process (German):* Also used for controlled chlorination.

(c) *Stevensons Process:* Uses mixture of hypochlorite and permanganate at pH 9.

Dry Chlorination: The chief obstacle in wet Cl_2 is that it attacks wool vigorously, but Cl_2 gas penetrates readily and reacts slowly when wool is dry. This property is conveniently utilized.

Wool is dried so that it will have normal moisture content. It is then subjected to Cl_2 gas “stoving”—controlled (about 0.45kg. (1 lb.) of Cl_2 for 18.14 kg. (40 lbs.) of wool).

This is supposed to give a more uniform product.

Biochemical Process: The WIRA (Wool-Industry Research Association) has also succeeded in producing non-felting wool by using proteolytic enzymes. Papain from papaya is the enzyme used. 100 parts of scoured wool requires a solution of 0.325 parts of papain in 1250 parts of water—containing 12.5 parts Sodium bisulphite and 2.1 parts of NaOH at pH 6-7 and temperature 65°C for 45 minutes. Washing and Drying. Most interesting point in this papain treatment is that wool is bleached besides being rendered non-felting.

Scale Coating: Coating of film forming substances are applied to wool to mark scales and reduce felting.

—Sirofix process: applies soluble nylon to wool followed by regeneration of nylon.

—Number of processes use melamine formaldehyde in form of acid-colloid.

—Lanaset process.

—Resloom process.

See also *chlorination, wool-properties*.

Non-woven fabrics: Cotton or staple rayon—as webs of fibres which are bound together by resin or starch. Soft and highly absorbent, may be dyed or printed and made fire proof and water repellent.

Various industrial and domestic uses.
See also *bonded fabrics*.

Nottingham: Originally from Nottingham (England)—a curtain-lace.
See also *lace*.

Novelty weaves: Those which are different from the fundamental weaves or combining several techniques in one fabric.
See also *weaving*.

Novelty yarns: Many variations—using different materials and constructions such as chenille, boucle (gimp, loop, ratine) knots—2 or Multiply yarns, slub or metallic.
See also *yarns*.

Nun's veiling: Originally light weight, black fabric, plain-woven like voile, but softer and closer for nun's veils. From worsted or silk. 0.91m (36")—1.07m (42").

Nurse's cloth: Plain woven, stiff, white cotton fabric with linen finish for nurse's uniforms. 0.91m (36").

Nylon:

Background:

The story of nylon is more complex than that of rayon or acetate, because this was one of the first commercial, truly synthetic fibers—coming directly out of the laboratories of Du Pont chemists. The fiber was the outgrowth of a fundamental research program started in 1927 and carried on by the late Dr. Wallace H. Carothers and his staff.

The project was "fundamental" in its purest sense. These Du Pont scientists were not trying to create a specific product—they were simply attempting to add to basic chemical knowledge, in this case through the study of polymerization—how and why small molecules unite to form "giant" ones. But from this program of fundamental research came the discovery of nylon, first announced by Du Pont in October, 1938. (Dr. Carother's work also paved the way for the later discovery of the polyester fibers.)

Impact of the new fiber was tremendous. It captured the public imagination as no other fiber has, before or since. Because nylon had such astonishing

properties, unknown in any other fiber up to that time, widespread rumors built up to the effect that it would "never wear out," and that "nylon stockings won't run." Due to such far-fetched claims, Du Pont in the early days of nylon found itself in the unusual position of trying to disclaim some of the "miracle" claims being made by the press for its new fiber.

The first complete costume of nylon was shown at the New York World's Fair in 1940. With increased production facilities, nylon apparel began to appear on the market in wider variety, but still largely in limited quantity. Included were women's lingerie and foundation garments, in addition to stockings and men's socks. All received enthusiastic public acceptance.

In February, 1942, the fiber "went to war," all production being earmarked for military demands. The new fiber proved invaluable for such uses as parachutes, glider tow ropes, jungle tents, tarpaulins, and tire cord for heavy bombers.

With the war's end, nylon came back to the civilian and has since led the way to the present wealth of synthetic fibers, which have practically revolutionized the textile field while opening up a hitherto undreamed of world of easy-care living.

Long the only producer of nylon, Du Pont in 1951 licensed to the Chemstrand Corporation the rights to manufacture the yarn under Du Pont patents. Similar arrangements have been made with other fiber producers, and nylon is now made by 11 companies in this country in addition to Du Pont and by many other firms throughout the world.

The word "nylon" was coined by Du Pont.

Chemical Composition:

- (1) Hexamethylene-diamine and
- (2) Adipic acid.

Apparel Uses:

Nylon "covers the waterfront." It would be hard to think of a fiber more widely used in the apparel field. Babies and toddlers, school boys and girls, teen-agers, men and women—nylon, alone or in blends, can clothe them all from head to toe and from underwear to outerwear, from swimsuits to snowsuits.

Home Furnishings Uses:

In carpets and upholstery both in the home and automotive industry.

Industrial Uses:

Due to its great strength, nylon has many industrial uses. Its major industrial application is in high quality tire cord and it is used also in cordage, seat belts, fish nets, parachutes, and coated fabrics such as tarpaulins and tents.

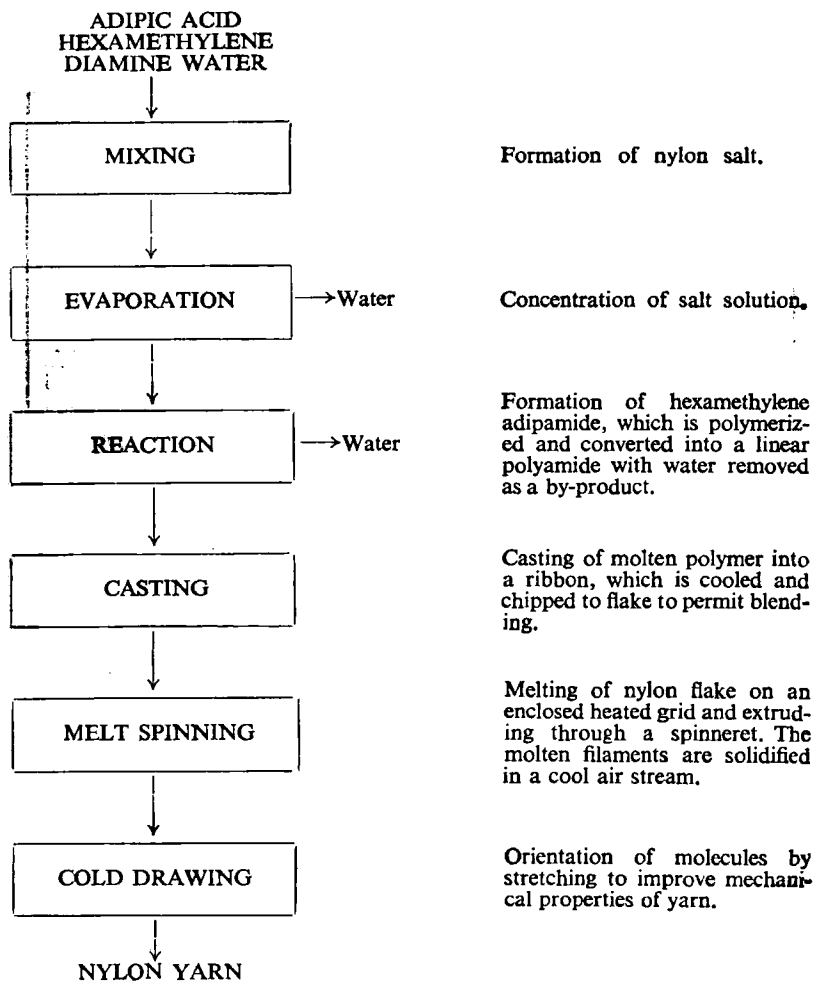
Main Characteristics:

Weight for weight, nylon filament

yarn is stronger than steel wire. But this ruggedness is coupled with extreme light weight, a combination that makes it possible for fabrics to be filmy and gossamer, yet practical and long-wearing.

Nylon has great resistance to wear and tear—can take an enormous amount of rubbing, scraping, and similar abrasion without being affected.

(Nylon is mothproof, resists insect-attack.) It also resists damage from mildew and is not weakened by perspiration.



Specialised Forms of Du Pont Nylon:

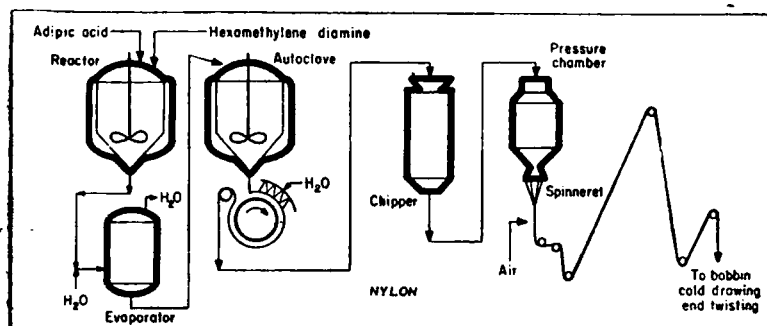
Du Pont 420 nylon, introduced in July 1957 is a high-tenacity, high-modulus staple especially engineered to be a good "working partner" with rayon and cotton. Tests have shown that when fortified with at least 17 per cent of this type of nylon, cotton work clothes and men's and boy's rayon suits, slacks and jackets can give up to 70 per cent longer wear than all-cotton or all-rayon garments of similar construction.

Sparkling Nylon, announced in September, 1959, is a new 15-denier hosiery yarn (now trademarked "Antron" nylon) that is as lustrous as its name implies. The sparkle is not a finish, additive,

or treatment, but is inherent in the new nylon itself, so it will not wash, fade, or wear out. The yarn is used for high-fashion, special-occasion hosiery and comes in a wide range of shimmering colors.

Nylon staple and tow were first used by carpet manufacturers in 1946. Du Pont BCF nylon, a trilobal cross-section, bulk textured, continuous filament nylon engineered specifically for carpets, was introduced in 1959. In 1960 the trilobal cross-section staple and tow for carpets were introduced. (Taken from Du Pont News Bulletin.)

See also *synthetic fibres, man-made-fibres, fibres, thermoplastic resins.*



NYLON PROCESS CHART

O

Obsolete: List of obsolete fabrics and processes.

Obsolete fabrics (now discontinued):

Argentine	Kimono flannel
Bagheera	Linen mesh.
Bolivia	Linsey woolsey
Brussel's carpet	Marseilles
Brilliant:ne	Mull
Calico	Peau-de-soie
Cambric white	Persian lamb
Cassimere	Radnov cloth
China silk	Roshanara
Cordura	Russian cord
Gloria	Shan-tung
Henrietta	Silk-gauge
India linen	Soiesette
Ingrain carpet	Wash-silk
Kimono carpet	

Processes discontinued:

Air-fast	Kotoc
----------	-------

Animalised fibres	Krene
Aqua-set	Lanticel
Aralac	Neva-wet
Celairse	Seraceta
Celok	Sheerset
Charmatise	Tenased
Crown tested	Tubize

See also under *different headings.*

Odour resistant: In practice control of germs or bacteria, is directly responsible in bringing about odour-resistance. Necessary in case of canvas, shoe-lining, powder-puffs, woollen-socks, etc.

See also *antiseptic finishing, damage, mothproofing, mildew-resistant.*

Oil-cloth: (a) A painted floor cloth. Cotton muslin fabric coated with

compounds of linseed oil and pigments—embossed or smoothened with dull or pebbled finish. Plain 0.99m (39")—prints 1.15m (45").

Heavy water-proof cloth used for covering.

(b) Oil-cloth is made principally from hessian (heavy painted), coarse cloth of flax or hemp stretched and brushed with glue compounds to make it stiff. When dried, it is smoothened by rubbing with pumice-stone. Then 2/3 coats of thick heavy paints are given (each coat being similarly smoothened).

See also *water-proofing, floor carpet, matting, linoleum.*

Oiled-silk: Thin silk fabric—impregnated with boiled linseed oil and dried. Used for shower-curtains. Surgical use is now replaced by plastic films.

See also *shower curtain materials.*

Oil-skin: Cloth made waterproof by means of oil. Garments made of oil-skins.

See also *water-proofing.*

Olive-drab: (The OD Official)—Official colour of U.S. Army woollen uniforms.

See also *forestry cloth, khaki.*

Optical bleach: (Optical whiteners). A chemical dye which changes the character and external appearance of cotton fibres so that they appear white by optical effects.

There can be no doubt that this is altogether a new technique in the art of bleaching and definitely a new approach in effecting bleaching. Optical bleaches at present are available for cotton or vegetable fibres only.

See also *bleaching, finishing.*

Organdy: A thin, transparent, stiff muslin of fine, combed, cotton-yarn. Plain-woven. Used for dresses, neckwear, trimmings. Better qualities with a durable crisp finish. Shadow-organdy—pigment printed, with opaque designs, used for dresses, curtains, blouses. 0.91m (36").

Organzine-silk: Several silk threads twisted together. A fabric of same. Net

silk yields organzine and tram; both are in proportion to diameter. The strongest and most elastic of textile threads, they are highly lustrous and smooth but organzine is hard twisted and used for warp while tram only slightly twisted and used for weft. They give the range upto 450,000 yards per lb. In organzine (threads used for warps). Threads are made from 2 or 3 twisted strands spun in opposite direction to that in which they are separately twisted.

See also *thrown-silk, tram, reeling of silk, silk.*

"Orlon" Acrylic Fiber:

Background:

Second of Du Pont's true synthetic fibers was "Orlon", which resulted from a research project begun in 1941 in the Pioneering Research Division of the company's Textile Fibers Department. This was a study of vinyl-type compounds, and their possibilities for fibers or films.

First garments in fabrics of "Orlon" became commercially available late in 1951, made from both continuous filament and staple. In November of that year Du Pont presented to the press in New York a fashion show and exhibits of new developments in the fiber.

By 1952, "Orlon" was appearing in practically all types of wearing apparel for men, women, and children, and its growth since then has been a dramatic one—so much so that as early as the fifth year of its commercial production more than 70,000,000 women's sweaters alone were made from the fiber.

Chemical Composition:

Acrylonitrile is the basic ingredient in the manufacture of "Orlon". Du Pont produces the fiber in two basic forms—staple fiber and tow.

Apparel Uses:

Perhaps the best known apparel use of "Orlon" acrylic fiber is in sweaters for all members of the family. Used either alone or in blends with other fibers, primarily wool, rayon, and cotton. Deep pile coats and linings, blouses, dresses, skirts, robes, sleep wear, mens and boys' slacks, suits, socks, sport shirts, undershirts, and sport coats are some of the most popular apparel items of "Orlon".

Other Uses:

In home furnishing: draperies, carpets, and blankets.

Industrial uses: felts, filtration fabric, and non-woven fabrics.

"Orlon" can be used to give bulk and warmth with light weight. The fiber has pleasing touch to the skin.

"Orlon" can be dyed to the full range of colors with outstanding clarity, brightness and resistance to fading.

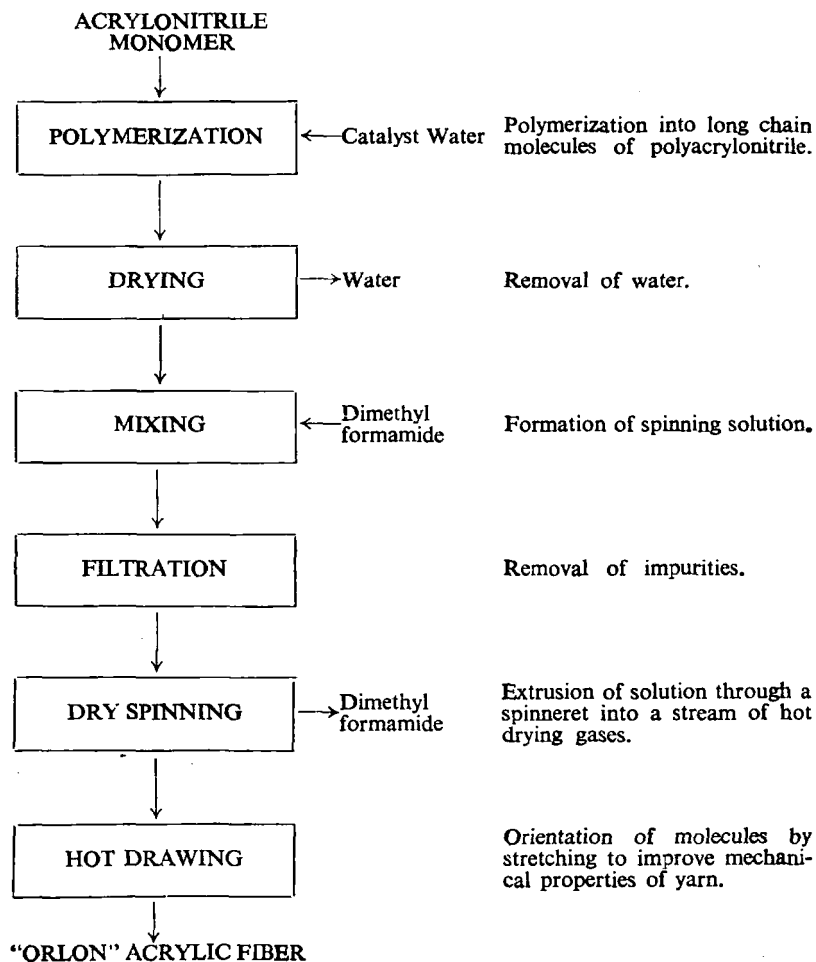
Fabrics of "Orlon" show good resistance to wrinkling. They can be made with durable pleats and creases.

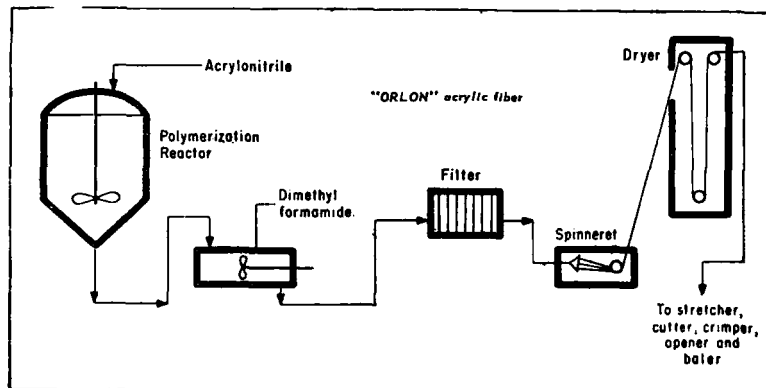
"Orlon" has very high resistance to

damage from many chemicals such as battery acid, acid fumes, soot, or smoke, a factor that makes it important for men's work clothes and uniforms. And like Du Pont's other synthetic fibers, it is not weakened by mildew nor attacked by moths.

While "Orlon" is not as strong as nylon, it is a sturdy fiber, possessing about twice the strength of wool. Garments will give long wear, because "Orlon" also has good resistance to abrasion. (Taken from Du Pont News Bulletin).

See *synthetic fibres, fibres, vinyl resins.*





ORLON PROCESS CHART

Osnaburg cloth: A coarser type of plain fabric, originally made from flax yarns, now made from flax, tow or jute yarns—sometimes flax or tow warp and jute or mixed weft but more often entirely jute. The finer and better qualities containing 20 to 36 threads, 10 to 15 picks, form a kind of sheeting.

—Rough, coarse, uneven yarns of lower thread count, plain-woven, grey cloth from low grade cotton or even cotton-waste. Unbleached—when converted resembles linen. Used for bags. Cleaner finished variety for hopsacking. 0.91m (36")—1.37m (54").

See also *converting, hopsacking, flax (tow)*.

Ottoman: (a) A heavy, corded, plain-woven silk fabric with longer and rounder ribs than faille. Used for coats, trimmings, etc.

(b) Heavy silk, nylon, or rayon fabric, corded with cotton-cord, (broader ribs alternating with smaller ribs). Worsted fabric is also called Ottoman. Plain-woven. 0.91m (36"), 1.02m (40").

See also *corded fabrics, ribbed fabrics, faille*.

Outing flannel: Soft, light-weight cotton fabric, plain or twill, napped. White solid colours—printed or yarn-dyed. Used in sleeping-suits, interlinings etc. 0.69m (27"), 0.91m (36").

See also *pajamas, flannel*.

Oxford-grey: Mixture of blue and white woollen fibres in yarns for woven or knitted goods.

Oxford-grey shirting: A plain woven cloth usually with a coloured pattern, used for shirts and dresses.

Oxford-shirting: Distinct basket-weave or variations. Single-warp and double-weft or reverse, mercerised. 0.91 m (36").

—Heavier than broad-cloth and usually having twice as many ends as picks per inch.

—Chambray Oxford—dyed warp, white weft.

—British Oxford—fancy stripes.

—Single Oxford—if made in single.

See also *chambrey, basket weave broad cloth, etc.*

P

Pacific-stabilised fabric: (TM) Finishing treatment for woollen or worsted, (ready-to-wear) clothes against wrin-

kles, stains and shrinkage.

See also *stabilisation, finishing, wrinkle-proofing*.

Paisley: Paisley has been an important manufacturing centre since 18th century, famous for linen, lawn, silk-gauze and famous Paisley shawls. See also *Paisley-shawl*.

Paisley-print: Designs imitating original shawl patterns on any fabric. See also *imitation goods*.

Paisley-shawl: (Scotland)—handwoven, from 19th century to imitate the famous Kashmir shawls of India. Mostly with characteristic pine-patterns. See also *Kashmir shawls*.

Pajama-check: (Pajama—Hindi, leg, cloth). Loose drawers or trousers tied round the waist. A sleeping suit. —Barred nainsook—for men's wear. —Heavier than dimity—(not cord but group of yarns). See also *outing-flannel*, *nainsook*, *dimity*.

Palm-beach: (Originally cotton warp, mohair weft fabric for men's suits). A light weight suiting fabric (of mohair, rayon or nylon) in plain weave, white, yarn or piece-dyed for ready-to-wear clothes. See also *suiting*.

Panne: A lighter velvet with pile laid flat, in one direction. —A rayon satin. —A rich looking velvet with the pile pressed down in one direction, by pressing the fabric over rollers and subjecting it to steam and pressure. This gives a satin appearance. If the rollers are embossed and imprint a pattern on panne, it is called 'embossed velvet'. See also *velvet*, *pile-fabrics*.

Paper-cambric: Paper-products: The development of paper industry gave stimulus to paper textiles based upon the production of pulp-yarns; paper-pulps are worked into flat-strips, which are subsequently rolled into cylindrical forms and by a final twisting, a yarn of sufficient strength is produced which is employed in weaving. —Paper products are non-woven

fabrics, used in kitchen handkerchiefs, blankets, etc.

—Twisted, woven or braided for backing of rugs.

—Strips: twisted and woven for bags.

See also *fibre-rug*, *fibre-yarns*, *non-woven-fabrics*.

Parachute-fabric: Originally silk-fabric —woven according to desired specifications. Now mostly nylon but sometimes high-tenacity rayons are also used, and these fibres are replacing silk.

—very fine, soft, lustrous and very strong fabric

—plain white colour or camouflage colours

—for humans usually silk or nylon, for cargoes usually rayon.

See also *nylon*, *rayon (high tenacity)*, *air-plane cloth*.

Peanut-fibre: regenerated protein fibres, resembling wool.

See also *synthetic fibres*, *wool substitutes*, *ardil*, *vicara*, *azlon*.

Perching: A contributing finish applied to woollen fabrics. It examines and repairs or corrects the fabrics. This is a job of highly trained workers who must be well skilled in locating defects and correcting them. This is mainly a hand operation.

See also, *finishing*, *woollen manufacture*.

Percalé: Plain woven cotton for dresses, pyjamas, sportswear, etc. White, dyed, plain or printed in checks or plaids of gingham type. Finer and lighter in weight than muslin, may be mercerised. 0.91m (36").

Combed yarns—about 200 threads per sq. in., smooth texture. Light-weight percalé—light weight carded yarn with lower count sheeting—has a fine yarn and higher thread count than muslin. It is generally with square thread count—and never less than 80 threads per square inch (6.45 sq. cms.).

Percalé (Printed) U.S.—plain woven, carded yarns, printed fabric. Very widely used—usually converted from standard print cloth by bleaching and printing with appropriate designs.

See also *sheeting*, *muslin*.

Percaline: Moire finished fabric with high gloss. Light weight, finer than percale, sized, calendered, bleached and printed. Used for trimmings.

See also *moire*.

Perle or pearl-cotton: Mercerised thread for hand-weaving, knitting or embroidery.

Permanent-finish: (Durable glaze). A chemical treatment given to fabrics to impart a glazed finish—which can withstand washing, rough wear, soiling, etc.

Some trade commissions do not approve of this term and the term they prefer is 'durable-finish'.

See also *finishing, durable finish, saylerised*.

Permanent set: Chemical mechanism very similar to permanent waving of hair. When wool is stretched, the long polypeptide chains are disturbed and certain cross linkages and the molecular grids are stretched down under stress. When steamed in this state, some hydrolytic breakdown of cross linkages takes place and these broken linkages then reform in new and unstressed positions and thus wool becomes set.

Processes used are—crabbing, blowing and boiling.

Crabbing involves use of hot water and some tension and this effect is enhanced by wet blowing.

Blowing depends on use of steam at 100°C for some time (not to be mistaken for steaming).

Boiling involves treatment of wool, under tension at 100°C.

See also *finishing, dimensional stability*.

pH (Acid-alkali):

—pH scale is now used to express the intensity of acidity or alkalinity.

—pH stands for H₂ potential—the logarithm of the reciprocal of H ion concentration.

Solutions whose pH is exactly 7 are neutral, those whose pH exceeds 7 are alkaline while those whose pH is less than 7 are acidic.

Acid	pH	Base
1	7	14
neutral		
Acid		Base

The exact pH of a solution is determined by *electrometric method*—also there are substances which change colour at a certain pH—and so *colorimetric method* also can be used.

(a) Litmus—blue at pH 8 or more
,, —red at pH 6 or less

(b) Phenolphthalein
—red at pH 9 or over
—colourless at pH 8 or under.

See also *acid, alkali, bases*.

Pick: Picking or placing line of weft between divided warp.

See also *weaving, weft, warp or ends*.

Picot: In lace-making the little loops are called picots. A loop in an ornamental edging—the front of a flounce and such picot edge can also be produced by hemstitching machine.

See also *lace*.

Piece-dyed: Fabric dyed after weaving.

See also *yarn-dyed*.

Pigmented: Process of giving permanent dullness to rayons or synthetic fibres, before spinning. Finely divided pigments (TiO₂), or others, added to spinning solution.

See also *delustring, glaze, lustre*.

Pile or piled fabrics: In this type, portions of warp or weft assume a vertical position, besides the ordinary longitudinal and transverse parallel lines.

In this case there are two series of weft threads, one intersecting with warp to form the ground texture while the other although bound to the ground is picked up at regular intervals which effects a uniform brush-like surface.

Warp-piled-fabrics: These have at least two series of warp threads to one of weft and are generally more varied in structure than weft-piled fabrics since they may be plain or figured and have their surfaces cut and/or looped. (Refer to heading).

Velvet: In velvets, (either single or double woven), at intervals of 2 or 3

picks, the pile threads are lifted up over a knife—at outer extremity, in withdrawing the piled threads are cut—but looped if the wire is pointed. (Refer to heading).

Plush: (Velour or double-plush) have two distinct ground textures which are kept at suitable distance to ensure requisite length of pile. Pile threads are interlaced with each series of weft threads and passed from one end to the other—the uniting pile material is then cut midway between upper and lower texture thus effecting two equal fabrics. (Refer to heading: Plush and Velours).

Figured warp-piled-fabrics—See Brussels carpet.

Weft-piled-fabrics—Refer to heading.

See also *Brussels carpet, velvets, velveteen, chenille, plushes, corduroy*.

Pillow-cases: Same as sheets. Tubular casings are usually costlier than flat cases.

Size: 1.07m × 0.91m (42" × 36") or 1.15m × 0.91m (45" × 36") usually.

Pima cotton: Long staple cotton fibres used in combed yarns for finer dressgoods—especially shirtings.

See also *cotton*.

Pin-check: Woven checks, finer and smaller than Shephards.

See also *shephards check*.

Pina cloth: A beautiful fabric made of the fibres of the leaves of Pineapple plant. This transparent yet a bit stiff fabric is made from this wonder fibre.

See also *pine-apple fibre, structural fibres*.

Pine-apple: (*Ananassa sativa*). A wonder fibre. Another exceptionally fine fibre derived from fibro-vascular bundles of the plant *Ananassa sativa* which grows in tropical regions and India. This exceptionally fine fibre is employed in the production of textiles of remarkable fineness (almost a wonder fibre). Exceptional fineness of ultimate fibre.

3.0-9.0mm ——— 0.004-0.008 AV.

See also *vegetable fibres, fibres, leaf fibres*.

Pique: A heavy cotton fabric having the surface corded or with a raised lozenge pattern. A similar pattern produced by quilting with needles.

Pique is a fabric of cotton, rayon or silk with raised cords usually running the length of the fabric. May be plain or have printed designs.

—A characteristic cotton fabric having warpwise cord effect to extra weft yarns on back and stiffer warp yarns under each cord.

—Better qualities have additional warp-ends woven along back only under each cord which helps raising it.

—American carded or combed yarn fabrics are usually warp-piques with narrow raised cords or wales running warp or lengthwise.

Very narrow cords are called pin-wales.

—Pique is a lighter Bedford-cord.

—Pin-wale or wide-wale-cord—combed or carded yarns usually mercerised, 0.91m (36").

Pique patterns

- (1) Bird's-eye woven patterns.
- (2) Cotton Bedford-cord — coarser and heavier than pique.
- (3) Embossed patterns
 - (a) Bird's-eye design—picoley
 - (b) Blister designs
- (4) Novelty or metalassie pique.
- (5) Honey-comb—retains raised cord effect.

Pique (British), also called toilet-wefts, is weft-wise fabric with distinct cord similar to Bedford but running widthwise.

Fancy-pique or Vestings are compound fabrics with puffed or quilted designs used for shirt-fronts, dress-shirts, etc.

See also *Bedford cord, bird's-eye weave*.

Pitch: Number of tufts or loops per sq. in (6.45 sq. cms.) across width of rug.

See also *rug*.

Plaid: A loose outer garment (of woollen cloth) consisting of an oblong piece of woollen cloth, very often of tartan or coloured stripes design which forms the principal outer part

of the costume of Highlanders of Scotland.

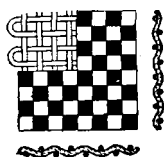
See also *tartan*.

Plain or flat knit: Simplest knitting construction in hose and jersey. Cloth having vertical wales—obvious on face with cross-lines at back.

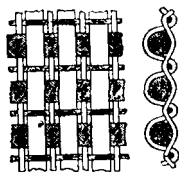
See also *knitting*.

Plain weave: (Plain cloth) in which the warp and weft threads are almost equal in thickness and closeness and pass *over and under* each other alternatively.

Such a fabric would appear to allow only slight ornamentation but actually many patterns are possible even with this simple weave, viz.: Thick and thin threads of warp and weft—alternatively the resultant fabric may be made to assume a corrugated appearance on the face while it would be flat underneath.



1.—Plain Cloth.



2.—Repp Cloth.

In Poplins, Repp and Cords:

1 thin and 1 thick warp alternatively woven with 1 thin and 1 thick weft.

Colour may also be used to ornament fabrics and produce stripes and checks. Many fine specimens of the most artistic and rich patterns can be produced by clever combination and use of colour and simple weave. In this weave the warps are set evenly on the frame—the shuttle carrying crosswise weft goes over one warp and then under the next and over the next again and so on. Plain woven fabrics, Gingham,

Percalé, Chambray, Table linen, Shantung, Woollen tweeds, and Voiles are plain woven fabrics.

See also *weaving, plain, repp, poplin, fibre to fabric*.

Plastic goods: Plastic used in place of cloth:

- (a) Coated yarns—with vinyl coating
- (b) Beutanol—vinyl coated fabric ref. to heading
- (c) Monofilaments
- (d) Plastolyn—ref. to heading
- (e) Quilted—Heat-set or stitched

Plastics:

- (a) Cellulose plastic—Nitro-cellulose
- (b) Cellulose acetate—Acetate rayon
- (c) L. cellulose—Linters
- (d) Acrylic resin—Orlon
- (e) Vinyl plastics—Vinyon
- (f) Polythene—Films
- (g) Polystyrene—Substitute rubber
- (h) Polyamide—Nylon
- (i) Polyester—Terylene, Dacron
- (j) Silicone—Synthetic rubber
- (k) Triflorochloroethylene
- (l) Polytetrafluoroethylene—Teflon
- (m) Styrene—Rubber

See also *thermo-plastic, synthetic resins, synthetic fibres*.

Plastolyn: Simulated damask, with napped-back cotton fabric. The fleeced-back surface protects table finish and resists staining and also can be wiped clean .1.37m (54") square.

Plated: Knit goods having face of one kind of yarn (say worsted) and back of another (say cotton).

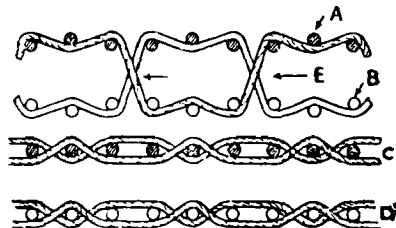
Plisse: Geometric patterns or blistered stripes effect, given by chemical treatments to cotton-goods. This is brought about by shrinkage action of NaOH and this effects permanent crepiness.

Plisse-printing: (or crepe printing) Results in permanent crinkled effect given to cotton and rayon fabrics. (1) The fabric is passed through roller printing machine where the design is imprinted with print paste that contains strong NaOH. The fabric is dried and then subjected to moist steaming. Only the portions printed with NaOH shrink while the rest of the fabric retains the original size and shape. This shrinkage

results in crinkled effect. (2) The design is printed with resisting gums and the fabric is given a caustic soda bath. The imprinted portion shrinks and when the gum is washed out the portion has a puckered appearance. In both cases, the shrinkage results in crinkled effect.

See also *crepe, printing*.

Plush: (Piled fabrics). A textile fabric having a cut nap for pile—(the same as fustian or velvet). Originally the plush pile consisted of mohair or worsted yarn but now mostly of silk or cotton backing. The distinction from velvet being in longer and less dense pile of plush used for dress and military but chiefly in upholstery.



PLUSH

A cut pile fabric with greater depth than velvet—0.0036m (1/7") or more.

- (a) Mohair—pile fabric on cotton back;
- (b) Rayon—imitation fur—various textures;
- (c) Silk or tussors—various textures for caps or trimmings.

See also *velvet, piled fabrics*.

Ply: Number of single yarns—twisted together:

- 2 ply indicates superior goods—Poplin, Voile, etc.
- One of several layers (laminated fabrics).

Point d'esprint: Cotton-net, having over its surface, scattered, small, snow flake-like dots.—Narrow or 0.91m (36").

See also *net*.

Poiret twill: (Named after the designer Poiret).

Steep twill—resembling gaberdine but finer and smoother—1.42m (56").

See also *twill, gaberdine*.

Polka-dot: Round dots (embroidered, printed or flock-dotted), giving a surface pattern effect. Called coin-dot if very large.

Polo cloth: Camel-hair coating, twilled and deeply napped—1.42m (56").

Pongee: A soft kind of silk, woven in China from the cocoons of a wild silkworm. Originally handwoven from wild silks in Shantung China Tussore is a variety of wild silks.

—Chinese fabrics show dull surface appearance because of rice powder.

—U.S. imitation of Pongee—from wild-silks, rayon or spun silk.

—Japanese—both varieties—sold on weight as 12-14 momme.

—Cotton pongee—smooth, flat, lustrous and plain—woven from combed yarn, mercerized, dyed and scherenised for a high lustre.

—U.S. pongee (Soisette)—more picks than ends—weft yarns heavier than warp yarns which produces a very flat and balanced cloth.

—British Pongee—warp yarns heavier than weft yarns and have more ends than picks and are always in square threads count construction.

See also *silk, wild silk, shantung, habutai*.

Poplin: Originally a 15th century fabric—the word derived from Papeline, as compliment to Pope. Used as silk for Church hangings.

It was a kind of cloth in which the warp was of silk while the weft of worsted; the latter being thicker than the former gave a corded appearance. The fabric had therefore a ridged structure, like repp, which gave depth and softness to the lustre of silky surface.

Poplins have about twice as many ends as picks—the fewer spaced weft yarns producing a characteristic ribbed appearance which becomes even more conspicuous if heavier weft yarns are used.

A plain woven fabric with ribs running widthwise, in all white, solid

colours, printed or yarn-dyed—stripe effect.

- (a) A ribbed fabric of silk, rayon, nylon with worsted silk or cotton weft cords—women's wear. 1.02m (40");
- (b) Cotton—weft-wise ribbed—mercerized, white or piece dyed—men's shirts, etc., in various degrees of fineness;
- (c) Rayon or nylon with cotton ends. 0.99m (39")—1.07m (42");
- (d) Worsted, same weave for dress suits. Same widths.

Uses—coats, shirts, suits, men's shirts, pyjamas.

See also *rib weave, ribbed fabric, plain weave*.

Powder-puff muslins: Fine, light weight cotton lawn type, plain or printed with a durable crisp finish—0.91m (36").

Preshrunk: Means a fabric or garment having undergone preshrinkage and won't shrink further out of fit.

See also *London shrunk, sanforized, rigmel shrunk, shrinkage control*.

Pressing: A finishing operation—used in case of wool. This produces smoothness and lustre.

Controlled moisture, heat and pressure are the three basic requirements for this process also and is like ironing the clothes at home. Resulting fabrics are wound smooth and all the wrinkles and creases are removed—thus giving a smooth level and lustrous appearance.

—As calendering to vegetable fabrics, pressing is used for the same purpose in case of woollen goods.

—Fabrics have to be damped slightly before subjecting to this operation. Done by Pressing-machines.

See also *finishing, calendering, woollen finishing*.

Primuline colours: (*Developed direct colours*). When Primuline yellow, which has an amido base, is diazotised on the fibres and then developed in solutions of phenols or amines, Azodyes of various hues can be obtained depending on the developer used. Thus—

B-nepththol develops a bright red
Resorcin „ an orange
Phenol „ a yellow
Nepththylamine „ a brown, etc.

The process for dyeing with primuline yellow is:

Cotton —Boiled for 1 hour in primuline yellow (5%) and common salt (10 to 20%).

—Diazotizing—Passing the dyed and rinsed cotton for 5/10 minutes in ice-cold solution of Nitrous acid 17.2 gms (3/4 oz.), sodium nitrate in 4.54 litres (1 gal.) of water slightly acidified with H_2SO_4 .

—Immediately wash—cold water—no exposure.

—Developer—5 to 10 minutes ice-cold solution of necessary phenol.

—Wash.

If cotton is dyed with other direct colours containing free amido groups, the colour can be diazotized, *on the dyed fibre*, exactly in the same manner (as stated). In this manner, a new Azodye can be produced upon the same fibre which differs from the original one not only in colour but also in being faster to washing and other operations. A treatment with $CuSO_4$ after development usually renders colour faster. The following direct colours may be treated as stated above:—

Blue: Diazurine, Diazo Blue, Diamine Blue, Diaminogene.

Red: Rosanthene.

Brown: Diazo brown, Diamine cutch, Diamine brown, Cotton brown.

Grey and Black: Benzo blue, Diazo blue black, Diazo black, Diamine black, Diazo brilliant black.

See also *dyes, dyeing, developed colours*.

Print: (A printed cloth). Calico stamped with figures. A term generally also applied to the staple kinds of cotton goods.

Print-cloth: (U.S.) Basic carded yarn, plan-woven medium weight, staple,

fabric. Yarns (28-42s). Most widely used converting fabric, often used as substitute for the same name.

See also *printers*.

Printers: (British fabric). Cheshire or Burnley Printers. Similar to print cloth—bleached, dyed and finished cloth. Often referred to as white-shirting.

See also *print-cloth, shirting*.

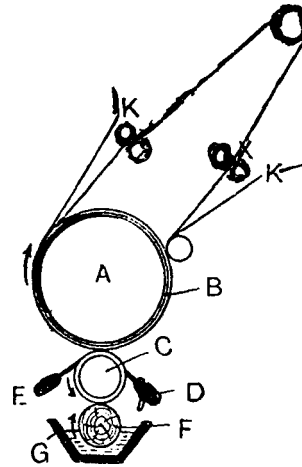
Printing: Preparation of cloth for printing. Preparation of colours for printing. Methods of printing. (a) Hand-block printing. (b) Engraved copper plate printing. (c) Roller-printing. (d) Duplex printing machines. (e) Stencilling. (f) Silk-screen printing, etc.

See also *copper rollers and styles of printing*.

Printing is a very important branch of textile industry, so much so that without this the cloths manufactured would have been unacceptable and would have become monotonous.

The principles of printing are the same as dyeing only here instead of dyeing the whole fabric, only certain portions are dyed with the desired colour and according to the desired pattern. But the same principles as dyeing are involved here in making the pattern fast or permanent.

- (1) Hand - block - printing — ref. to heading.
- (2) Engraved copper plate printing—first practised by Bell in 1770 as an industry—now obsolete.
- (3) Roller or cylinder or machine printing—This is rather an elegant and efficient process, patented and worked by Bell in 1785. Here also, as in the case of copper plate printing, colour registration was the most difficult part but Adam Parkinson of Manchester suggested an improvement in 1785. Thus Bell's invention with Parkinson's improvement perfected this printing machine.



PRINTING MACHINE

The design shows the details of machine. Cylinder A is iron pressure cylinder wrapped around with B wrapping.

C is the engraved copper printing roller.

D is the steel "Cleaning Doctor".

E is the brass "Lint Doctor".

F is the colour furnishing or feeding roller.

G is the colour trough or box in which F roller works partly immersed in colour.

X is the continuously moving or circulating woollen blanket between the cloth (K) to be printed, and the roller A which furnishes the necessary elasticity.

K is the cloth to be printed.

The mode of printing can be understood perfectly from the figure:

The roller (C) revolving in the direction (as indicated by the arrow) takes colour from (F). The excess or superfluous colour is wiped off by Doctor (D) and in continuing its revolving comes in contact with cloth (K) which being pressed by cylinder (A) into (C), abstracts the colour from it exactly as per pattern or design engraved on (C).

The advantages of roller printing over other processes:

- (1) High productivity—about 12,000 yds. p.d.
- (2) Exact or accurate colour registration.
- (3) Reproduction of every style of design.

From time to time, many improvements have been made in printing machines, the chief being "Duplex".

Duplex or Reversible machines are so named because they can print on both sides of the cloth. The arrangement consists of two ordinary machines so arranged that when cloth passes fully printed, on one side from the 1st machine, its plain or unprinted side is exposed to the 2nd machine, which prints an *exact duplicate* of the 1st design or impression upon it in such a manner that both printings coincide or synchronize.

Such machines are used for printing shawls and saris for the Indian market.

Preparation of Cloth for Printing

Goods intended for printing must be exceptionally well bleached or otherwise impressions, stains and other serious defects are bound to occur during subsequent operations.

The general preparation for most colours (that are developed and fixed by steaming only) consists in passing the bleached calico through a weak solution of Turkey Red Oil (Fatty-matter upto 3%). Some colours are printed on pure bleached cloth, while some colours like alizarine red are considerably brightened by the presence of oil while a very few (almost none) are affected by it.

Brushing: The cloth must also be brushed to free it from loose nap, flocks and dirt.

Shearing: Frequently, the cloth has to be sheared too, by passing it over very rapidly revolving specially arranged knives, which rapidly and effectively cut off all filaments and knots, leaving a perfectly smooth and clean cloth, in fit condition to receive printing impressions.

Some cloths, like checks, stripes, etc. require very careful stretching or straightening. This is done by a special machine known as "Stenter". Finally all types of cloths are wound round hollow centres (wooden or iron) rolled and mounted for printing machines.

Preparation of Colours

The art of compounding colours for textile printing demands both chemical knowledge and extensive technical experience since these colours have to be properly proportioned and also suitably selected.

For one colour designs—any mixture that has the required shade, quality and fastness can be used. But where two or more colours are used in the design, the choice of compatible colours demands thorough chemical knowledge.

Most of the dyes and colours can be used—since the greater number of them contain all the elements essential for direct production and fixation, but some few contain the colouring matter alone and require characteristic after-treatments for fixation.

All printing colours require to be thickened for the two objects, viz.: (1) binding—thus enabling them to be transferred to cloth from colour box without loss and (2) to prevent running or spreading beyond the limits of design.

Thickening agents: Various starches, flour, gum, dextrine and albumen, etc.

For styles of printing, see *heading*.

See under *dyeing, finishing*.

Procion dyes (I.C.I. 1956): A new class of dyestuffs giving brilliant shades on cellulosic fibres and may be used in case of silk and Nylon but gives rather doubtful results with wool. These are fibre-reactive dyes. Fixation is effected by a direct chemical linkage between dye-molecule with the cellulose molecule which ultimately becomes an integral part thereof. These are anionic in character having good solubility in cold water.

Dyeing Process: The solution (dye-stuff) is generally added with glaubers salt or common salt and takes about $\frac{1}{2}$ hour and generally followed by Na_2CO_3 for reaction development for 1 hour in cold followed by soaping.

See also *fibre-reactive dyes, dyes, dyeing*.

Protenized: Woollen shrinkage control process—especially for knitting yarns. See also *chlorination of wool*.

Protein fibres: Mainly animal fibres where the main substance is protein. The natural protein fibres are animal fibres and furs. Regenerated protein fibres are wool substitutes like Lanital,

Aralac, Ardil, Vicara, etc. All these have wool-like properties and these fibres closely resemble wool in their chemical make up.

See also *regenerated protein fibres, animal fibres, fur, synthetic fibres, man-made fibres, fibres.*

Prussian blue: Mineral blue. The principle of this photo-developed blue is the same as used in photography and can only take place in sunlight and exposure and that too during the time-limit when the effective actinic rays are present in sunlight.

Steaming or any such drastic heat treatments are positively detrimental to the desired final or ultimate effect and therefore should be, as far as possible, avoided.

(1) The essential chemicals required in this process are:

- | | |
|-----------------------------|---------------|
| (1) Ferric-ammonium citrate | } Equal parts |
| (2) Potassium ferrocyanide | |

The treatment fluid can be prepared by dissolving the two in equal quantities in water and then mixing the two. When cloth is dipped into this liquor, the fibres absorb this solution but this can be washed out as the liquor is soluble. But when exposed to sunlight, or exposure, the necessary chemical changes are brought about and the soluble ferri-salt is rendered insoluble ferro-salt and this reaction takes place when exposed to sunlight and thus the soluble compounds are rendered insoluble within the fibres and which therefore get permanently fixed. (The same principle as involved in blue-printing).

After exposure and aeration until dry, the development and fixing are extremely simple since *water alone acts both as a developer and fixer.*

(II) **Sulphur Blue:** Preparation of dye solution sulphur blue R. Thional blue RL 260 Used for Police uniforms.

45.36 Kg. (100 Lb) of goods—
2½% shade M. Shade.

Quantities:

1.14 Kg. (2½ lbs) colour
0.23 Kg. (½ ,,) T. R. O. (Turkey-Red-Oil)

Dissolve at boil and in the bath add 2.27 kg (5 lbs.) of Na₂S in 181.83 Litres (10 buckets) of water and colour solution is prepared.

The subsequent processes are exactly as described for mineral blue or Prussian blue.

It will be observed from any of the foregoing reactions that the most important points to be observed in the processes are (1) Preparation of the liquor must be made away from light and preferably in dark; and (2) Aeration treatment is absolutely essential for completion of reaction.

And so the blueing process consists of:

Cloth—

Washing and scouring with non-ionic detergent;

Drying as otherwise it may dilute liquor;

Liquor treatment in darkness; Aeration and exposure to sunlight to bring about chemical changes;

Washing to remove superfluous and soluble remains of K₃Fe (CN)₆;

Washing;

Washing;

Drying;

Plating for finishing.

See also *miscellaneous colours, mineral colours, dyeing*, 1710 (*Textile Times*).

Pulled wool: From pelts of dead animals, by chemical process. Inferior to sheared wool.

See also *recovered wool, sheared wool, reclaimed wool.*

Purl: Fringing with arrayed edging—as in lace inverting stitches—an embroidered border—a hem or fringe of twisted gold or silver thread. The ribbed and wavy appearance is caused by inverting stitches (as in the 16th century lace).

—Knitting stitches showing courses of horizontal ridges on one side of the fabric—called link and link.

See also *knitting, lace.*

Pyroset: Any pattern set fast by heating.

See also *heat-set, thermosetting.*

Q

Quilt: A bed cover of two cloths sewed together with something soft (sort of material) in between them. A thick coverlet.

Quilted: Stitched together as a quilt—*padded*.

Quilter: A person (or machine) for making quilts.

Quilting: A cotton or linen cloth (like a diaper) with raised pattern for vests—a kind of coating formed by sewing strands of rope.

(a) Two layers of cloth (with some soft material in between) stitched together as in quilts. Used for decorative suits and dresses.

(b) Weaving imitating *matelasse*.

Dobby or Jacquard woven fabrics in all bleached white and combed yarn with quilted, raised or flat designs used for spreads. Finer yarns generally used for face while heavier for the back.

(1) Alhamra.

(2) Crochet—medium weight, lace-like design.

(3) Honeycomb—soft, loose, light weight raised designs.

(4) Marseilles—heavy reversible quilted pattern.

(5) Mitcheline—heavy, double-fabric.

(6) Satin—improvement on (5).

(7) Toilet—heavy, pique-type with embossed figures.

(8) Ratine—bulky, soft, spongy, with gimp yarns.

(9) Repp—widthwise prominent ribs $\frac{2}{3}$ times more ends than picks. Grosgrain type.

(10) Warp-Repp—(British) for as many ends as picks. Ribs lengthwise. Moreen with figure effects.

See also *individual headings, sheet-wadding*.

R

Rabbit fur: The following are some of the more important rabbits.

(a) Angora rabbit—Ref. to heading.

(b) Himalayan—the fur is white. This variety is produced by selective breeding but now generally breeds true.

(c) Dutch—fur is valued for disposition of colour and markings. The more accurately defined the colour the higher is the value.

(d) Silver Grey—uniform coloured breed, with a rich chinchilla grey fur.

(e) Japanese—fur with orange coat.

See also *fur*.

Rack-stitch: Variety of $\frac{1}{2}$ cardigan stitch in knitting construction.

See also *hosiery, knitting, cardigan*.

Ramie: (Rhea or China grass). A *wonder fibre*. Obtained from the bast (fibres) of *Boehmeria nivea* (*Urticaceae*). There appears to be however some confusion about the three names and it appears that there are two plants, *Boehmeria nivea*

and *Tenacissima*, but the two plants are identical for all practical purposes. *Boehmeria nivea* is a shrub with growth of the common nettle, but without stinging hairs. At each season, a number of straight shoots are shot up from the perennial stock.

The leaves are green but have a downy substance of silvery appearance on the back side. This perennial plant grows in hot and rainy regions—and its plantation and cultivation presents no difficulties at all. Furthermore there are no plant pests for this plant.

The plant attains a height of nearly 0.91 to 2.44 m (3 to 8 feet). It is very easy to cultivate and thrives in almost any soil which is naturally rich, moist, light and loamy with porous subsoil and a good and equally distributed rainfall.

With soil conditions favourable, 2 to 4 crops per season can be taken (each crop yielding roughly 4.06 tonnes (4 tons) of stem and about 2.67 tonnes ($\frac{2}{3}$ tons) of fibre per acre). If better cultivation methods

are used, the production can be stepped up and there is one great advantage—that there are no pests for this plant.

The only reason for this wonder fibre being comparatively unknown is decortication and subsequent degumming and extraction of fibres.

Innumerable attempts so far have been made but so far nothing has proved to be very promising and none of the devices has had any conspicuous success.

The fibres form long bundles and are cemented together by gums and waxes and pectines.

Immersion in water produces a slow fermentation and softens the ligneous matter (components) and this separates the fibres from its surroundings. In this respect, it can be said that this is probably the only method which could be of commercial interest. After decortication, degumming must start immediately either chemically or by micro-organisms.

Ramie is a wonder fibre possessing some very valuable properties. It is definitely stronger than any other known fibre and its brilliance easily equals (if not surpasses) that of silk. It successfully resists all atmospheric vagaries and dyes with extreme ease.

The fibre is absolutely white and lustrous. The average length is 0.10 to 0.13 m (4" to 5") and diameter of 40 to 20 microns and a very pleasant lustre. Its strength is simply staggering and figures upto 1,50,000 lbs per sq. in. (74648 Kg. per 6.4 sq. cms). Equally high is the durability and resistance to atmospheric deterioration.

The average chemical composition is as follows:

Cellulose—90%
Water—6%
Aqueous extracts—1.2%
Waxes—0.3 to 0.5%
Ash—1.0 to 1.3%

It is principally used for high grade fabrics and replaces silk in certain cases. (Chief use—gas-mantles).

Its cellulose is usually combined with peptocelluloses and is used for clothing as China-grass cloth.

Ramie is truly a wonder fibre with amazing qualities. If all claims expected of this new (yet very old) fibre are nearly or even very nearly fulfilled, the fibre (that too natural) will not only take the crown off cotton but can remain truly unchallenged by any other fibre.

The positive qualities are:

8 times stronger than cotton.

Equally elastic as cotton.

When wet, strength increases.

More absorbent than cotton.

Does not give off lint like cotton.

Dyes easily and retains the dye.

When woven with wool, prevents shrinkage.

A superior summer fibre, absorbs perspiration.

Is cool and light.

Staple length about 0.18 m (7").

Washes with extreme ease.

Plantation and cultivation extremely simple.

No pest destruction and the fibre is resistant to moisture, mildew and bacteria.

Its lustre matches easily with that of silk.

Why then such a wonder fibre with all these qualities did not succeed as a king-fibre dethroning cotton. The answer is there are no adequate decorticating and degumming processes and devices. Hundreds of inventors have worked and failed and are still working. If these are made available, no other fibre can stand competition with this fibre and Ramie then could be the unchallenged king of fibres.

See also *vegetable fibres, bast fibres, fibres, Boehmeria nivea, Rhea, China-grass.*

Ramona-cloth: Cotton fabric—mercerised—pre-shrunk and finished without starch. Heavier than broad-cloth. White or coloured. Used for dresses, decorative cloths, etc.—0.91 m (36"). See also *broad-cloth.*

Ratine: Name of a type of yarn and also fabric. Rough spongy fabric, plain but loosely woven with nubby yarns (ratine yarns). Of cotton, rayon, silk, wool or blends. Used for women's wear.

See also *yarns.*

Raw fibres: Fibres in their natural state See also *raw-silk.*

Raw-silk: Silk in the gum. Silk in the natural state and one where degumming of silk is not done.

See also *raw-fibres, degumming (of silk)*.

Rayon: Formerly called artificial silk. Is regenerated-cellulose, by any of the three well-known processes:

(1) Acetate, (2) Viscose, (3) Cuprammonium.

Rayon is a regenerated cellulosic fibre and is a man-made fibre. It is prepared from wood-pulp or linters. It can be called the most versatile fibre since the fabrics made from it can be warm or cool, dull or bright, plain or complex, etc.

Rayon manufacture essentially consists of the following:

(1) Wood-pulp or linters—basic materials.

(2) Wood-pulp or linters reduced to pulp.

(3) Cellulose reduced to sheets.

(4) The sheets are shredded—loose and fluffy.

(5) Fluffy cellulose to viscose liquid, thick as honey.

(6) Forcing the honeylike liquid through spinnerets.

(7) Twisting the yarns.

(8) Weaving into cloth.

There are three well-known processes for manufacture of rayon and these are (1) Acetate, (2) viscose, (3) cuprammonium. In practice however yarns manufactured by viscose and by cuprammonium only are termed truly rayon while yarns, sheets or cloth manufactured by acetate process are termed acetate since they have resemblance to synthetic rather than regenerated fibres.

<i>Acetate</i>	<i>Viscose</i>	<i>Cuprammonium</i>
Linters	Wood-pulp	Linters
Treated with	Treated with	Treated with
Acetic anhydride	NaOH	Cuprammonium solution
Methylene chloride	Alkali-cellulose	(CuSO ₄ + NH ₃)
(formerly glacial acetic acid)	Press	Dilute
With catalyst H ₂ SO ₄	Shred	Mature
Primary acetate	Age	Filter
1 ppt.	Treat with CS ₂	Spinning solution
1 Wash	Cellulose xanthate	Wet spun in water
Secondary acetate	Dissolve in alkali	Stretch
Dissolved in acetone filter	Filtering	Pass through Acid
Spinning solution	Maturing	Twist
Dry spun in warm air	Spinning solution	
Twist	Wet spun in acid bath	
Acetate yarn	Desulphurise	Cuprammonium yarn
	Bleach	
	Viscose yarn	

Allied topics :

- (1) Rayon alpaca: alpaca fabric with alpaca warp and rayon backing or weft.
A dull dress fabric—plain-woven with core-yarns of rayon wound with dull acetate—0.99 m (39").
- (2) Rayon cotton—blend to give lustre.
- (3) Rayon high-tenacity—to give extra strength for tire-cord and parachutes.
- (4) Rayon staple—filaments cut into suitable spinnable lengths.
- (5) Rayon taffeta—made to resemble silk.
- (6) Rayon wool—blend to give lustre and durability.
- (7) Rayon yarn—consists of multi-filaments.
- (8) Novelty—with combination or core-yarns as in case of rayon-alpaca.

See also *cellulose, mercerisation of cotton, acetate, acele, viscose, cuprammonium, chardonnnet, bemberg, artificial fibres, regenerated fibres, fibres, man-made fibres.*

Red-sable-hair: Sable.

Kolinsky: size 0.30m × 0.065m (12" × 2½")—one of the marten tribe. Underwool is regular but short and weak, as also the top hair with colour usually yellow. They have been successfully dyed and used as substitute for sable. Native of Siberia, China and Japan. The fur is lightweight and best suited for coat-lining. Fur is often designated as Red-Sable.

See also *fur, animal-fibres, kolinsky.*

Reeled-silk: (Filature or reeling of silk).

When cocoons have been gathered, the crysalides are killed. All unreelable silks (caused by pierced cocoons or stained by premature death of crysalide or by other causes) are separated for spun silk manufacture. The uninjured cocoons are sorted for reeling operation. The object is to bring together the filaments from 2 or more cocoons and to form them into one continuous uniform and regular strand, which is the 'raw silk' of commerce. To achieve this, the natural gum of the cocoons which holds the filaments

together must be softened and ends of filaments of the required number of cocoons caught so as to unwind and lay these filaments together to form a single uniform rounded strand of raw silk.

Reeler has to be careful to see that the thickness of the strand is uniform and to replace supply of raw cocoons when exhausted. In this way a continuous uniform fibre or strand of raw silk of indefinite length is produced.

See also *silks, wild-silks, silk manufacture, sericulture, silk-spinning.*

Regenerated cellulose: See *Rayon.*

Rep-Repp or reps: A cloth made of silk, wool, cotton, rayon or nylon or combinations, or with cotton slub-yarns for weft. (The word is probably corruption of Rib). It is woven in fine cords or ribs across the width of the fabric, and used for dresses. In wool or cotton—for various upholstery purposes. Variety of textures are possible for drapery and upholstery and light weights for suits.

Plain woven —0.69m (27"), 0.91m (36"), 1.27m (50").

Reprocessed wool: Wool-fibres which have been processed once (woven or felted) in the manufacture of product—but never actually used by customers and which are subsequently again reduced to fibrous state for manufacturing other woollen products.

Fibres reclaimed from piece-cuttings, clippings, or tailored garments or tailor's clipping-wastes.

The essential difference between reprocessed and reused wool is that reprocessed wool is processed but not used while reused wool is actually used by customers.

See also *garnetting, reused wool, reclaimed wool, machinaw.*

Resiliency: The property of springing back to original state when the applied stress is removed.

See also *elasticity, properties of fibres, stabilisation of fabrics.*

Resist-printing: *Resist or reserve style printing:* Reserves are substances

Fabrics of Rib weave:

Bengaline, broad-cloth, faille, gros-grain, cttoman, poplin, repp.

See also *weaving, each heading*.

Rigmel: (TM). Owned by Bradford Dyers' Association Ltd. A process to bring about compressive shrinkage in cotton.

See also *shrinkage control, stabilization, sanforized*.

Romaine: Often termed heavy-sheer. Originally of silk but now usually of combination yarns of rayon/acetate with characteristic S and Z twist yarns in both directions—0.99m (39").

Moss-crepe: spongy dress fabric of rayon/acetate combination or core-yarns.

See also *combination-yarns, core-yarns, blending, mixtures, moss-crepe*.

Rope: The term implies a material of different thicknesses from a single thread and fine twines to heavy-duty ropes. Right from a single thread and fine twines upwards upto heavy-duty ropes—the art and process of manufacture of ropes is *nothing but twisting—twisting together fibres and yarns*.

In between these varieties, the manufacture consists of a number of separate yarns—(each yarn being made from some kind of fibre by preparing and spinning)—and twisting these together so as to form a rope of different dimensions. Number of yarns to be used would naturally depend upon fineness and circumference of the ultimate rope desired. More the number the greater the thickness.

The modern trade of rope-making deals with making ropes of vegetable fibres and sometimes with metallic wires.

Vegetable fibres employed mostly in cordage are: cotton, manila-hemp, sisal-hemp, phormium, jute, bow-string-hemp, banana, (musa-fibres) agave fibres, coir, etc.

The idea of the main object of twisting fibres together is that they may be held together where a strain is applied and also the cluster of

fibres put together can respond better and add to strength.

The sequence of operations in rope making are:

- 1, hackling the fibres,
- 2, spinning into yarns,
- 3, treating yarns if necessary,
- 4, forming strands,
- 5, laying and twisting strands into ropes.

Most of these operations are now done by machines.

See also *cordage, twines, bast fibres, fibres*.

Rubber: When all the double bonds of unsaturated rubber are saturated—the resultant product is hard-rubber or Ebonite.

It must be understood that raw-rubber has a low tensile strength, limited elasticity and permanent tackiness—is soluble in oils and hydrocarbon-solvents; when vulcanized with sulphur however the properties are completely altered to most desirable properties. It is said that had vulcanization (Charles Goodyear) not been discovered there would have been no rubber industry and certainly far less textile applications.

Use of rubber products in textiles is limited to proofing, bonding and other special finishes only. It is possible to utilize special vulcanized rubber lattices—as in case of vultex.

See also *synthetic rubber, water-proofing, mackintosh, finishing, rubber-cloth, rubber sheeting*.

Round thread: (Art-linen) A general term for variety of plain-woven linen used for embroidery—for ease of drawing threads.

0.457m (18"), 0.91 m (36"), 1.15m (45"), 1.65m (65"), 1.83m (72").

Roving: To draw through an 'eye'. To bring wool into form it gets before being spun into threads.

A roll of cotton or wool drawn out and twisted.

The process of giving the first twist to yarns. A slightly twisted sliver of carded fibre.

R-frame—machine for manufacturing cotton or worsted.

- R-machine**—a machine for winding on bobbins.
- R-reel**—a device for measuring a hank of yarn.
See also *spinning, carding, yarn construction*.
- Rubber-cloth**: A fabric coated with caoutchouc or rubber.
- Rubber-sheeting**: Plain cotton fabric with rubber-coating on one side. Sometimes napped.
- (a) Light-weight, for infants—0.91m (36"), 1.15m (45"), 1.37m (54").
- (b) Medium-weight, for hospitals and home use.
- (c) Heavy-weight, for hospitals.
Now plastic coated fabrics are used instead of rubber-sheeting.
See also *water-proofing, mackintosh, rubber*.
- Rubber-back rug**: (Frise—incorrect spelling, Frieze):
- (1) Pile-fabric with uncut loops.
- (2) Pile-rug of tightly twisted yarns in loops or cut-pile, coated on back with vinyl coating or rubberised, to hold tufts in place and to prevent slippage.
See also *anti-slip, mackintosh*.
- Rug**: A coarse rough woollen cloth or coverlet.
—a soft woolley, mat—a cover for bed.
—a blanket for bed or coverlet.
—a covering for the floor, a travelling robe.
- Rugging**—a heavy napped cloth for rugs.
See also *Axminster, Brussels, chenille, chinese, frieze, velvet, Wilton, carpets*.
- Rug-pad**:
- (a) to deaden sound.
- (b) to prevent slipping.
- (c) to increase wear.
—Jute or coarse hair usually finished as honey-comb on one side.
—Sponge rubber of various textures and thicknesses—Non-skid type.
See also *anti-slip*.
- Run-resist**: A knitting process. Reducing runs in hosiery and underwear. Of rayon or nylon.
- Rush-squares**: Native grass of Indo-China. Hemp or Sisal—sewn or braided together into a 0.30m (12") square. These squares can then be joined together to any size.

S

- S-twist**: Direction of the twist appearing like letter S.
For illustration see under Z-twist.
See also *Z-twist, twist, yarns*.
- Sabel**: (TM) Raisin treated, marquissette type, thin curtain fabric.
See also *marquissette*.
- Sable (Hair)**: A species of Marten with lustrous brown or blackish fur. Size mostly 0.43 × 0.13m (17" × 5").
- American & Canadian—skins are dark coloured and almost as silky as Russian sable. Excellent quality. Chinese or Japanese—similar to American but poorer in quality.
- Russian—skins belong to Siberian specie of Marten. Similar to American but much more silky, owing to density of colour and rare qualities. They are 'true Sable'. The top hair is regular, fine, silky and the underwool is close, fine, very soft. Pelts are exceedingly fine and close in texture and are very durable though a little light-weight.
- (The darkest furs of Yakutak in Siberia are most valuable).
- Sable fur once enjoyed the very high position as minks today, but the position of supply was always scarce.
See also *fur, marten*.
- Sacking**: A heavy closely woven fabric, originally made of flax but now almost exclusively of jute. Used for packing various materials.
Sacking is essentially a twilled fabric in which the number of warps per inch greatly exceeds wefts. Usually, 3 leaf twill sackings are double in warp and 4 leaf sacks are single.

Cotton-sacks are now also made in large quantities for flour, sugar and other edible products. These sacks are usually plain-woven. Chief manufacturing centres are Dundee (U.K.) and Calcutta (India).

See also *burlap, gunny, hessian, bagging*.

Sail cloth or duck: More commonly called canvas which is usually a double warp, single weft fabric of bagging type. Plain woven, heavy cotton, 1, 2, 3 ply yarns. Striped or printed—for sportswear, upholstery or curtains—1.27m (50").

Flax and cotton are the chief fibres employed and hemp and ramie are also occasionally used. The best kind of sail-cloth is made from long flax, as the fibre is ideal and possesses the very essential qualities viz., flexibility, lightness and strength. With introduction of steamships or motorships, the manufacture of sail cloth is now of less importance.

See also *bagging, canvas, duck*.

Sand-paper: See *emery cloth, abrasion and wear resistance*.

Sanforized: (TM) for shrinkage control on cotton piece-goods. A patented process and a regd. trade mark owned by Cluett Peabody & Co. Inc.

The fabrics treated thus are tested for the following conditions:—

- (1) that the residual shrinkage in the fabrics will be at the most 1 per cent or less;
- (2) that the fabrics are tested for residual shrinkage as per tests set down by the trade mark owners.

See also *shrinkage, stabilization, rigmel, London shrunk*.

Sanitas: (TM) Wall covering cotton fabric with 4 or 5 coats of paints fixed upon it. Washable, durable. See also *coated-fabrics*.

Saran: A man-made fibre composed of copolymers of Vinylidene and Vinyl chloride.

A synthetic fibre having good resistance to exposure and chemicals. It is also non-inflammable.

Manufacture: the raw materials are melted, spun and stretched for orientation of molecules. Produced in both filament and staple. Monofilaments are used as yarns for seat-covers, upholstery, furniture-webbing, screening, shoes and bags, doll's hair, wigs, etc. Staples are straight, curled or crimped, used for rugs, drapery and upholstery.

Curled staples are unique since these closely resemble wool. Also these have many applications in plastic field.

See also *synthetic fibres, man-made fibres, fibres, velon*.

Saris: Chief outer garment worn by Hindu ladies, consisting of a long piece of silk or cotton cloth wrapped round the middle. Usually plain-woven, in pastel colours with stripes and woven many times with borders of jari or coloured material. Dimensions—usually 4.57m (5 yards), 5.48m (6 yards) or 8.23m (9 yards)—1.02m (40") wide.

Sateen: (a) A glossy worsted, cotton or woollen fabric. Warp or weft-face satin weave. Combed yarns for warp-face and carded yarns for weft-face;

(b) heavy fabric of carded yarns used for leather-backing, shoes, etc.—0.76m (30"), 0.81m (32"), 0.91m (36"), 1.27m (50");

(c) cotton fabric made with mercerized yarns with satin weave except that the lustrous surface is across the goods and not lengthwise as in satin.

Used for linings, pyjamas, draperies, etc.

See also *satin-weave, satin, plainweave variations*.

Satin: A closely woven silk with a lustrous and unbroken surface.

(a) A special kind of weave in which crosswise yarns (wefts) do not cross lengthwise (warps) as often as in plain-weave.

Silk, nylon, rayon and cotton fabrics are called satins. Satin fabrics usually have a diagonally ribbed (or broken twill) back.

Sometimes it is also woven with crepe-back or of double-satin (ribbon).

- (b) *Fabric of satin* woven in silk, rayon, nylon or combination with cotton back and named as silk-satin or rayon-satin, etc. 0.99 m (39")—1.07m (42").

Slipper-satin—heavy, lustrous satin of rayon or acetate for wedding-gowns, slippers, etc.

Wash-satin—silk, nylon, rayon for blouses, lingerie, etc. 0.91 m (36").

Upholstery-satin—cotton backed, heavier than dress-satin. Various texture effects due to uneven yarns. Also called antique-satin. 1.27m (50").

Satin-damask—a satin with an elaborate flowery pattern sometimes raised in velvet-pile.

Satin-de-laine—a thin glossy wollen fabric like cassimere.

Satinlisse—cotton fabric with satin surface usually printed with delicate patterns.

- (c) *Satinise*—to make smooth and glossy like satin.

Satin-weave: Actually broken twill. Instead of progressing one warp yarn at the beginning of each new crossing of weft, it progresses two. The ultimate material thus gets a smooth appearance on one side.

Satin and sateens form important sections of plain woven fabrics. But in satin the bulk of warp while in sateen the bulk of weft is on the surface of the fabric.

See also *weaving, plain-weave, sateen, cassimere*.

Saylerized: (TM) Durable crisp finish for cotton fabrics—particularly for Organdy.

See also *permanent finish, finishing, (special finishes), durable finish*.

Scarf: A cravat or a light decorative piece of dress worn loosely on shoulders or as a band about the neck. A light handkerchief for the neck.

See *cravat*.

Schappe: A fabric woven from spun silk—used in novelty yarns.

Schapping: (German: Shap'pe). When silk-waste is piled in heaps and kept damp and moist, the gum begins to

ferment and loosen and can then be washed off leaving the true thread soft and supple. The great difficulty however is the rank offensive odour and so this very efficient process cannot be tried near about cities.

See also *sericin, degumming, raw silk, silk, silk-finishing*.

Schreinerized: Calendering with embossed diagonal lines—producing a high lustre on cotton damask or lining fabrics. Not durable.

See also *finishing, special finishes*.

Scotchlite: (TM) Reflective fabric (coated with dazzle-powder), sewed on outer garments, which reflects light from motor-cars at night. Various colours, 0.30m—0.89m (1'-35").

Scouring: (In silk and wool manufacturing). Upto the point of conditioning, silk fibres are comparatively lustreless, stiff and harsh because of the coating of albuminous matter (gum) on the surface. Removal of this gum (partial or total) is necessary which is effected by boiling off or scouring. Process: About 27.22 Kg (60 lbs.) of white soap is shredded and dissolved in 909 lit. (200 gals.) of water and the solution is maintained at 200°C. The hanks of raw silk are then immersed and rotated constantly in the solution until free from the gum. These are then washed.

Wool—much depends upon a thorough scouring of fleece—as qualities of fibres may suffer considerably by inadequate treatments while imperfectly cleaned wool can not be evenly dyed. Water used must be soft and pure—as lime dispersal in hard waters is deposited on the fibres and is then extremely difficult to remove. At present syndets are progressively used in place of soaps as these are reported to be giving better results.

Two methods are well known: (1) Emulsion, (2) solvent. In emulsion, the gummy substances are emulsified and washed away; in solvent these are dissolved by solvent and then removed. (The solvent can then be recovered by distillation).

See also *soaps, syndets, detergents, alkyl-aryl-sulphonates, boiling off process, degumming*.

Scratch-moire: Any design except the conventional watered effect.

See also *percaline, finishing, embossing, printing, moire.*

Screen-printing: At present in great demand being the most logical development of the stencilling process.

The screen stencil ordinarily used consists of bolting silk or other stencil cloths, stretched over a wooden frame. On this silk or cloth is fixed the design to be stencilled. The design may be produced by simply painting the areas which are to remain white with some substance, like gum or shellac which would make the stencil impervious to the ink used. The stencil is placed in close contact with the surface to be printed or decorated and inked from one end to the other by means of a rubber squeegee. The operation forces the ink (which should resemble ordinary house paint), through the open areas of the stencil and it fixes to the surface beneath. The stencil is then lifted up and the printed surface is then allowed to dry, after which another colour may be printed from another stencil, and so on.

For special purposes, wire-gauze or cotton fabrics are used in place of bolting silk or cloths.

A great number of ingenious methods have been devised for putting the design on the screen. Finer details in the designs however are possible and advisable by using photographic stencils. This can be done by impregnating the screen with a light sensitive material, such as dichromated glue or albumen and exposing it to light under a tracing of the design. The image is then developed by washing with water, which removes the coating from the open areas where it has not been light-hardened.

Simple designs are often made by cementing patterns cut from paper, celluloid or thin metal, to the screen. A more common method is to cut the design from shellac coated paper and fasten it to the cloth by passing a hot iron over the two in contact.

Compared with other processes screen-printing has the following advantages:

- (1) It requires relatively cheap equipment.
- (2) Very few preliminaries.
- (3) It is very economical for short runs of suitable subjects and so widely used for showcards, posters, etc.
- (4) It permits printing on almost any surface.
- (5) Inks used can be oil colours, water paints or lacquers, etc. This permits the process to be used for producing any effect—most delicate of pastel shades or glossy weather proof colours, so heavy that they stand out in visible relief.
- (6) Areas of far greater size can be stencilled. Frames 1.27m x 1.52m (50" x 60") are frequently used for textile printing.
- (7) Surface to be printed need not be flat.

Limitations of the process are:

- (1) It is not suitable for fine detailed reproductions.
- (2) Delicate gradations (half-tones) are rather difficult.
- (3) It is unsuitable for very long runs.
- (4) Stencils have a limited durability.
- (5) It is a relatively slow printing process.

See also *stencilling processes, printing, finishing, bolting-cloth, sign-cloth.*

Scrim: Loose, open fabric for needle work, or curtains.

Plain woven—0.91m (36") to 1.27m (50").

Linen—theatrical gauze—ply combed yarn woven with strong wide tape. Selvege many times with fancy borders. Heavier combed ply yarns fabric is called Hardanger.

See also *hardanger, theatrical-gauze.*

Sculptured: Engraved or having elevated marks on surface. Hand-carved Chenille rug of thick pile cut in grooves, to mark the pattern.

See also *Chinese rug, chenille, piled fabrics.*

Sea-Island cotton: A fine long stapled variety of cotton grown on coasts of

Southern islands of Carolina and Georgia. Seeds of this cotton are covered with long hairs only which can be easily pulled off and which leave a clean seed with practically no fuzz.

See also *cotton*.

Seed fibres: Complete list (cotton is the most important):

- (1) *Cotton*
- (2) Silk-cotton—*Bombax Malabaricum*
- (3) Kapok (Ceiba)
- (4) Tree-cotton-red (*Ochroma*)
- (5) Cherisia
- (6) *Cochlospermum*
- (7) *Apocynum*
- (8) Typha
- (9) Cattail floss
- (10) Milkweed floss
- (11) Thistle
- (12) Dandelion
- (13) Coir (coconut fibre)

See also *vegetable fibres, fibres*.

Seamless: Woven throughout and without a seam. Hose knitted on circular machines and not full-fashioned.

See also *circular knit, knitting*.

Seer-sucker: A thin East-Indian linen fabric. (Called Crimp in Britain). A durable summer dress fabric with typical woven crinkle-stripes, formed by tension and release weaving method. But this is not crepe, and requires no ironing. White or white alternating with coloured stripes or checks.

- (a) Cotton—lightweight—for women and children,
—heavyweight—for men's summer suits—0.76m (30") to 0.91m (36").
- (b) Rayon—same as (a)
- (c) Nylon—puckered effects by heat setting.
- (d) Bedspreads like dimity.

See also *crimp, dimity*.

Selvedge, Selvedge: That part of the cloth which forms an edge of itself without hemming—a border.

Selvedged: An untwisted skein of rope yarn matted together.

See also *weaving, woven designs*.

Serge: A strong twilled fabric, once made of silk only but now usually worsted. Also an even sided 2/2 twill of any fibre.

- (a) Cotton—a reversible 2/2 twill or similar even-sided cotton-twill. When with ply yarns they resemble worsted-serge. Dyed or printed. Used for suiting.
- (b) Nylon.
- (c) Rayon.
- (d) Silk—surrah.
- (e) Worsted—or blended with rayon, vicara, etc. Light or heavy.

French serge—fine and smooth—1.27m (50"), 1.37m (54"), 1.52m (60").

Sericin: A gelatinous substance of silk—sericin constitutes the gummy covering of the silk fibre. A gelatinous body which dissolves rapidly in hot water, warm soapy solutions, in which on cooling it forms a jelly.

It is precipitated from hot solution by alcohol turning into white powder—formula probably $C_{13}H_{22}N_5O_8$.

According to some authorities, the glands of silk worms contain only fibrin in semi-liquid state which on exposure (to air or O_2) turns the external pellicles into a more or less soluble form of sericin.

See also *fibroin, degumming of silk, schappe, boiled-off-silk*.

Shade cloth: Window-shade cloth—of cotton treated in different ways.

- (a) Holland—traditional window shade cloth with various mechanical finishes.
- (b) Oil-painted cloth—painted with linseed oil.
- (c) Impregnated with pyroxylin.
- (d) Fabrics coated with vinyl plastic.

See also *coated fabrics, impregnated fabrics, vinyl plastic, silesta, tabbinet*.

Shadow-print: Opaque pattern or design printed with insoluble white pigments.

Shadow-organdy—also on rayon.

See also *warp-print*.

Shadow-stitch: A very delicate kind of ladder stitch in lacemaking. Used in fine open-work.

See also *lace, rack-stitch, cardigan*.

Shantung: A heavy grade of Pongee (wild-silk) woven in Shantung (China)—also of tussore silk, cotton/rayon and cotton/silk, or mixtures. Plain-weave, used for curtains, sport-wear, summersuits, pyjamas and robes.

See also *tussore (silk), curtain fabrics, pongee*.

Sharkskin: (a) Worsted (spangle) suiting for men and women, 2/2 twill. (Hand-spangled weave used in Britain). Warp and weft each alternate by two's in black and white yarns.

(b) Women's suiting in plain or basket-weave. Firm and heavy, of dull acetate yarns.

Both fabrics have a sleek yet delicate pebbly surface appearance.

Shawl: A wrapping made of silk, wool, cotton or hair, used particularly by women, as a loose covering for shoulders.

See also *Kashmir-shawls, pashmina*.

Shearing: The process of cutting and removing surface fibres in case of finishing of wool, cotton, rayon, silk fabrics. The process is done after singeing, when many times it becomes necessary to remove all traces of both singeing as well as fibres.

Shearing machine: it has a wide spiral cylinder to which are attached cutting blades, which remove all fuzz.

See also *finishing*.

Sheepskin: Leather prepared from the skins of sheep. The most valuable part of the sheepskin is the wool and not the pelt. Sheepskin is the most porous and open textured skin but it is also the most greasy. It is soft and flabby with loose flesh but a tight compact grain. Mostly it is used for manufacture of gloves and upper garments.

See also *animal fibres, fur*.

Sheer (fabric): Thin transparent plain woven fabric of any fibre. Various textures—0.91m (36") to 1.07 m(42").

Sheet: A large broad piece of cloth for a bed.

Sheeting: Cloth used for bedsheets. Process of forming into sheets.

British sheetings—plain or twill-woven. *Narrow sheetings* are strong and serviceable—generally with white Croydon finish. Medium-weight narrow sheetings are called Domestic.

American sheetings—always plain woven of carded yarns. Narrow sheetings 1.02m (40") are used for converting.

Wide-bed sheetings—strong, higher thread count, bleached and muslin-finished. Cheaper qualities with lower thread count are back-filled and unbleached.

Standard muslin sheeting—constructions are 68 × 70 or 64 × 64 threads per inch (0.03m).

Percale-sheetings—combed yarns—fine and smooth, about 200 threads per sq. in. (6.45 sq. cms.).

Light weight percale—light-weight carded yarn and has finer yarn and higher thread count than muslin.

Sheetings generally have a balanced or square thread count.

Sheet-wadding: Carded cotton in thin sheets with glazed surface. Used for padding and quilt-filling.

See also *quilt*.

Shepherd's check or plaid: A woollen cloth made with black and white checks.

Name of all fabrics with small even checks in white and black. Wool, cotton, nylon, rayon or mixtures for men's and women's wear, twill, plain or basket weaves. 0.91m (36"), 1.02m (40"), 1.32m (52"), 1.37m (54").

See also *pin-check*.

Shetland lace: An open work ornamental trimming made with woollen yarn for shawls, etc.

See also *lace*.

Shetland wool: A thin but strong undyed worsted, spun from the wool of the sheep in Scotland—much used for knitting fine shawls, sweaters or woven fabrics.

See also *wool, heather mixture, paisley*.

Shirley cloth: (England—for use in the Armed forces).

Cotton fabric of exceptionally close weave, using double warps like Oxford cloth. Various weights and made water-repellent and wind-resistant.

Made by Shirley Institute.

See also *water-repellency*, *wind-resistance*, *Byrd's cloth*, *ski-suiting*.

Shirr: A puckering made in the fabric by parallel gathering of threads.

Shirred: Having lines or cords inserted between the threads as in case of certain elastic fabrics.

Shirring: Decorative shirred needle work.

Shirr-string: A cord used for gathering of threads together in Shirred work.

Shirt: Men's sleeved undergarment—of cotton, linen, silk, flannel, nylon, terylene, or combination such as cotton/wool or cotton/silk or cotton/terylene, etc.—for upper part of the body. Used mostly by men.

See also *shirting*.

Shirting: Cloth for shirts. Plain and fancy woven fabrics used for shirting—(broad-cloth, poplins Oxford, etc.). Usually given mercerised, glazed and preshrunk finishes.

White-shirting—a general British term for white finished fabrics as long-cloths, cambrics, muslins, etc.

Shirt-frill—a fine cambric frill worn on shirts.

See *printers cloth*.

Shoddy: Originally shoddy meant the waste arising out of wool manufacture. Now the term is applied to wool of the old woven fabrics brought to such a state as it was before being spun and woven and thus fit for reuse in the manufacture.

The mass of torn up material (fibrous mass) is again re-spun and re-woven.

An inferior cloth made by reusing the old wool or wool used once.

See also *mungo*, *garnetting*, *reprocessed wool*, *reused wool*.

Shoddy-picker: Machine for tearing apart the soft rags and clippings to form shoddy.

See also *garnetting*.

Shot: (a) Having a changeable colour, warp colour different from weft as in case of silk, alpaca, etc.

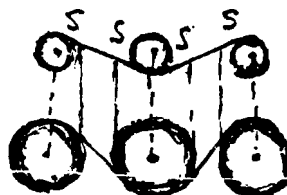
(b) Weft yarn in pile-rug.

Shower-curtain material: Various water-repellent materials as coated fabrics or plastic films, etc.

See also *oiled-silk*.

Shrinkage: Control, stabilisation and processes for shrink-proofing. The contraction or reduction of fabrics by shrinking. A chemical or mechanical treatment by which the possible shrinking is brought about. Preshrinking of cloths becomes absolutely necessary so that the clothes made from such preshrunk fabrics will not shrink further out of fit.

This would ensure stabilisation of clothes.



SHRINKAGE

Shrinkage:

(a) Raw wool shrinkage means loss of weight in scouring process. Grease wool is heavier than scoured wool.

(b) Amount of contraction or relaxation any fabric undergoes in finishing or in subsequent washing. (In cotton, linen, rayon, the shortened length after washing is due to releasing of tension of yarn which has been stretched or sized. In wool fabrics (knitted or woven) contraction or felting is due to effect of heat, moisture, and friction which cause fibres to fuse together and get entangled or embedded as epidermal scales of fibres get interlocked.

Shrinkage control or stabilization: Treatment of cloth (yarn and fibres) to reduce further shrinkage of finished fibres:

- (a) cotton=rigmel, sanforized
- (b) spun rayon=definize, fibre-set, sanforset
- (c) wool—
 - (1) steam & cold & air—London shrunk
 - (2) chemical—chlorination of wool, lanaset, resloom, sanforlan. Knitted — koroy, protonized, redmanizing

Full shrinkage cannot be produced in one wash and many times 3 washes are required before dimensional stability is reached.

Various methods are suggested to stop this. Compressive shrinkage is not merely relaxative and contractive.

Preshrinkage—most cotton fabrics are dried in stenter in which it is slightly stretched and straightened in damp state—as the cloth passes, it is dried by hot air—the stenter may thus be adapted for production of anti-shrinkage cotton.

When an elastic material takes a sinuous path (or follows a wave formation), the convex surface is extended while the concave surface is contracted. If damp cotton fabric is placed on the extended crest of waves formed by elastic material and moves with it into contracted trough, the cotton fabric will be contracted in length by compression—as it is held in close contact with the elastic material during this movement.

For effecting this compressive shrinkage in cotton, the two processes are:

- (1) Sanforized (U.S.).
- (2) Rigmel (British).

These two adopt somewhat different methods but the differences are more of a mechanical nature rather than of principles.

- (1) Sanforized uses elasticity of wool.
- (2) Rigmel utilizes elasticity of rubber for compressive shrinkage.

(I) Sanforized: Cotton fabric and woollen blanket move forward round a heated metal drum of 1.52m (60") diameter; as the stretched blanket slowly reverses its curvature, the outer extended surface becomes the inner contracted surface and so the cotton fibre

which is between the blanket and the cylinder is forced to adjust itself to a shorter length. The potential shrinkage of the fabric is taken up during drying in a state of compression.

(II) Rigmel process: Utilizes elasticity of rubber for compressive shrinkage.

Shrinkage control & Sanforization:

The control of compressive shrinkage was always a problem (almost a headache) in the textile industry especially in case of cotton.

Sanforized service is primarily intended for this control and there are adequate equipments available which can bring about shrinkage—the patterns of these strictly adhere to the original principles laid down by the "sanforized" compressive shrinkage control—a regd. T. M. owned by Cluett Peabody & Co. Inc.

Stretching of fabrics during wet processing was considered often as a major cause in its subsequent shrinkage—this however is now considered at the most as one of the causes.

In the two processes, one process is mechanical and is based on the principle of shortening and compressing the fabrics while the other is physico-chemical, based on principles of decreasing the tendency of cotton to swell when wet.

See also *rigmel, sanforized, preshrunk London-shrunk*.

Sida: A vegetable fibre, derived from the bast of sida plant. There are indications that these fibres may prove to be a substitute for jute if proper research and developments are carried out.

See also *vegetable fibres, bast fibres, jute*.

Sign-cloth: (a) Heavily sized muslin for printing.

(b) Silk or acetate of leno-type resembling fine bolting silk and used in silk-screen printing.

See also *screen printing, bolting cloth*

Silesia: A thin brown Holland for window blinds. A thin, twill or satin woven cotton cloth, heavily calendered. A heavily calendered, lightweight cotton fabric—twill woven for suit-linings and heavy grades for trouser-pockets—0.91m (36").

See also *holland, shade-cloth, tabbinet*.

Silk: An animal fibre. A natural protein fibre. A delicate soft thread produced by larvae of *Bombyx mori* and other moths, which feed on mulberry leaves.

The last act in passing to pupa stage from larva, performed by the moth *Bombyx mori*, is to spin a cocoon or protective sheath round its body, which affords protection in the pupa stage. These cocoons are the silk fibres of commerce.

To get this fibre from the cocoons, the larvae have to be destroyed as otherwise the moth in passing to adult stage from pupa breaks through this cocoon and the continuous filament or fibre is thus pierced and broken at a number of places which makes it unfit for spinning. And so the moths are destroyed in the pupa stage. This makes possible the reeling of silk in continuous length.

See also *animal-fibres (silk)*, *thrown-silk*, *anaphae*, *attacus*, *Bombyx mori*, *filature organzine*, *tram*, *sericulture*, *reeled (silk)*.

Singeing: Burning the surface hairs or fibres. Singeing removes surface fibres and lint. It is applicable in case of wool, cotton, rayon, linen and silk. It is absolutely necessary and is done prior to other finishing processes where a clean and clear surface is required and where the lint and fibres have to be removed.

See also *finishing*, *bleaching (gassing)*, *gassing*.

Sisal Hemp or Henequen: (*Agave Rigida* Var., *Sisalana*). There seems to be some doubt whether the two names—Sisal and Henequen—are given to the same fibre or these are two different plants. But both these are agave fibres. Probably the plant Sisal Hemp is *Agave Sisalana* while the plant Henequen is *Agave Fourcroides* or *Agave Ixtle* of Yucatan.

Both these are natives of Yucatan and both have essentially the same structural features and for all practical purposes are almost identical.

Sisal: the plant is grown in large plantations and reaches the height of 3.05m to 4.57m (10 to 15 feet) and contains the fibres in its leaves. The leaves

are cut, beaten and rolled in order to separate the fibres. The fibres are then decorticated and washed and dried. These are white or slightly yellowish, strong and lustrous, with cell length from 0.02 to 0.05 m and diameter 20 to 30 microns. Tensile strength upto about 37324.00 kg per 6.45 cms. sq. (80,000 lbs per sq. inch.) Chiefly used for cordage, twine and coarser fabrics. Average composition is:

Cellulose—72%
Lignineous matter—14%
Water—12%
Wax & fat—about 1%
Ash—1%

Henequen: See heading. *Agave Fourcroides* and *Ixtle*—a Yucatan Agave.

False Sisal: *Agave Decipiens*; it can be distinguished from true Sisal by its spiny leaf margin. The fibre is inferior to sisal.

See also *agave fibres*, *vegetable fibres*, and *fibres*, *henequen*.

Sizing: A kind of weak glue used as coating. Any gluey substance used as sizing. To resist the strains of weaving, the threads have to be coated or saturated with a size. In mechanical weaving it is absolutely necessary to size the warp before placing it in a loom. Two well known processes are:

- (1) The Ball Warp sizer.
- (2) Slasher sizing.

Hank sizing is employed for bleached and coloured yarns.

In sizing, a yarn is put through a slashing machine. Here the threads are put together and passed through a size which is hot glue made of wheat, rice flour, sago, farina, tallow, wax and china-clay. This sizing binds the threads together and makes them wear better.

See *weaving*.

Ski-suiting: Heavy woollen fabric treated for water repellency.

See also *water repellency*, *shirley cloth*, *finishing (special finishes)* *slicker fabric*, *slip-cover fabric*.

Skipdent: Open effect in men's summer suiting—by omitting certain warp yarns from the reed in the loom. (The effect can be observed in the ends of Turkish towels).

Skunk: A member of weasel family—well-known for its most offensive odour, which it can emit if attacked. Native of North America. Stockily built little animal—about the size of a large cat. It has long pointed nose and an arched back and short legs. Fur is long, thick and shiny and is black with white stripes towards the back. Its tail is long and brushlike, usually black on top and white underneath.

Fur is beautiful. Garments of this fur were once sold as 'black-Marten'. Now this practice is controlled.

Skunk fur wears well.

See also *fur*, *animal fibres*.

Slag-wool: Silicates with fibrous forms like glass are transferred by artificial processes, and are fused and drawn or spun to a continuous fibre and various 'slags' which, in the fused state, are transferred into 'slag-wool'.

See also *mineral fibres*, *fibres*, *glass fibres*.

Slicker fabric: For fishermen's outfits and rain-wear. Plain cotton fabric made water-proof by wax or some kind of coating.

See also *water repellency*, *mackintosh*, *ski-suiting*, *shirley cloth*, *slip-cover fabric*.

Slip-cover fabric: Made of cotton, linen, rayon or nylon. Firmly woven, pre-shrunk and made water-repellent. In various weaves and textures.

See also *slicker fabric*, *water repellency*, *mackintosh*, *ski-suiting*.

Slipper satin: Heavy, lustrous satin (rayon or acetate) for slippers or wedding gowns.

See also *satin*.

Slit cellulose film: Narrow strips of cellulose film-sheets. Used for novelty effects in knitting or weaving.

Sliver: A continuous strand of loose untwisted wool or other fibres.

See also *spinning*, *carding*.

Slub-yarns: Slubbing is twisting after carding to prepare for spinning. Soft,

thick, untwisted portion at intervals make lumpy yarns for weft in slub-broad cloth.

See also *yarns*, *spinning*.

Soaps: Soaps are a chemical compound with oils and fats with either soda (hard soaps) or potash (soft soaps) and are principally used in washing.

The general properties of soaps are: greasiness to feel, ready solubility in water which on agitation gives lather. Soap when dissolved in large quantities of water suffer hydrolysis. Soaps can be made from almost any organic oil or fat (both vegetable and animal) and is probably the oldest known detergent.

But soap although the oldest and a wonderful cleanser and surface active agent, has its limitations and the action is ineffective in hard water, acid media and certain electrolytes. These not only hamper the efficiency but also make soap economically unsuitable.

Soaps are surface acting agents and are characterised by having molecules having both hydrophobic and hydrophilic arrangements. Synthetic detergents are now mostly taking the place and are fast replacing soaps, but nevertheless soaps still hold their place. Textile soaps however are now being replaced with syndets—ionic, nonionic and alkyl-aryl-sulphonate types.

See also *syndets*, *alkyl-aryl-sulphonates*, *soft soap*, *wetting-out agents*, *Turkey red oil*, etc.

Soda ash: An alkaline salt of commerce. Washing soda— Na_2CO_3 —Sodium Carbonate. It is useful as a cleansing agent. An anhydrous salt.

See also *alkalies*, *Bases*.

Sodium hydroxide: A strong alkali. Also called Caustic-soda. Sodium hydroxide has the formula— NaOH and is manufactured either from carbonates or by electrolysis of NaCl . This is the most important alkali and finds innumerable applications in bleaching, dyeing, printing and finishing.

See also *alkalies*, *bases*, *finishing*, *dyeing*, *bleaching*, *printing*.

Softening: In the raw state all native fibres have some oily substance for protection. When this is removed most of the fibres become harsh and it is very difficult to spin these fibres.

In textile fabrics, softness and suppleness are necessary and where they are absent, these have to be supplemented. Softeners may be added to impart softness or smooth feel, fullness, suppleness, flexibility, etc.

The chief softening agents are:—

- (1) Emulsion of oils, fats or waxes,
- (2) Soaps, (3) Sulphonated oils,
- (4) Sulphated fatty alcohols, (5) Fatty acids—condensation products, (6) Quarternary NH_3 compounds.

Oils are hydrocarbons, which include mineral oils and liquid fats.

Fats are compounds of fatty acids and various alcohols like glycerol.

Waxes are hydrocarbons.

Fatty Compounds

Hydrocarbons—Fatty acids	—Fatty alcohols
Octane	—Caprylic —Octyl ($\text{C}_8\text{H}_{16}\text{COOH}$)
Decane	—Capric —Decyl
Dodecane	—Lauric —Lauryl
Tetradecane	—Myristic —Myristyl
Hexadecane	—Palmitic —Cetyl
Octadecane	—Stearic —Stearyl etc. etc.

Tallow also is extensively used as softener in products like Waxol T. (ICI). Waxes like bees-wax, paraffin-wax or carnauba wax are also applied in emulsion form—Waxol P. (ICI).

Soaps, Turkey-red oil.

—Recently however compounds have been prepared having hydrophilic groups in the centre of the molecule and fatty groups on surface.

—Calsolene oil (I.C.I.).

Sulphated alcohols: Prepared by hydrogenation of fatty acids and when sulphated by chlorosulphonic acids give compounds whose Na-salts are soluble in water, stable in hard water, etc. These sulphated alcohols have fatty characteristics and are excellent softeners.

Trade products are Lissapol, Gardinol, Lorol, Ocenol, Teepol.

0.45 Kg. (1 lb.) paste to 454.5 litres (100 gal.) of water

Condensation products:

—Igepons—are well known.

—Sapamines

These are excellent softeners.

Quarternary NH_3 compounds are also excellent softeners.

—Dixanol with sapamine base

Sapamine KW

Sapamine CH, etc.

Trade Product: Velan PF.

See also *weaving, spinning*.

Soft soap: A soap prepared by using linseed oil and caustic potash. Used in dye-houses.

See also *soap*.

Soluble cotton: Nitrated cellulose which is water-soluble.

See also *collodion, gun-cotton, nitrated cellulose*.

Souple silk: (Souple-supple). Raw silk derived from the silk glue.

See also *silk, degumming*.

Souring: Addition of acid to make the bath sour—a process in bleaching fabrics that follows the treatment with bleaching powder and consists of treatment of the fabric with dil. HCl or H_2SO_4 , so as to wash out lime.

See also *bleaching, finishing*.

Soya-bean: A synthetic protein fibre made from Soyabeans — Glycini Hispida.

See also *man-made fibres, regenerated-protein-fibres, azlon*.

Speciality hair fibre: Fibres of Angora goat or rabbit, camel-hair, Kashmir goat, alpaca, vicuna, etc. Often blended with wool.

See also *animal fibres, fibres*.

Spinneret: A device used for drawing out or spinning fibres. It is like a very fine sieve. Viscous solutions are drawn out into open air or baths where they become fine fibres.

See also *spinning, man-made fibres, rayon-acetate, viscose or cuprammonium, synthetic fibres*.

Spinning: *To draw out and twist into threads.* The forming of threads by drawing out and twisting various fibres.

The primitive thread-making implement was the spindle—simple as this primitive apparatus is a skilful spinner can produce a yarn of such strength, delicacy and evenness as has scarcely been exceeded by modern machinery. The yarns of Dacca-mulmul were so fine that 0.45Kg. (1 lb) weight of cotton could be spun into a thread nearly 402.3 km (250 miles) long.

In modern mechanical spinning, the following changes are incorporated:—

- (a) providing mechanical means for rotation of spindles,
- (b) automatic drawing out of fibres
- (c) working a number of spindles, together at speeds unattainable by hand.

Most of these improvements to spinning machinery were made nearly two centuries ago and it must be noted that these machines are still in use and that these machines were so perfect that no material change is found necessary and that the inventions of Paul, Arkwright, Hargreaves and Crompton are the basic foundations of all modern machines for spinning.

Spinning consists of 3 processes: A: attenuating — twisting — winding — all these carried out simultaneously.

Continuous—flyer (bobbin), cap, ring. Intermittent—mule-spinning.

Comparison of 3 continuous spinning methods.

<i>Flyers</i>	<i>Caps</i>	<i>Rings</i>
Flyer & Spindle both positively driven. Bobbin dragged by yarn from flyer	Cap & Spindle both stationary & bobbin is driven.	Bobbin & Spindle revolve together—traveller is dragged round the ring by yarn.

Mule spinning is intermittent and not continuous and twisting and winding are done separately. This

combines the principles of Hargreave's spinning Jenny with Arkwright's water frame.

In this the cycle of operations can be divided into 3 periods—(a) withdrawal of the carriage with drafting and twisting of the roving, (b) "backing-off" with the carriage stationary, (c) winding.

Spinning topics:

Chief objects of spinning are:

To clean—to remove dust, dirt and knots.

To parallel—to place all fibres parallel.

To twist—to twist the parallel fibres.

Devices for spinning—spindle, spinning-wheel and charkha.

Modern spinning machinery.

Spinning jenny could spin 16 or more threads at a time.

Spinning frame—before this invention all cloth was woven with a linen warp. This invention enabled the use of cotton warp.

Spinning mule—combines the principles of both spinning jenny and spinning wheel and spinning frame. It had 48 spindles and could produce an unusually fine yet uniform yarn.

Today we have an almost embarrassing number of devices which are put to practical use in modern spinning operations.

Cotton spinning: The sequence of operations are as follows:

Ginning, baling, bale-breaking, opening and cleaning (blow-room machinery), scutching, carding, combing, drawing, slubbing, roving, sliver, drawing into threads, spinning on spindles, winding, clearing, reeling, bundling.

Woollen and worsted spinning: Woollen yarns are made from shorter fibres of wool possessing high felting qualities. These are prepared for spinning by process of carding which thoroughly blends and mixes the fibres (long, short, black, white or coloured) or even fibres of different materials in such a way that a homogeneous fibrous-mass in broad fibre form is obtained, which is further divided lengthwise or longitudinally as it emerges from the carders into a number of pith-like filaments, which are further extended into finer filaments and twisted to form wool-threads on mule-frames.

Worsted: These are made from long lustrous varieties of wool and the fibres are so combed as to bring them, as far as possible, parallel to each other. Spinning is usually effected on frames and the yarn is spun into compact, smooth and level threads which are woven into cloth, since felting and milling are unnecessary here.

The sequence of operations therefore is as follows:

Wool-fleece—sheep-washing—shearing—wool classing—wool sorting—wool scouring—drying—teasing—woollen manufacture—worsted manufacture.

Woollen manufacture: willowing—oiling—blending—teasing—carding—condensing—roving—and mule spinning.

Worsted manufacture: preparing—backwashing—combing—drawing—doubling (or drafting)—twisting and spinning.

Silk spinning: Distinction between reeled silk and spun silk.

Reeled silk: Filature or reeling, throwing, numbering, conditioning, scouring, silk-weighting.

Spinning of silk-waste: Schapping—discharging—conditioning—beating—opening & filling—silk dressing (equivalent to combing in wool)—noils—noils & drafts.

Peculiar silk spinning processes: Preparing or drawing—silk spreader—dandy-roving-frame—spinning—twisting and doubling—weighted yarns and folded yarns.

Spinning of jute: The process of spinning and weaving is essentially similar to those employed for heavy flax or hemp goods, the only difference being that a softening treatment must be given to the fibres before manufacturing and therefore this is the only peculiarity of jute manufacture.

Batching, the first process in manufacture—Batch-setting, i.e., selection of different qualities of jute—Softening (in softening machines)—Bale breakers—moistening fibres—Breaker-Card (first machine of the preparing department)—Stripper—Doffers-Roller—Drawing and Preparing rollers—Conductors—Delivery and Pressing Rollers—Sliver can—Finisher-can—Carded sliver—First drawing frame, i.e., 4 slivers into one sliver—Second drawing frame

(2 slivers into one, generally spiral drawing frame)—Third drawing frame to make sliver thicker.

Doubling Threads

Final Preparatory Process—Roving.

Rove-yarns are now ready for spinning.

(Final preparing process when each sliver is first drawn and receives a small twist, but there is no doubling).

Types of Drawing Frames:

(a) Push-Bar or Slide (b) Rotary (c) Spiral, (d) Ring, and (e) Open link.

All these perform the same function, i.e., combing out fibres and then laying them parallel and then drawing them into sliver.

The principles of spinning of jute are almost identical with those of dry linen manufacture.

Linen Manufacture:

Spinning and weaving of Flax, as also bleaching and various finishing operations.

Yarn Manufacture:

(a) Hackling—(b) Preparing—(c) Spinning.

Hackling: hand or machine, i.e., combing out fibres and placing them smooth and parallel.

Preparing from smooth and parallel fibres to level, uniform and continuous sliver.

Roving Machines:

Spinning: Dry spinning—for lower counts. Wet-spinning—for higher counts.

In principle these machines are similar to cotton spinning. Reeling into hanks, drying the hanks, bleaching, weaving.

Rayon Spinning: See heading.

This is solution-spinning where the dissolved cellulosic material is drawn out in continuous lengths through the spinnarets and then wound on spinning rolls.

Almost all synthetic fibres are also similarly spun like rayon.

See also *spinning, carding, combing, roving, sliver, spinning of respective fibres (cotton, wool, silk) solution spinning as in case of rayon, nylon, and other synthetic fibres.*

Splicing: Reinforcement by extra yarn (of say nylon) in heel, toes, or sole of hose for added strength.

Spreads: Cover for bed or table, having a broad surface.

Spring needle: Distinguished from latch-needle in knitting machines.
See also *knitting, latch-needle*.

Spun-rayon-fabric: Fabrics spun out of rayon. Many weaves, weights and

textures. Also sometimes with special finishes—0.97m (38")—1.07m (42")—1.27m (50")

See also *strutter cloth, butcher cloth*.

Square-weave: Plain woven fabrics having equal number of warp and weft yarns as 80 sq. fabrics or 80 × 80.

Stability of Fabrics: See Table
See also *stabilized*.

Fibres	Effects of sunlight	Effects of ageing	Effects of exposure
Acetate rayon ..	Loss of tensile strength	Slight loss of strength	Loss of strength
Cuprammonium ..	„ „ „	None	Good
Viscose rayon ..	„ „ „	Slight yellowing	Yellows slightly
Nylon ..	„ „ „	None	Excellent resistance
Protein fibres: lanital, aralac, vicara, ardil, etc.	Very slow degradation	None	None
Glass ..	None	None	None
Seran, Velon ..	Slight darkening	None	Excellent resistance
Vinly resins ..	None	None	None
Dacron, Terylene ..	Very slow loss of strength	Loss of tensile strength on prolonged exposure	Excellent resistance
Cotton ..	Loss of strength	Slight yellowing	Slight yellowing
Silk ..	„ „	„ „	Slight yellowing and loss of strength
Wool ..	Loss of strength Dyeing affected	„ „	„ „ „

Stabilised fabrics: There are various factors which disturb the dimensional stability of fabrics. Amongst the more important of these are effects of water, sunshine, exposure, heat or cold, damage due to bacterial or other animal attacks, etc. As a result of any of these, fabrics lose their characteristic 'fresh appearance'

or lose their dimensional stability, and begin to appear as 'old clothes'.

Water causes clothes to shrink and the result is that clothes shrink further out-of-fit.

Sunlight causes certain colours to fade out.

Exposure causes various effects on various fabrics.

Heat or cold also effects characteristic dimensional changes and for attacks of animals, the fabrics have to be given treatments.

Treating the fabrics therefore for all these factors becomes necessary if at all the clothes are to last and the treatments are possible for almost all these factors.

See also *dimensional stability, serviceability of fabrics, sunlight, shrinkage control, stability of fabrics.*

Staple: (a) Length of textile fibre.
(b) Cut filament in man-made fibre.
(c) Standard fabric.

Staple-rayon fibre: Filaments of rayon cut into suitable spinnable lengths.

See also *fibre-properties, filaments, monofils.*

Starch: A pure, tasteless, odourless, white farinaceous matter of vegetables, yielding a translucent jelly used for stiffening fabrics or yarns.

See also *finishing, sizing, weaving.*

Starching: Adds lustre and improves the body of the fabric. Used in case of cotton manufacture for almost similar purpose as used in laundering.

Starch is mixed in cold water and then solution is heated until it becomes thick and homogeneous.

The starch-mangle is a trough that holds the starch and the roller with fabric around is made to pass through this mangle when the starch is applied.

See also *finishing.*

Starched chiffon: (Mouseline-de-Soie). Plain woven silk-muslin, stiffer than voile—1.15m (.45").

Starchless finish: Chemical treatment given to fabrics to stabilise natural crispness, without any starch.

See *finishing, crisp.*

Steaming: In textile printing—treatment of cloth after printing (finishing after printing).

Steaming is done to shrink and condition the fabric, in case of wool, spun-rayon, etc. It is applied after decatizing.

See also *printing, finishing, shrinkage control.*

Stencilling: The art of stencilling is very old and has been applied as a device for textile printing by the Japanese.

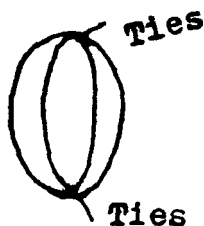
Its application as a printing method is becoming increasingly popular recently. The pattern and/or design is cut out on a sheet of paper or very thin metal with a sharp pointed knife (stencil cutter) in such a manner that the uncut part would represent the portions to be reserved or left uncoloured. The sheet is then mounted on a frame and is brought in contact with the material to be printed and the colour is brushed through the cut-out portions or interstices.

A single colour stencilling machine was patented in 1894 by S. H. Sharp. It consists of an endless stencil plate of thin sheet steel which continuously passes over a revolving cast-iron cylinder. Between these two, the cloth (to be printed) passes and the colour is forced on to it through stencil cutouts (holes) by mechanical means.

It must be noted, however, that compared to other processes, the stencilling method is the oldest, yet the process in improved form will go on and is showing all signs of going on permanently and with the modification on the lines of silk-screen printing stencilling will go on always.

Stencilling with suitable planning of an "all over" pattern, can be as easily produced by this process, as by hand or machine printing and that moreover if several plates are used, as many colours as plates may be introduced into it. The only defect are the "ties" which must be reduced as much as possible and which naturally exercise tremendous influence on the patterns (or design). The ties are certain parts which have to be left uncut so that the central part may not fall out altogether and keep them held up/or connected, viz., the letter 'O'. In letter 'O' if the ties are not left the central portion would fall out altogether.

See also *silk, screen, printing.*



Stock-dyeing: Fibres dyed before spinning as distinguished from yarn-dyed or piece-dyed.

See also *yarn-dyed, piece-dyed, ingrain.*

Strand: One of the strings or parts that compose a rope or yarn. Component part of yarn as single ply.

See also *yarn rope.*

Stripping: (1) Chemical process of destroying colour in dyed cloth.

(2) Process of eliminating embedded

impurities from fibres in card clothing.

See also *finishing.*

Stripes: (Striped cloth)—having stripes or bands of different colours.

See also *checks.*

Strutter cloth: Finer and smoother than Butcher cloth, from spun-rayon, plain-woven with anticrease finish for women's dresses.

See also *butcher cloth, spun-rayon fabric, anticrease.*

Structural fibres: Hard or leaf fibres from fleshy leaves of Pineapple or Abaca. Not spun but tied end to end and used as yarns.

See also *pina-cloth, pineapple fibre.*

Stuffer yarns: Extra yarns added to and between weft yarns, on back side of rugs, to add to body and/or weight.

See also *pique.*

Styles of printing: See Table.

STYLES OF PRINTING

(See under *different headings*)

1	2	3	4
Direct Printing	Printing of mordants upon which colour is afterwards dyed	Discharge Style or Extract Printing Style	Resist or Reserve Style
a) Application of mordant dyestuffs b) Application of basic aniline dyestuffs c) Application of direct dyeing colours d) Application of pigment colours e) Application of Indigo f) Insoluble azo-colours. g) Sulphur dyes h) Aniline black	a) Madder style b) Printing of other mordants.	a) Discharge of Fe & Al mordants b) Antimony tannate c) Chrome discharge d) Turkey red discharge e) Alkaline discharge f) Paranitraniline red discharge g) Indigo discharge h) Substantive colours i) Manganese bronze j) Sulphur colours	a) Reserves under Al & Fe mordants b) R under Alizarine red and pink c) R under insoluble azo colours d) R under steam basic colours e) R under vat-indigo-blue f) R under sulphur-colours g) R under aniline black

See also *printing headings, direct-printing, printing on mordants, extract printing, resist printing.*

Sudanette: (TM) Fine, plain woven, mercerised broad-cloth from Pima cotton. Used for men's shirts, pyjamas, etc.—0.91m (36")

Suede: (Fabric and type of finish). Suede is undressed kid and the colour thereof.

Suede-cloth: (1) Cotton, rayon or wool fabric, woven or knitted and peculiarly napped so as to resemble Chamois leather. The peculiarity of this napping being the fine nap raised by emery covered cylinders.

Used for gloves, linings and sportswear.

(2) Duplex Suede: double woven and napped on both sides.

See also *napped fabrics, emery wheel, kasha.*

Suiting: Cloth suitable for making suits of clothes.

See also *palmbeach.*

Sulphur: (Sulphide colours): These are only suitable for dyeing vegetable fibres, as they are applied in strongly alkaline bath. These cannot be used for animal fibres like wool or silk.

The mode of dyeing with these colours is based on the fact that these are soluble in alkaline reducing agent and if cotton is worked in the solution, the subsequent oxidation *develops the colour, and fixes it* upon the fibres in an insoluble condition.

The colours are remarkably fast to light, alkalis, acids and washing—the only drawback being tendering of fibres, unless proper care is exercised. These colours have acquired great importance.

List of Most Important Colours

Yellow: Immedial Y1, Pyrogene Y1, Sulphur Y1, Thion Y1, Thiogene Y1.

Orange: Eclipse Phosphine, Immedial Or, Pyrogene Or, Thion Or, Thiogene Or.

Green: Pyrogene Gr., Italian Gr., Eclipse Gr., Pyrol Gr., Immedial Gr., Katigene Gr., Thionol Gr.

Blue: Immedial Bl, Immedial Skg Bl, Eclipse Bl, Katigene Indigo, Pyrogene Bl, Sulphur Bl, Thion Bl, Thiogene Bl.

Violet: Katigene Vio., Thiogene Heliotrope, Thiogene Purple.

Brown: Pyrogene Br., Cachou de laval, Thiocatechine, Katigene Black Br., Eclipse Br., Immedial Br., Katigene Br., Dianol Br.

Grey & Black: Pyrogene Grey, Vidal Bk, Immedial Bk, Katigene Bk, Anthraquinone Bk, St. Denis Bk, Amidazol Bk, Cross-dye Bk, Eclipse Bk, Carbide Bk, Thiogene Bk, Sulphanitine Bk, Sulfo-gene Bk, Pyrogene Bk, Dianol Bk, Sulphur Bk, Thion Bk, Kryogene Bk.

Sulphur dyestuffs: Whose chemical nature is doubtful, are prepared by fusing together organic nitrogenous compounds, alkalis and sulphur (Na₂S) or polysulphide.

—Insoluble in hot water but may be dissolved in Na-sulphite. Sulphide is used in case of vegetable fibres. Sulphur dyes are not used in case of animal fibres—for these could attack animal fibres.

Cotton: boiling or very near boil dye liquid is used and takes about 45 minutes. Cotton must be kept below surface level as the exposed portion above level would be oxidized and result would be patches. After steeping—

- standing in solution
- aeration for oxidation
- steaming
- washing with soap solution
- rinsing
- drying

No formal classification of Sulphur colours has been found.

See also *dyers, dyers' chart.*

Sunbak: (TM) Patented lining material showing rayon on one side and napped wool on the reverse side—1.05m (41").

Sun-copying: Ref. *Prussian blue.*

Sundour: (TM) A vat-dyeing process, practised in Scotland. Chiefly used in case of decorative fabrics which can withstand sun, exposure and washings.

See also *finishing, vat-dyeing.*

Surah: A soft twilled silk fabric, also made from nylon or rayon. Plain, plaid and printed—0.99m (39"), Tie fabric 0.61m (24"). This word is

broadly used to designate any twilled silk fabric or rayon fabric.

Swatow grass cloth: (Shantow-China). A grass-cloth manufactured at Swatow (China) from the so-called Taiwan hemp (the fibre of *Boehmeria nivea* from Formosa—Ramie).

See also *ramie*, *China-grass*.

Swiss: Fine, sheer cotton fabric—plain, printed or with figures. Plain woven and without lustre.

May have embroidered or woven figures.

(a) Dresses, aprons, curtains—0.71m (28"), 0.81m (32"), 0.91m (36").

(b) Curtain Swiss—0.91m (36"), 1.02m (40").

Swissing: The calendering of bleached cloth after damping, by passing through bowls or pairs of rollers.

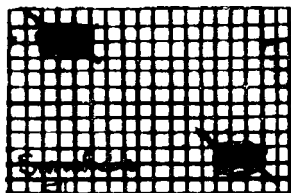
See also *finishing*.

Swiss-rib: (Switzerland). Has 2 wales alternating called 2-2 rib.

See also *rib-knit*.

Swivel: A rug or tuck that turns round on a pin or check—method of making dotted Swiss, where individual shuttles make dots in weaving—done on Swivel looms.

See also *clipped-dot*, *pindot*.



SWIVEL DOT

Syndets: Short term for synthetic detergents.

Detergents: Soap and Syndets.

Detergents are cleansing agents, viz. surface active agents having the property of removing dirt from soiled materials.

Soap: made from organic oils+fats (both vegetable or animal) is the oldest known detergent.

Syndets: or synthetic detergents are soap-like chemicals from mineral oils or coal-tar products.

Although soap is a wonderful cleaning agent it has its limitations. Hard water, acid media and certain electrolytes are positive enemies of soap. Not only far greater quantity of soap is required thus making it uneconomical but these media also affect the detergency of soap. These difficulties experienced in their use led to investigation of other cleansing agents which would perform equally well under the conditions which limit the use of soap.

Syndets especially the alkyl-aryl-sulphonate type answered all these conditions more or less perfectly and a stage is fast approaching when they are likely to be accepted without doubt in textile processing.

Both soaps and synthetic detergents are surface active agents—also they are fundamentally similar both structure-wise and also in behaviour. All surface active agents are characterised by molecule which carries a hydrophobic (water repelling) tail and a hydrophilic (water attracting) head.

A number of synthetic detergents are now available in the market in compound form with other compounds, which enhance the action of the detergents.

A standard formula for such compound is:

40-45% Anionic detergent (Alkyl-aryl-sulphonate)

50-54% { Sodium tripolyphosphate
Sodium silicate
Sodium sulphate

2% Carboxy - methyl - cellulose (CMC)

0.2% Optical bleaching agent

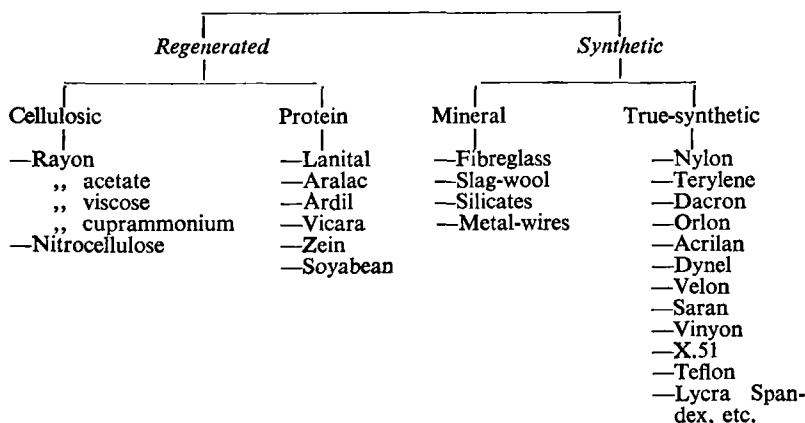
In household detergents the % of active component is 15% to 20%, while in commercial or textile detergents called H.D. or Heavy Duty the % of active principle is between 35% to 40%.

See also *soap*, *detergents*, *alkyl-aryl-sulphonate*.

Synthetic fibres: These are man-made fibres and are not found in nature. These have to be prepared in laboratories, where chemists are constantly experimenting for newer types and research for this is constantly going on.

These can be roughly classified as under:—

Synthetic Fibres



Regenerated fibres: Strictly speaking, although man-made, are not truly synthetic, in the sense, that the basic ingredients already occur in nature, and these have not to be synthesized.

Rayon—manufactured by any of the three processes—are regenerated cellulosic fibres—where only the appearance and structure are altered by suitable chemical treatments, but the basic stuff occurs in nature.

Amongst the regenerated protein-fibres are two groups—one made from animal proteins while the other is made from vegetable proteins. The animal protein employed is casein (milk) while in case of vegetable protein, zein protein is mostly employed.

Properties of these are wool-like and these fibres also resemble wool in their chemical make-up. These are mostly employed as wool-substitutes.

True synthetic fibres are truly synthetic—since even their basic materials have to be polymerised or synthesized in laboratories and these materials certainly do not occur in nature.

Nylon—a polyamide synthetic resin fibre and the first fibre that was made. It is truly a wonder fibre since it is becoming more and more popular everyday and there are indications that it will very soon dethrone cotton. A very serious competition is already going on where the virtues of king cotton are already seriously challenged.

(See heading, for each fibre).

The first synthetic fibre was rapidly followed by a series of synthetic fibres and the list is now growing, as more and more types are being made available in the market.

Mineral synthetic fibres are also man-made and amongst them the most important is fibre-glass. It is a synthetic mineral fibre made from sand, limestone and soda (the same materials which go in the making of ordinary glass). Fibre-glass is not affected by fire, chemicals or heat. Fabrics made from fibre-glass are used for curtains, draperies, rail-sacks, bedspreads, shower-curtains, wall-coverings, hand bags, lamp-shades, table-cloths, etc. The fibre itself is used in ropes, twines and sewing threads for glass textile factories. It is often woven into industrial fabrics to give resistance to fire, acid, rot and heat.

The other mineral fibres listed are mostly used in industrial fabrics requiring various specific requirements.

(See each heading).

All synthetic fibres have to be prepared from various substances such as

- Nylon—polyamide.
- Terylene } Polyester
- Dacron } Polyester
- Orlon Acrylonitrile
- Acrilan "
- Dynel { Vinyl chloride and acrylonitrile
- Vinyon { " " "

Velon { Vinyl chloride and vinyl-
Saran { chloride
Vinyon { " " and vinyl
acetate, etc.

Synthetic fibres have a decided advantage over the natural fibres, since many of the desired properties can be controlled or even added or given to them in the manufacture itself.

Thus synthetic fibres (as manufactured) are made inherently hydrophobic and so these do not become shaggy like the hydrophilic natural fibres and also the synthetic fibres maintain their dimensional stability—throughout the life of the fibre.

Also many times they are inherently moth and mildew resistant, and germ-proof, etc. If lustrous, their lustre can be controlled in the manufacture itself. And the dyeing in case of these fibres is also more certain.

Their resistance to outdoor exposure and other such influences is also very great.

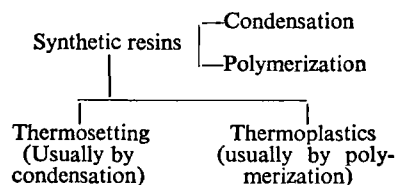
The invention and development of synthetic fibres has done much to advance textile industry, but that an eminent place remains for the natural fibres is accepted virtually without question. But this does not mean that natural fibres can afford to lose their laurels. There is much room for improvement but this capacity for improvement resides in the fibres.

It does not mean that natural fibres are best as they are and no improvements to them should be made. That is definitely not the case since the defects of natural fibres are also inherent and have to be rigorously modified, as only then are they in a condition to be a better wear. So much remains to be done still in this respect, and it is hoped that research may perhaps show some of the things that can be done in such cases.

See also *man-made fibres, fibres, wool substitutes, protein fibres, stability of fibres, fibre-properties, finishing, delustring, solution-dyeing, spinning of these fibres.*

Synthetic resins: The use of synthetic resins is becoming increasingly popular for various ultimate uses and the pioneering done by Fould, Wood, Marsh of Tootal, Broadhust Lee. Co. Ltd. is especially important.

Synthetic resins are substances of high molecular weight formed by joining together small molecules into bigger ones by either condensation or polymerization:



Thermosetting resins harden on heating and the hardness is permanent while thermoplastic resins soften on heating and harden on cooling.

Thermosetting resins are generally formed by condensation. These may exist as long separate chain molecules before being hardened by heat and once hardened—a considerable amount of bridging or cross linking occurs in the ultimate molecular net work, so much so that they do not respond to any plasticizing reagents as probably these compounds cannot penetrate between the molecular chains.

Phenol-formaldehyde (well known trade product is Bakelite) was the first synthetic resin. This is synthesised inside cotton fibres to give a crease resisting finish.

Urea-formaldehyde—is colourless and is used for crease-retention. The basis of crease-retention lies in the fact that the synthetic resin is formed within the fibres—process discovered by Fould, Wood, Marsh of Tootal Broadhust & Lee. Co. Ltd.

See *Tebilized.*

The process consists of 3 steps:

(1) Impregnation; (2) drying and (3) heating followed by washing.

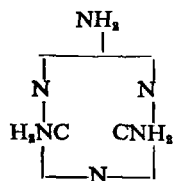
This invention has not only removed one major defect of cellulosic fibres but has also definitely introduced a new feature in finishing.

Under a neutral or slightly alkaline condition urea and formaldehyde condense. The compounds are crystallized and are readily soluble in water; when heated under slightly acid conditions these condense further to give the well-known resin.

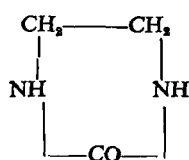
The crease-resisting effects also result in the following improvements:

- (1) Increase in weight
- (2) Improved resistance, feel and drape
- (3) „ strength in Rayons
- (4) „ fastness to dyes
- (5) Resistance to degradation by light or exposure
- (6) Rot-proofing.
- (7) Decrease in extension of Rayon (freedom of distortion)
- (8) „ in shrinkage on laundering
- (9) „ in water imbibition
- (10) Prevention of slippage
- (11) Moisture regain unaffected

Melamine-Formaldehyde



Cyclic Ethylene Urea



These are similarly employed as Urea-formaldehyde.

(Topic Thermoplastic-resins must be read with this).

See also *anti-crease, stabilized, dimensional stability, thermoplastic.*

Synthetic rubbers: Synthetic substances resembling rubbers. Neoprene was the first synthetic rubber.

Chloroprene — polymerised — Neoprene.

It had better heat-resistance and oil-resistance than rubber.

Butadiene—polymerised — Polymerized butadiene. Other similar products are:

- Perbunan
- Chemigum
- Hycar
- Koroseal

Koroseal — Polynyl chloride from vinyl chloride

Isobutylene — P — Polyisobutylene (Vistanex)

Butylrubbers are copolymers of isobutylene and butadiene.

Synthetic rubbers can be vulcanized by sulphur and accelerators.

There is very little difference between synthetic rubbers and synthetic resins and many thermoplastic resins can be used in place of rubbers in textile applications.

See also *resins, rubbers.*

T

Tabby: Plain weave. A coarser kind of waved or watered silk.

See also *tabbinet.*

Tabbinet: A more delicate kind of tabby resembling damask. Used for window-curtains. A kind of rich waved silk.

See also *silesia, shade-cloth, holland.*

Table-cloth: A cloth of cotton, linen, rayon, nylon or combination; plain-woven, for covering a table especially at meals.

Table-cover: A cloth for covering tables especially at other than mealtimes. Linen, cotton, rayon, nylon; in plain weave as damask.

Table-padding: (a) Cotton fabric—plain or twill with a thick nap on both sides.

(b) Quilted goods—plain woven—as mattress-pads.

Taffeta: A thin glossy silk stuff—having a wavy lustre—originally silk stuff plainly woven for dresses, linings, curtains, etc. 0.99m (39")—1.07m (42").

(a) Cotton—often mixed with rayon for dress fabrics. 0.91m (36")—1.27m (50").

(b) Silk varieties—as tissue-taffeta or paper-taffeta (stiffer). 0.99m (39")—1.07m (42").

(c) Nylon and rayon—as silk.

See also *umbrella fabric.*

Tanning—Tannic acid: Art of tanning or converting raw hide into leather. It is a generic name for widely distributed group of vegetable products. These are water-soluble with an astringent taste and acid reaction.

In textiles industry, tannin is of value as a vegetable dye and in mordant dyeing, especially basic colours, where a clever use of the fact that cotton has a natural affinity for tannic acid is made.

Sources: Hirda, Beheda, tea-leaves. Simple tannic acid or tannin treatment alone deserves a special note since it is by itself an aero-photo developing treatment fluid—yielding a chocolate dark brown colouration—to cloth and this colouration is more or less permanent. The simplest method of treatment is to dip a previously dried cloth in a strong solution (about 5 to 10%), to take out this cloth thus treated and to squeeze out the cloth of all the superfluous liquid, and then dry the fabric.

See also *dyeing, mordanting, basic colours, catechu.*

Tapa-cloth: Tapa is bark of the paper mulberry much used in the South Sea islands for matting.

—A Hawaiian dress.

Tape: A narrow band of woven work, not over 0.20m (8"), used for tying etc. Cotton, linen, rayon or nylon, in plain, twill or herringbone weaves.

—A mending tape.

Tapestry: An ornamental textile used for covering walls, furniture, curtains, hangings, etc., made of either high warp (*haute-lisse*) or low-warp (*basse-lisse*).

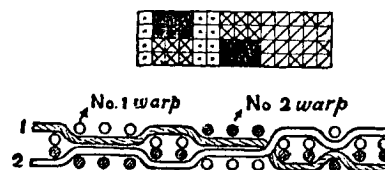
In high warps, the threads are stretched vertically and the worker sits up to work while in case of low-warp the frames are placed horizontally and the worker has to bend over them. In both cases, the method of weaving is the same and the designs are woven according to pattern.

A pictorial handwoven fabric made with bobbins worked from the wrong side, carried only from edge to edge of each colour and not from selvedge to selvedge.

Machine reproductions are woven

on Jacquard looms with yarn dyed figured fabrics of 2 sets of warp and weft.

See also *axminster, aubusson.*



TAPESTRY—2 WARP 2 WEFT

Tarlatan: A thin, rather open, transparent muslin for women's dresses. Often coarse in texture. Plain woven and highly glazed and sized.

—Light weight, open-weave, transparent fabric, woven from thin yarns and lightly stiffened.

—As coarse as cheese-cloth, but stiffer. Used for doll's dresses, Christmas stockings, etc.

—If glazed on one side, called Argentine.

Tartan: Any woollen cloth with a plaid pattern. A woollen or worsted stuff checked with various colours—once a distinctive dress of Scottish highlanders, each clan having its own characteristic pattern.

It is now a general term for plaids.

See also *plaid.*

Tarpaulin: A heavy, well-made, double-warp, plain fabric of various materials used chiefly for covering against rain. Usually made of strong linen or hemp or cotton cloth, smeared with tar or pitch to render it waterproof.

Used for providing covering for goods, carriages, etc.

To make it proof against rain or to atmospheric influences, it is usually treated with tar, although various other compositions are also used—especially for finer coverings or railway-canvas. These covers are similar to canvas. Quite a large quantity of tarpaulin is also made from jute.

See also *bagging, canvas, waterproofing.*

Tash: An oriental silk-jari fabric with gold or silver thread.

Tassel: A hanging ornament consisting of silk or other material.

Tat: East Indian matting—gunny cloth.

Teasel: A plant with large burrs or heads covered with stiff hooks, or awns, which are used in raising a nap on cloth. The heads are cut in halves and attached to a cylinder which is made to revolve against a cloth—larger heads for raising nap on blankets, best for nap on men's garments, small flower-heads for fine woollens and broadcloths. No mechanical device is invented yet which can do the work of this plant satisfactorily.

See also *gig, gigging, napping*.

Tebilized:

"TEBILIZED": for tested crease resistance.

TEBILIZED DOUBLE TESTED: for crease resistance and minimum ironing.

(TM) of Tootle Broadhurst Lee, Co. Ltd. for the now world renowned crease-resisting process.

"I want you to make this piece of cotton like that piece of wool in its power to resist and recover from creasing" was the now almost legendary direction which Sir Kenneth Lee gave to his specially appointed research staff, just after the first World War. This direction was largely fulfilled when Tootle Broadhurst Lee Company Limited patented and thereby made public the now world-renowned Crease-Resisting Process.

Licences for the use of the process have been granted to textile finishing companies throughout the world, with whom the inventors work in close technical co-operation.

The latest, and indeed historic, advances are processes for the production of minimum-ironing cotton, linen and rayon fabrics. These new fabrics which will take so much of the drudgery out of house-keeping may be identified by the trade mark "TEBILIZED Double Tested."

Compared with untreated fabrics, goods marked "TEBILIZED"

- (1) have an improved handle and drape which last the lifetime of the fabric. Remarkable and attractive variations in handle may be obtained by careful manipulation during processing;
- (2) are easier to look after, stay clean longer and consequently require less laundering;
- (3) have greatly reduced laundry shrinkage and, on viscose rayon fabrics, considerably increased strength, which contribute largely to the longer useful life associated with fabrics carrying the mark. The tendency of many fabrics to slip, grin and fray is greatly reduced.

The reason for these and other diverse improvements, which will be considered in greater detail below, is inherent in the nature of the process.

Before the invention of the Crease-Resisting Process the production of apparel fabrics from natural cellulosic fibres (for instance cotton and linen) and from regenerated cellulosic fibres (for instance viscose rayon) was handicapped because cellulosic fibres lack the natural resilience and power to resist and recover from creasing associated with animal fibres like wool and silk. This is due to the differing chemical composition of the two types of fibre. The molecular structure of wool differs from that of, say, viscose rayon in that, among other things, although both are composed of long chains of molecules lying side by side, in the case of wool there are bridges or links between the chains to support and hold them in position; rayon, like cotton and linen, has no such bridges.

In crease-resisting fabrics marked "TEBILIZED" similar bridges or 'entanglements' between the chains are formed by impregnating the fibres with a liquid synthetic resin, which being of low molecular weight (i.e. the resin is composed of very small molecules) penetrates into the heart of the individual fibres—not just between them. The fabric is then dried and heated, a

complex chemical reaction takes place, the resin molecules re-form, become too large to escape from the fibre and cannot therefore be removed by normal usage, laundering or dry-cleaning. (This is important since the customer can be assured that the finish will last as long as the fabric.) In this way the fabric is given that resilience and power to resist and recover from creasing which wool has naturally, and at the same time the robustness and stability of the fabric is greatly increased.

Fabrics marked "TEBILIZED" stay smart and attractive longer, because of their crease-resisting powers and their improved drape and handle. In addition, the presence of the resin means that dirt does not penetrate the fabric so easily and that the fabric does not retain so much water when wet. The combination of these properties means easier and less frequent washing.

It is convenient to mention here that "TEBILIZED" marked fabrics should be washed as silk or wool—that is, in warm soapy water, and without prolonged soaking.

The carefully controlled processing associated with "TEBILIZED" marked goods enables laundry shrinkage to be greatly reduced, frequently to less than 1 per cent. This contrasts favourably with figures of 12 per cent frequently encountered on untreated fabrics and is of particular importance in the case of rayons which, unlike cottons, cannot be stabilized by mechanical shrinkage processes.

Untreated rayon is less robust and less stable than cotton. When wet it swells and its naturally low tensile strength further decreases, in contrast to cotton and linen, which are stronger when wet. Prior to the invention of the process, this imposed a grave limitation on the use of rayon for apparel fabrics. In this field the crease-resisting process makes a truly remarkable contribution: compared with the untreated fabric, rayons marked "TEBILIZED" are frequently one and a half times as strong when dry and twice as strong when wet

due to the considerable reinforcing effect of the resin in the fibres. It is hardly necessary to stress the importance of this improvement in connection both with washing, either at home or in the laundry, and with serviceability. This increased strength conferred on rayon fabrics by the crease-resisting invention is yet one more factor which has contributed to build up the wide and interesting ranges of fabrics marked "TEBILIZED".

The same considerations of instability and weakness mean that untreated rayon fabrics are much more extensible than cotton and therefore liable when made up into garments to become distorted—or "baggy"—at the elbows and other points of stress. At the same time rayon yarns, lacking the natural convolutions or curls which give mutual cohesion between the fibres of cotton yarn, have a tendency to slip on one another, a tendency considerably more pronounced in filament than in cut staple fibre yarns. This slippage causes "grinning" of the fabric and should this take place near the edge of the fabric in a garment the material will fray, become unsightly and, perhaps, the garment will come apart at the seams. The resin impregnation stabilizes the fabric and in minimizing both distortion and slippage greatly enhances the value and ultimate appearance of garments made from fabrics marked "TEBILIZED". Such garments preserve their shape well during wear.

The resin treatment accorded to "TEBILIZED" fabrics ensures that colours used in dyeing will be faster to washing and frequently also faster to light than they would be on the untreated materials.

In their constant endeavours to improve still further British textile products and in line with the ever-increasing demand for relief from household drudgery, Tootal Broadhurst Lec Company Limited set themselves a task of producing minimum ironing fabrics of cotton, linen and rayon which while retaining all their natural beauty and attraction would require little or

no ironing. They achieved their first success in this field with the production of minimum-ironing cotton fabrics and this has been followed by the historic announcement of similar processes for linen and viscose rayon fabrics.

The new fabrics marked "TEBILIZED Double Tested", which ushered in a new era for the British textile industry, are tested not only by the well established methods which have made the "TEBILIZED" mark famous, but also by an entirely new scientific test which measures the smooth-drying properties of fabrics. It is worth noting that this method of evaluating the smooth-drying characteristics of textiles has played a vital part in the development of the precise techniques required to produce these outstanding and historic further examples of British enterprise in the textile world.

The mark "TEBILIZED Double Tested" is the public's first and most valuable assurance of TESTED SMOOTH DRYING.

(From an article by the Tebilized Trade Mark Users' Association, Manchester).

See also *anti-crease-finish, crease-retention, stabilization, shrinkage-control, synthetic-resins.*

"Teflon":—"Teflon" TFE and FEP-Fluorocarbon Fibers (Du Pont's): Du Pont's Information Bulletin states:

Background

"Teflon" TFE- and FEP-fluorocarbon fibres are designed for industrial applications. Both forms of the fibre are distinguished by high strength, excellent chemical and temperature resistance, and exceptionally low coefficients of friction. "Teflon" TFE fibre has an icy slipperiness—a feature demonstrated a few years ago when a professional ice skater did a series of "figure eights" on a ring made of fabric woven from TFE fibre.

"Teflon" TFE fiber was developed in 1953 and commercialized in 1957. Chemists who developed the fiber nicknamed it "Dragon Fur" to imply its virtual indestructibility. The TFE fiber is a multifilament yarn, normally brown, but it can be bleached white.

It can be woven or knitted in the same manner as most synthetic yarns and can be processed into flock, staple, and tow.

"Teflon" FEP fiber was developed and commercialized in 1961. This fiber is produced as a monofilament only, in diameters ranging from two to 60 mils. Because of its relatively large diameter, this wire-like fiber does not resemble products normally considered textile fibers.

Uses

"Teflon" TFE fiber—A major application for "Teflon" TFE fiber is in non-lubricated bearings which utilize the fiber's extremely low coefficient of friction and high strength. Fabrics woven or knit of the fiber are used to line ball joints and rod-end and sleeve bearings.

The aircraft industry has made use of bearings lined with "Teflon" TFE fiber since 1958, with the number of applications growing steadily. One new jet airliner utilizes 1,063 fiber-lined bearings, which eliminate the need for lubrication and other routine maintenance. A taxi fleet test several years ago established the advantages of suspension units lined with fabrics of "Teflon" over conventional lubricated joints; the first major automobile manufacturer to use these bearings introduced them on the 1963 model. Other manufacturers have begun gradual introduction—an important step toward the development of the entirely greaseless automobile.

"Teflon" TFE fiber has found broad applications also in braided packing for pumps and valves, in filtration fabrics, and in gaskets and seals, where the fiber's toughness, chemical and heat resistance, and low coefficient of friction are critical.

Medical authorities have reported on the extensive use of "Teflon" TFE-fluorocarbon fiber in prosthesis, especially in arterial grafts and heart valve replacements. Du Pont, however, has conducted no clinical testing of medical applications and is, thus, not in a position to endorse such applications.

"Teflon" FEP fiber—is used primarily in filtration meshes and mist separators where metal wire fabrics were formerly used. Its chemical inertness, thermal

resistance, non-stick properties, and light weight are the principal reasons for its selection.

See also *synthetic fibers*.

Tenter: A machine for stretching cloth by hooks to full width. Tentering straightens and dries the fabrics and is used in case of wool, cotton, rayon, linen and silk.

During manufacturing the fabrics are subjected to many wet treatments and due to these, irregularities are observed in the fabric-surfaces and in length and widths.

Before starting with the dry finishing processes, the fabrics have to be stretched and dried which is accomplished by tentering. In tenter the fabrics are caught and held by pins and clips, on tenter chains, which stretch the fabrics to desired width. As the fabric passes through drying range, hot air is circulated through the fabric which effects controlled drying.

See also *finishing*.

Tereck-cloth: (TM) Pyroxyline treated and impregnated fabric.

See also *coated fabrics*.

Terene: Indian TM for I.C.I. terylene manufactured under licence by

Chemicals and Fibres of India Ltd.

See also *terylene, dacron, synthetic-fires*.

Terry-cloth: A piled fabric with uncut loops. Plain woven cotton fabric woven with loops on surface—for absorbing water. Used chiefly in towels, bath-ropes, sweaters, swimming-suits, bath-room shower-curtains, etc. 2 sets of warp (tight and loose)—weft in between. Loose warp yarn is pulled into loops. Often called Turkish towelling—0.76m (30")—0.91m (36").

The loops in this cloth may be on one or both sides. All over the fabric are stripes, checks or Jacquard patterns. It has a firm close underweave and closely spaced loops, which make the fabric absorbent.

See also *pile-fabrics, towelling, bath robes, Turkish towels*.

Teca: (TM) for acetate staple fibres—crimped and wool-like—blended with wool or other fibres.

Terylene: (I.C.I. British). (TM) for the British polyester fibre manufactured by Imperial Chemical Industries Ltd. (*Dacron must be read with this*).

See also *dacron, synthetic fibres*.

Tex System:

International Comparative Yarn Counts

Tex No.	Denier	Cotton	Worsted	(Yorkshire) Woollen	Linen wet
1.	9	590	886	1937	1653
2.	18	295	443	969	826
3.	27	196	295	645	551
4.	36	147	221	484	413
5.	45	118	177	387	331
6.	54	98.3	147	323	275
7.	63	84.3	126	277	236
8.	72	73.7	111	242	207
9.	81	65.5	98.4	215	186
10.	90	59.1	88.6	194	165

Subsequent Denier—(Tex × 9).

For subsequent counts—No. ÷ Tex.

See also *count, yarn numbering*.

Textural design: Anything woven—a web. Manner of weaving or connecting disposition of parts of body.

Weaves alone can produce various designs without the use of colour—as in case of texture-rug.

Texture: Appearance and feel of fabrics, described as lustrous, dull, stiff, soft, heavy, sheer, woolley etc., according to yarns, weaves or finish.

Theatrical gauze: Originally as background of stage scenery. Plain woven linen of open texture like scrim. Yarn-dyed for glass curtains. 0.91m (36")—1.83m (72").

See also *scrim, hardanger*.

Thermo-plastic: Property of becoming plastic under influence of heat. Materials which are rigid at normal temperatures but becoming plastic on application of heat.

(*Thermo-plastic resins must be read with this.*)

See also *synthetic resins*.

Thermoplastic resins: (True Polymers)—from monomers, uniting with themselves to produce a long-chain molecule known as Polymer. These are products of polymerization.

Monomer—*Polyme-* $\left\{ \begin{array}{l} \text{—co-polymers} \\ \text{—heteropoly-} \\ \text{rised} \qquad \qquad \text{mers} \end{array} \right.$

Thermo plastic resins can be prepared in the following three ways:—

- (a) direct polymerization of the monomer—liquid
- (b) polymerization of monomer in solvent
- (c) emulsion of monomer-polymerized

Vinyl Resins

Ethylene	—Polyethylene
Vinyl-benzene (Styrene)	—Polystyrene
Vinyl chloride	—Polyvinyl-chloride
Vinylidene-chloride	—Polyvinylidene-chloride
Vinyl-acetate	—Polyvinyl-acetate
	— " -alcohol
	— " -Formal
Acrylic acid	—Polyacrylic acid
Methacrylic	—Poly-methacrylic acid.

See also *synthetic resins, synthetic-fibres*.

Thickening agents: Materials put into liquid mass to make it thick. Various starches, flour, gums, dextrine, albumen.

See also *printing, preparation of colours, gums, adhesives, albumen*.

Thread: (a) A very thin or fine cord of two or more yarns of fibres tightly twisted together.

(b) A very thin line of any substance twisted and drawn out.

A filament of any fibrous substance. Thread-lace: Lace made of linen thread.

Thread-lisle: A fine hard twisted linen thread originally made at Lisle (France) used in hosiery.

Threads are used in sewing and also in weaving.

See also *yarns, lace, knitting*.

Three-quarter goods: Fabrics 0.686m (27") wide or $\frac{3}{4}$ yard.

Three pile: The finest kind of velvet.

Three leaf-twill: See *Twill*.

See also *spinning*.

Thrown silk: The object of the operation called "throwing" is to twist and double the raw silk fibres into more substantial yarns—since raw silk is far too fine and delicate.

- (1) *Winding:* The first operation in throwing raw silk in hanks is taken from the reel and putting it on swifts—is wound on bobbins. These bobbins are then taken to first spinning frame where the single strands receive the first twist.
- (2) *Scouring:* The subsequent operation is scouring which removes gummy substances and binds the strands into one.
- (3) *Cleaning:* Next operation—here silk is simply reeled from one bobbin to another which on its way passes through a small slit which allows safe passage to smooth strands and stops when lumps are present.
- (4) *Doubling:* Next process—where 2 or more filaments are bound

together side by side on the same reel before they are twisted or thrown into a single yarn.

- (5) *Spinning or throwing*: Next operation is throwing silk where yarns are twisted and silk is reeled into hanks of definite length.

Principal classes of thrown silks:

- (1) *Singles*: consisting of single strand of twisted raw silk made up of filaments of about 10 cocoons.
- (2) *Organzine* (or warp threads): made up of 2 or 3 twisted strands spun in opposite direction to that in which they are separately twisted.
- (3) *Tram* (or weft threads): consisting of 2 or 3 strands of raw silk—not twisted before doubling and only slightly spun.

See also *silk, silk spinning, organzine, tram, reeled silk*.

Tibet cloth: A woollen fabric generally printed in colours. A heavy fabric used for similar purposes as furs, made of goat's hair, black and finely curled.

See also *goats, furlike*.

Ticking (I): A strong linen or cotton fabric usually woven in stripes of colours, blue and pink with white being most common.

Ticking is used for mattresses, awnings, and tents. It is also used as embroidery foundation. Usually the coloured threads are of cotton while white or grey warp threads are flax. The weft is flax or tow.

In many of the cheaper varieties the warps are entirely of cotton and weft is jute.

A feather tick is usually of fine flax yarns set closely, and having a large number of weft threads per inch.

Sometimes the inside of tick is waxed.

Structure of fabric is twill; ordinary 3 leaf twill is generally used but occasionally the one direction is reversed at regular intervals and thus producing *arrow head* or *herringbone* twill.

In finest ticks herringbone twill and sateen twill weaves are used

while plain weave is used for cheaper varieties.

Mattress ticks and awnings are woven with the same twill-weaves. The colourings however are more elaborate.

Ticking (II): Cotton fabric, close weave, weather-proof.

- (a) Heavy blue and white striped—herringbone twill—0.81m (32")—0.91m (36").
- (b) Printed sateen type—for mattresses, pillow-cases. Tough cotton warp, satin-weave—0.81m (32").
- (c) Damask—2 colour woven design—mercerised, cotton and rayon—jacquard weave—0.81m (32").
- (d) Bohemian—plain, close woven, white warp, coloured weft—0.81m (32")—0.91m (36").
- (e) Blue and white—heavily sized twill—0.91m (36").

Tinsel yarns: Brass, copper or tin (almost as thin as foil) or aluminium and used in discs, patches, strips or threads for giving clothings striking appearance.

Anything showy—anything having a false lustre.

See also *metallic-cloth*.

Tire-fabric: (or Tyre-fabric): Fibres of cotton, rayon or nylon, used in manufacture of rubber tyres. The fibres mostly used are (a) high-tenacity rayon, (b) nylon, or (c) coarse hard twisted yarns of cotton, multiple ply.

See also *auto-tyre fabric*.

Tissue: Cloth interwoven with gold or silver threads or with figured colours. Light weight fabric—tissue-gingham.

Tissue paper—a thin, soft, transparent kind of paper.

Tobacco-cloth: See *cheese cloth*.

Toile: French term for cloth. In Lace, however, the term refers to solid part of design.

Toilet: (Toilette-cloth). A cover for dressing table.

Toilenette: A German quilting with silk/cotton chains and woollen weft.

Top: Long parallel wool fibres from which noils (short fibres) have been removed by combing.

See also *noils, combing*.

Topping: Another colour dyed on top of the first colour—as yellow dyed on red to produce orange—or black and white checks, in wool dyed to produce another colour on top of white.

Tow: Originally a rope made of coarser part of flax or hemp for towing boats—Yarns made from coarser flax or hemp.

Tow—a term given in textile manufacturing to short fibres formed during scutching and hacking operations and also to the yarns which are made from the fibres (usually from flax or hemp). A special machine called tow-card is used to draw these fibres into sliver, which further passes to drawing frames for spinning.

See also *flax spinning*.

Towel: A cloth used for drying hands, face or body after bathing or washing.

Towelling: A cloth for wiping the skin after it is washed and for such purposes.

These cloths are made of different materials—known as Towelling. The 2 principal kinds are "*Huckaback*"—a slightly roughened material for chamber towels for hands and face—and *Turkish Towelling* made of linen but now almost invariably of cotton.

Indian pancha: a thin plain woven rough unbleached cotton towelling.

See also *Turkish towels, absorbent towel, huckaback, terry cloth*.

Tracing cloth: Plain woven, fine, combed yarn cotton fabric—especially treated for transparency and water repellency. Used in drawing plans and suchlike requirements, by architects, engineers, etc.

See also *cambric*.

Tram: Weft thread of two or three strands of raw silk only slightly twisted. One of the principal classes of thrown silk.

See also *thrown silk, organzine*.

Transparent films: Celluloid films or cellophane. Also polythene films and other plastic films.

Tricot fabric: A hand knitted woollen fabric (or its machine-knit imitation). A soft, slightly ribbed cloth for women's garments, underwear, dresses, etc.

The fabric is a type of warp-knit structure with vertical wales on right side and horizontal wales on wrong side. Two-bar tricot—having 2 sets of yarns is run-proof. One-bar tricot—having single set is run-resistant.

See also *knitting*.

Tricel: Cellulose triacetate synthetic fibre; fabrics made of it have a pleasing lustre, are self-smoothing, have an attractive drape, and are capable of being heat-set. Most popular for ladies' dresswear. Courpleta (TM) is made in England by Courtaulds Ltd., and Arnel (TM) in the U.S.A.

Tricotine: (1) Cavalry twill, cotton, for uniforms, sportswear, 8 harness right hand twill.

(2) Steep, warp-faced, worsted twill with double lines suggesting knit structure.

(3) Also of rayon.

See also *cavalry twill*.

Tropical type suiting: (Often mistaken for tropical worsted)—light weight suiting for men's wear, in various weaves and textures, usually from blends of rayon, cotton, wool, nylon, terylene, etc.

See also *tropical worsted*.

Tropical worsted: Light weight worsted suiting of fine yarns, in various weaves. 1.37m (54")—1.52m (60").

See also *tropical type suiting*.

Tubular fabrics: (a) Cotton or linen, in plain weave—without any seams—for pillow cases—0.54m (21").

(b) Braids—many are tubular.

(c) Neckties—tubular knit fabrics.

(d) Knit fabrics, made on circular knitting machines.

See also *knitting, hose, circular knit*.

Tuck-stitch: A knitting stitch—intended to produce tuck-effect, in ribs, ridges, etc.

See also *knitting, lace*.

Tulle: A delicate kind of thin silk network fabric of a very open structure used for trimmings of ladies's dresses and also for wedding-veils and caps—0.91m (36"), 1.83m (72"), 2.74m (108").

See also *illusion, maline*.

Turkey carpets: A soft thick kind of carpet.

See also *carpet*.

Turkey-red dye: A fine durable red dye obtained from madder. Now prepared synthetically.

See also *dyes, natural dyes (vegetable dyes), mordant colours*.

Turkey-red oil: Sulphonated castor oil soap. A sulphonated resinolic acid soap. Still used in large quantities in dye houses and in fact a satisfactory substitute for this is still not found.

See also *soaps, soft-soap*.

Turkish towels:

- (1) Terry cloth—woven with border—white or coloured—single loop or double loops (each loop of 1 yarn).
- (2) Ribbed—ribbed surface—due to alternating terry and plain weaves.
- (3) Linen and cotton combined bath-towels.
- (4) Knit fabric with terry surface.

See also *terry cloth, towelling*.

Tussore silk: (Sars Tassara shuttle). A kind of dark fawn coloured silk generally made with silk fibres obtained from moths other than *Bombyx mori*.

See also *wild silks, silks, attacus, bombyx, antherae, pongee*.

Tweed: A kind of woollen twilled cloth, of various patterns, used for men's wear. Originally from Scotland.

Coarse, hand-spun, hand-woven, woollen cloth. Plain, twill, herringbone or check woven. Gunclub, Tooth-check, Tattersall are some typical designs. Donegal tweed has a characteristic colourful slub yarn.

(a) Imported fabric from Scotland—coarse, rough and soft—having colours suggesting Scotch-heather.

(See *Heather-mixture*).

(b) Domestic tweed—in imitation of imported fabric on powerlooms—woollen or mixtures.

(c) Shetland tweed—hand-woven in England and in U.S.—a kind of suiting having softer texture. Used for suits, coats, jackets, trousers, sportswear, etc.

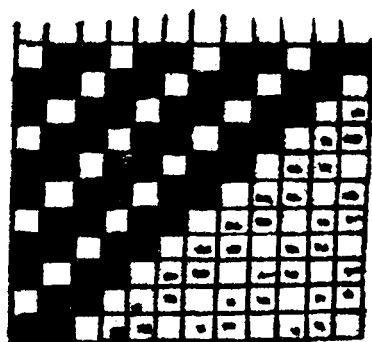
(d) Harris tweed—made by hand in Outer Hebrides off the Scottish coast.

Tweed derives the name from River Tweed in Scotland.

See also *heather mixture, harris-tweed*.

Twill (Weave): I. A woven fabric in which a warp is raised one thread and depressed 2 or more threads for the passage of weft—thus effecting a curious appearance of diagonal lines. The succession of diagonal lines traverse from selvage to selvage at an angle of 45°.

II. Twills are next in importance to plain cloth due to the wide range of application and variety of possible effects. Twills invariably form diagonal ribs in fabrics and these are due to the intervals at which the warp and weft are intersected—when 2 or more warp threads are passed over and under (one or more than one) weft thread in regular succession. When ribs form 45° angle, warp and weft threads per in. are about equal in number.



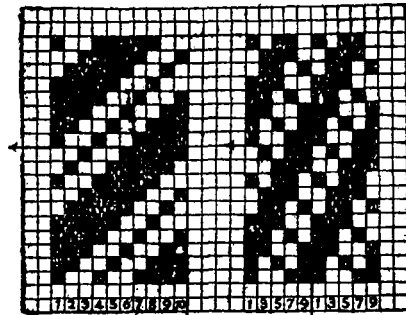
TWILL

III. Twills may be stout and serviceable cloths, though theoretically it would appear the weaving strain on the threads is necessarily irregular.

Twills are made in most kinds of cloths—silk, wool, cotton, etc.

Ordinary 3-leaf twill, Steep twill

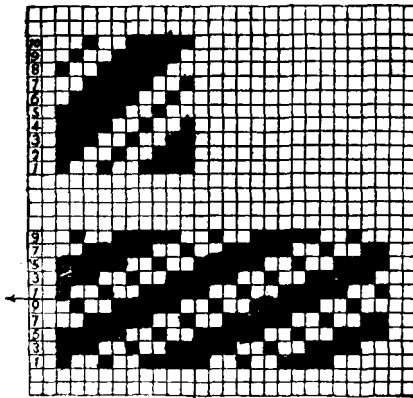
- 63' twill advances 2 picks for each end
- 70' twill advances 3 picks for each end
- 75' twill advances 4 picks for each end



UPRIGHT TWILL

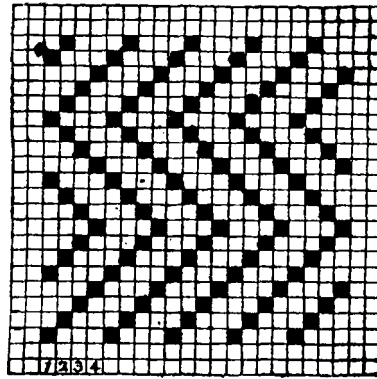
Reclining twill

- 27' twills—the weft floats over 2 ends
- 20' twills—the weft floats over 3 ends
- 15' twills—the weft floats over 4 ends



RECLINING TWILL

- Variations—
- Herringbone twill weave
 - Broken twill weave
 - Zigzag
 - Diamond
 - Diaper
 - Damask
 - Satin
 - Sateen



ZIGZAG

See also *weaves, weaving*.

Twine: A cord composed of 2 or more threads, twisted together. General—ply yarns of medium twist—single yarns with ply twist, in opposite direction.

Braider—a single stranded yarn (9.05mm diameter) from hard fibres.

See also *ropes, strand*.

Twist yarns: Twisting consists in twisting between the finger and thumb, the ends of new warp separately upon those of the old one—the remains of which are still in the eyes of shedding harness. The twisted portions adhere sufficiently to allow all being drawn through the eyes simultaneously. Upon whichever system the yarns have been spun it is necessary to either 2, 3, or multi-fold them. Then again for fancy twists it is necessary to be able to produce styles like loop, curl, etc. Twofold are done on flyer, cap and ring frames. Fancy twisters are almost universally done on ring frames.

Silk twisting or doubling—if 2 or 3 fold yarns are needed then, 2 or

more ends of the spun threads are wound together and then conveyed to the twisting frame for putting in the yarn the necessary twist for weaving. The process is similar to cotton or worsted industry and ring and flyer frames are used as desired. Expressed in turns of units per length.

- balanced.
- cable—each successive turn in opposite direction as S/Z/S.
- constant.
- corkscrew—giving corkscrew appearance.
- direction—S and Z twists.
- hard—excessive twisting.
- hawser—S/S/Z/ or Z/Z/S
- multiply.
- intwist.
- characteristic twisted yarns.

Characteristic for yarn-twists:

S and Z twists—Warp-yarns—Weft yarns — Grenadine — Organzine — Tram.

Crepe-twist-yarns, Rayon-slab-yarns, Ply yarns, Flake yarns, Nubby or seed yarns, Spiral yarns, Ratine yarns, (gimp, loop and ratine), Snarl yarns, Boucle yarns, Covered-core yarns, metal-wire yarns, Moire-twist yarns.

Grandrelle, Lisle-yarn, Chenille-yarn, Random-yarn, Lace-thread, etc.

See also *novelty yarns, spinning*.

Twistweave rug: Rugs with lightly twisted yarn pile, either in loops or cut on the surface.

See also, *rugs, piled fabrics*.

Two-toned: Contrast colour effects obtained by using warp of one colour and weft of contrast colour.

See also *denim, chambray, iridescent*.

Typewriter-ribbon fabric: Fine, cotton cloth from combed single yarns of long staple cotton. Finest cotton fabric made for making typewriter ribbons.

U

Ulster: A long and loose kind of overcoat, with a hood and belt—worn by both men and women.

Ultramarine: (Literally means beyond the seas). A most beautiful and durable sky-blue colour. So called because of its intense blue but more probably from Lapis Lazuli from which it is made and which is brought from beyond the seas (Asia).

See also *dyes*.

Umbrella fabric: A black, waterproofed cloth. *Taffeta*—twill or satin, strong, selvege-carded, or woven stripes. Cotton made waterproof or water repellent or of rayon, nylon, etc.

See also *waterproofing, taffeta*.

Under-clothing: Clothes worn under other outer garments. A coat for wearing in the house or one worn under the overcoat.

Under-coat: Underfur of a long-haired animal.

See also *fur*.

Unfinished (worsted): A fabric which has not undergone or which is not subjected to finishing processes, as *Grey goods*—unbleached cotton cloth, or grey cloth.

See also *grey goods*.

Upholstery fabric: In modern usage, materials used as furniture coverings, cushions, padding or stuffing for chairs, sofas or beds as also floor carpets and household furniture and curtains.

See also *upholstery-velvet, table-cover, padding, leather cloth, linoleum, carpets, matting*.

Upholstery velvet: (Velour). Draping fabric with short pile—mercerised cotton, heavier than velveteen for couch covers—1.27m (50").

See also *velour, upholstery fabric*.

Upholstery webbing: Narrow, plain woven jute banding for supporting springs under upholstered seats.

Upland cotton: American upland cotton.

See *cotton*.

V

Vacorep: (TM) Name for a patented process for recovery of cotton-waste.

Varnished cambric (Cloth): Varnishing with a liquid so as to give a glossy surface. A sticky substance which dries and forms a hard lustrous coating thus improving the appearance and permanence of fibrous surface.

See also *coated fabrics, cambric*.

Vat-dyes: (Indigo-dyeing) A most important method of dyeing, based on the fact that under the influence of reducing agent (substance capable of yielding nascent H) indigo-blue is changed to indigo-white, which is soluble in alkali—the solution thus obtained being called “A VAT”).

If textile materials are steeped in a clear yellowish solution of reduced indigo and then exposed to air or O₂ the indigo-white absorbed by the fibre is oxidized and reconverted to indigo-blue upon or within the fibre which thus becomes dyed blue (*this is the indigo-Vat dyeing method*).

Vat method is applicable to almost all fibres and the dyeing is fast.

See also *dyeing, indigo, miscellaneous colours*.

Vegetable dyes: Also called natural dyes. These include:

Vegetable:

(1) Madder, (2) Indigo, (3) Woad, (4) Saffron, (5) Safflower, (6) Weld, (7) Brazilwood, (8) Barwood, (9) Camwood, (10) Logwood, (11) the Fustics, (12) Orseille, (13) Cudbear, (14) Annatto (15) Turmeric, (16) Cutch, (17) Gambier (Malayan), (18) Quercitron, (19) Catechu, (20) Sapan-wood, (21) Peach, (22) Lima-wood, (23) Persian berries, etc.

Animal dyes:

(1) Tyrian purple, (2) Kermes, (3) Cochineal, (4) Lac, etc.

Direct cotton colours: Turmeric, Saffron, Annatto, Safflower. Indigo & Madder were the first vegetable dyes used.

See also *natural dyes, natural mordant colours*.

Vegetable fibres: These include seed-fibres, bast-fibres, leaf-fibres, Agave fibres, Musa fibres, coir, etc.

See also *fibres, vegetable fibres, each heading*.

Vegetable protein fibres: Fibres derived from vegetable proteins. Mostly these are wool substitutes.

See also *man-made fibres, regenerated protein fibres, synthetic fibres, ardil, azlon, vicara, zein*.

Veiling, Veils: A cloth or piece of other fabric used as means of concealing something, sometimes from the view. —The word chiefly means covering for the face and head—as worn by women. A curtain. Anything that hides an object. Veiling of the face by women is a practice among the Eastern Mohammedan races and also amongst the peoples who are under the influence of Islam.

Face-veil (Burkha): a long strip of muslin covering the whole of the face except eyes and reaching nearly to the feet. Cheaper Burkhas are made of coarse black crepe. In Europe—where although veiling once played an important role—has now assumed a mere apology of an ornamental piece of gauze, lace or net attached to the hat or bonnet and used as a protection against dust, light, winds, etc., rather than against ‘wolves’.

See also *tulle, maline, illusion*.

Velon (N): A synthetic fibre manufactured from the essential chemicals—vinyl chloride and vinylidene chloride. It is chiefly used in drapery and upholstery materials, shoe-fabric, and industrial clothing.

- (i) monofilaments woven into fabrics
- (ii) films for aprons
- (iii) washable upholstery material—plain or embossed patterns.

See also *synthetic fibres, saran, man-made fibres, fibres*.

Veloures: Term for piled fabrics:

- (a) Drapery fabric—upholstery fabric (See heading).

(b) Wool veloure—napped fabric for coats.

(c) Hat felt of fur fibres and napped.

Soft, velvety cloth of wool, rayon or blends; having piled surface on one side and satin or plain weave on the other. Used for women's coats, draperies, and upholstery. This term veloure and plush are often used interchangeably for the same fabric.

See also *plush, duvety, velvet, piled fabrics*.

Velure: A velvet—a silk or plush pad for smoothening or giving lustre to silk hats.

Veloutine: A corded fabric of merino and fancy wool.

Velvet: A cloth with a deep furlike surface. A cloth made from silk with a close, shapy pile. A silken textile fabric having a short dense piled surface. The peculiar properties of velvet being the splendid yet softened depth of dye colour it exhibits, it is immediately conspicuous as a fit material for royal or state ceremonies. Italian velvets were the most magnificent, most effectively treated for ornamentation by either varying colours of pile or length of pile—double pile or by brocading with plain uncut pile with a gold tissue ground.

—A broad term for all warp-piled fabrics except plush and terry.

2 Warps—2 wefts—1 extra which makes the pile.

2 fabrics woven double—face to face—and cut apart while still on the loom which moves to and fro, like a shuttle.

(a) Chiffon-velvet—all silk—1.02m (40").

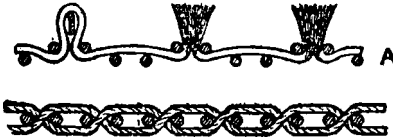
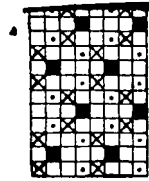
(b) Costume-velvet—wide velveteen—thick pile—highly mercerised—0.91m (36").

(c) Lyon's-velvet—V shaped pile—0.45m (18")—0.91m (36").

(d) Nylon—same as silk or rayon.

(e) Panne—(See heading).

(f) Rayon-velvet—also called transparent velvet—may be with rayon with silk or nylon or acetate—0.99m (39").



VELVET

Piled carpets (velvet rugs): the foundation is a warp of strong (cotton, woollen, silk, hemp) threads—the number of which is regulated by the breadth and fine or coarse quality of its pile. Short lengths of coloured fibres (wool, silk, camel-hair or goat-hair) are knotted onto each warp thread in such a manner that the two ends of each twist or tuft of the coloured yarn project in front.

Across the width of the warp and above the range of these tufts—a weft thread is made to run. Then another line of tufts is knotted and again above them, another weft thread is run across the warp and so on. These rows of tufts and wefts, as made, are then compressed together by a comblike instrument, thus producing a compact textile with tufted surface or pile. The projecting tufts are then carefully clipped so as to have an even surface. The traditional knots for making piled fabrics are:

- (1) Chiordes or Turkish knot.
- (2) Sehna or Persian knot.

Warp-piled fabrics: unlike the normal fabrics where warp and weft threads are used in longitudinal and transverse parallel lines, in piled fabrics the portions of weft and warp are made to assume a vertical position which is responsible for the tufts or piled appearance.

In this manner the fabrics are known as:

- (1) Warp-piled fabrics—velvets and plushes.

(2) **Weft-piled fabrics**—velveteen and chenille.

Warp-piled fabrics have at least 2 series of warp threads to one of weft. Both velvets and plushes are single and double woven—both ground and pile warps are intersected with weft in velvets but at intervals 2 or 3 picks of pile threads are lifted over at the outer extremity.

See also *velveteen, weaving (warp-pile), cut-pile fabrics, carpets, rugs, plushes.*

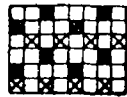
Velveteen: A cotton cloth made in imitation of velvets. It is a kind of Fustian made of twilled cotton with a pile of the same material; woven singly with weft forming pile. A kind of velvet made of cotton or cotton and silk mixed.

A kind of fustian having a rib of velvet pile alternating with plain depressions.

It is a weft-piled fabric called Fustian, in velveteen weave, made of cotton or rayon. A fabric having an all over, short, closely set pile woven flat with 2 sets of weft yarns—one weaving with warp (the ground weave) while the other weaves into warp at intervals (as satin weave) and then floats over a number of the warp yarns. These floating weft yarns are cut and brushed to form a pile. Uses—dresses, coats, suits, etc.

Weft-piled fabrics: Here there are 2 series of weft threads—one of which is made to intersect with warp to form a firm ground structure while the other though bound to the ground structure at intervals, is cut and made to rise vertically so that the fibres open out.

See also *weaving, chenille, velvets, piled fabrics.*



VELVETEEN

Venetian cloth: Of satin weave. Cotton or woollen. Smooth, strong, sleek fabric—made with warp-faced satin weave and napped, and pressed.

(a) Cotton—with mercerised yarn—2 ply is like satin but heavier and more lustrous. White or coloured.

With mercerised cotton—heavier than satin, warp-faced satin weave. Used for curtains, linings, drapery—0.91m (36").

(b) Velveteen covert—woollen suiting or coating, woven steep twill, slightly napped. Used for suits, coats and dress-suits, etc.

Vicara: A synthetic fibre made from zein protein and resembling wool in its properties.

(A synthetic fibre manufactured by Virginia Carolina Corp. of America).

See also *synthetic fibres, man-made fibres, wool substitutes, regenerated protein fibres.*

Vicuna: One of the two species of the South American genus representative of camel tribe (which also includes llama, Guanaco, Alpaca).

Vicuna differs from Guanaco by its short head. The general colour of woolly coat of vicuna is orange-red. Vicuna wool is extremely delicate, soft and highly valued for weaving.

Vicuna fleece is very fine and finer than any other wool bearing animal-hair, less than 2/1000th" thick which is less than half as thick as finest sheep. Used especially in high grade worsted.

See also *animal fibres, fibres, furs, Llama, alpaca, guanaco.*

Vinyon (-M fibre) } A synthetic fibre
 ,, (-HH staple) } manufactured
 ,, (-N type): } from the basic
 chemicals vinyl chloride and acrylonitrile. A synthetic fibre composed of copolymers of these chemicals. This fibre is chiefly employed in making industrial fabrics and elastic garments.

See also *synthetic fibres, dynel, man-made fibres, fibres.*

Virgin wool: Any wool which has not been manufactured into fabric.

See *wool.*

Viscose rayon: The most important of the three processes, used in the manufacture of rayon, or regenerated cellulose fibres. The name viscose is given to all fibres manufactured by this process.

Chief source material is wood pulp—manufactured fibres are either filaments or staples of suitable spinnable lengths, and are smooth or crimped.

See also *rayon, regenerated cellulose fibres, artificial fibres, fibres, acetate rayon, cuprammonium, chardonnet silk, artificial silk.*

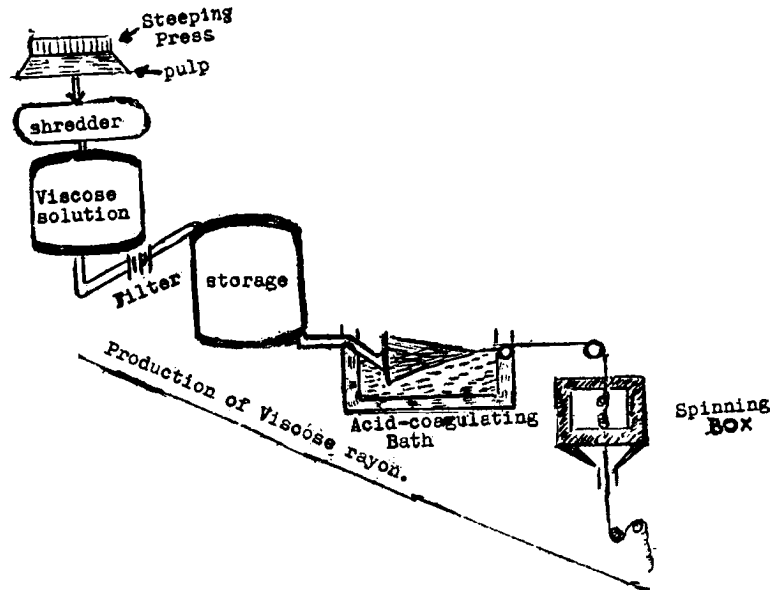
Viyella flannel: (55% merino, 45% long staple cotton). Solid colours, checks or plaids for shirts and dresses. Twill woven—0.91m (36").

See also *blends, mixtures.*

Voile: A thin cotton (or woollen) fabric used for dresses—especially saris worn by women.

—A thin, transparent, plain woven fabric.

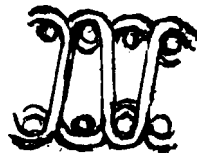
(a) Cotton—2 ply combed yarn, hard twisted, for dresses, blouses and saris—0.79m (31")—1.02m (40").



VISCOSE RAYON

V-shaped pile: A piled fabric with pile diverted which appears like V.

See also *velvet, Lyon's velvet, W-shaped pile.*



V-SHAPED PILE

- (b) Nylon—very transparent.
- (c) Rayon—very transparent—0.99m (39")—1.07m (42").
- (d) Silk—fine, sheer, used for nun's veiling.
- (e) Wool—thin, smooth, wiry, worsted yarn, highly twisted—1.37m (54").
- (f) Chiffon-voile—grenadine yarn and twisted single yarns, wound together.

Uses—women's lingeries, saris, blouses, etc.

W

Waffle cloth: (See Honeycomb weave). Wool-fabric with characteristic honeycomb weave.

Wale: A raised streak left by a stripe—a ridge on the surface of cloth.

Warp: In weaving which is interlacing at right angles of 2 or more flexible materials—the longitudinal or lengthwise members are called warp while transverse members are wefts. Literally, warp means to turn—to twist—to be twisted out of straight position.

See also *weft, weaving*.

Warping: The chief function of warping is to provide a sufficient number of parallel threads for a web all of equal length and to retain their parallelism. The number of longitudinal threads in a web vary according to closeness and breadth. There are two types of warper's system:

- (a) *Mill Warping:* The oldest type still in extensive use.
- (b) *Beam Warping:* Extensively used in cotton trade and Sectional Warping employed for coloured threads.

In Beam warping the creels have a capacity of nearly 600 bobbins and are V shaped in plane. On this V the bobbins are arranged in rows or tiers of nearly 20 in row behind row. The threads are drawn separately on a series of rollers and then to warp beams, which rest on the surface of a drum. As the drum rotates, the threads are drawn from bobbins and wrapped in even coils upon the beam.

(1) *Warp Winding:* Consists in transferring yarns from ring spools and hanks to warpers, bobbins and cheeses.

(2) *Sectional Warping:* Chiefly employed for coloured threads, the peculiarity being in contracting the threads to form a ribbon.

(3) *Yorkshire Dressing:* Used to make striped warps from balled warps

which have been dyed in different colours.

See also *weaving, weft-winding*.

Warp-knit fabric: Intricate process on flat machine—close and less elastic than weft-knit—from any fibre or mixture for gloves, novelty knits, etc. See also *tricot*.

Warp-piled fabric: They have at least 2 series of warp threads to 1 of weft. These are more varied in structure than weft-piled fabrics; are plain or figured; surface-cut or/and looped.

See also *velvet, plushes, double plushes, figured warp-piled fabrics, Brussels carpet*.



WARP-PILED FABRIC

Warp or yarn print: Printing design on warp before weaving—this gives shadow designs.

See *ingrain*.

Wastes: (Cotton, cloth, wool, rayon, nylon, silk). In textile industry, wastes are bound to occur as when the machines are not working properly, a certain amount of waste is bound to be left.

In the textile industry the wastes are:

Cotton: Cotton waste, ginning waste, linters, oily waste, combers waste, spun yarn waste, woven cut pieces, etc.

Silk: Silk waste, silk spinning wastes, etc.

Wool: Wool waste, spinning waste, recoverable wool.

In an industry handling so many materials every day wastes are bound to occur and are quite an economical problem. The only economical considerations are how much of these wastes could be utilised economically.

Production Waste	
Fibres	Machinery
<i>Cotton</i>	
Ginning Linters Fly Cotton waste	Combers waste Oily waste Yarn waste Cut pieces
Recovery—ref. to Vacorep.	
<i>Wool</i>	
Selection Short staples	Machine waste Chemical treatment waste Re-usable clothing waste
Recovery — ref. to <i>wool-wastes, reprocessed wool.</i>	
<i>Silk</i>	
Waste silk of broken cocoons	Machine waste
Recovery used in spun silk—cleaning of fibres and using them in wild-silks.	

See also *vacovep, reused wool, wild-silks, reprocessed wool.*

Waterproofing (Water - repellency);
Treating fabrics to withstand water. Proofing against water.

—The act of making fabrics impervious to water with use of substances like India-rubber, etc. Method of impregnating or coating fabrics with substances like oil, wax, rubber resins, etc.

- (a) *Water-proof*: fabric wherein the pores, the open spaces between warp and weft yarns and also between fibres are filled with appropriate substances and which results in having a continuous surface of the fabric and with very little air-permeability.
- (b) *Water-repellent fabric*: wherein fibres are usually coated with a hydrophobic substance and whose pores are not filled in the course of the treatment. These are therefore quite permeable to air and water-vapour.

	<i>Water-proof</i>	<i>Water-repellent</i>
Pores	filled	not filled
Air-permeability	small or nil	large
Water vapour permeability	small or not	large
Characteristics	resistant to passage of water even under hydrostatic head	resistant to water and rain and spreading of water but permits water under hydrostatic head

Natural fibres are hydrophylic and can absorb water and therefore are not water-repellent; the same is the case with regenerated fibres like rayons, etc., or even protein fibres. And so these can't be used as wet-weather-wear, if external water-repellent finishes are not given.

Synthetic fibres, on the other hand, are hydrophobic and have lower or nil water absorbency or water absorbing capacity. The fabrics of these fibres have the inherent capacity to withstand wet-weather-wear and these need no treatments.

This factor achieved considerable importance in World War II, when a serious consideration had to be given to this factor and tests were made which showed quite interesting results. As a result of these wool as outer great coat in the Army uniform was given up and was substituted by light weight cotton fabric with a water-repellent finish.

The unique ability of cotton fabrics, swelling under water and thereby closing the interstices, results in making the garment water-repellent, after initial wetting and yet

this cloth remains air-permeable, when dry.

The Shirley Institute undertook this experiment, which ultimately resulted in the development of 'Shirley-cloth' of soft yarns with high thread count, in Oxford weave.

See also *aridex*, *moisture regain*, *Shirley cloth*, *Mackintosh*, *oiled cloth*, *Byrd's cloth*.

Weaves, Weaving: Basic weaves:

- (1) Plain—plain (muslin, taffeta)
 - „ —rib (poplin)
 - „ —basket (monk's cloth)
- (2) Twill—2-2 (*serge*)
 - „ —2-1 (*drill*)
 - „ —herringbone
- (3) Satin—warp-face (satin fabrics)
 - „ —weft-face (*sateen*)

- (4) Figures—small geometric patterns (*Bird's eye*, *Huck*)
 - Jacquards—(*brocade damask* etc.)
 - Lappet — warp-wise loom embroidery
 - Clipped dot

- (5) Pile—uncut-frise—looped (*terry*)
 - cut-warp (*velvet*)
 - cut-weft (*corduroy*)

- (6) Miscellaneous—leno—*marquissette*
 - double cloth
 - novelty weaves

All schemes of weaving are based on a few elementary principles, as shown in the following 4 divisions.

(For figures refer to each heading)

WEAVES

Divisions

1		3	4
1 warp 1 weft	2 warp 1 weft or 2 weft 1 warp	Piled-fabric —Warp-piled —Weft-piled	Twisted warp Gauze Leno Lappet, etc.
Both remaining parallel in finished article	Clothes are backed, reversed and figured		

Divn. I—1 warp and 1 weft. Both remain parallel in finished article—Plain cloth, Repp-cloth.

Divn. II—(a) 2 warp and 1 weft or 2 wefts and 1 warp—Twill.

(a) Cloths are backed, reversed, figured with extra material.

- Twills —2/2
- „ —1/3
- Upright Twill
- Reclining Twill
- Fancy Twill
- Zigzag
- Diamond
- Diaper
- Satin
- Sateen

(b) Two or more distinct fabrics built simultaneously from 2 or more warps and wefts—as in 2, 3 and multi-ply cloth.

(c) Fabric built by 2 or more warps and weft in such a manner as would result in only one texture.

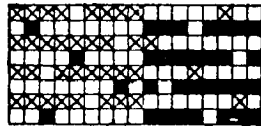
Tapestry

Divn. III—Piled fabric in which a portion of warp or weft rises vertically from base. This gives piled or lifted appearance—

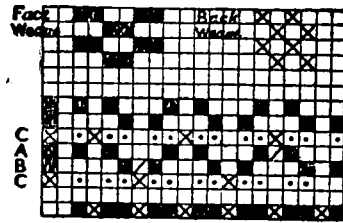
- Velvet—(a) Warp-piled fabric.
- Chenille—(b) Weft-piled fabric.
- Figure warp-piled fabric—Brussels Carpet.
- Warp-piled fabric—velvets, plushes—double-plushes, etc.

Divn. IV—Embraces all fabrics in which one portion of warp is twisted (partially or wholly) round another portion—as in gauze, Lappet cloths, etc.

In this group are included fabrics in which warp threads intertwist among themselves, producing a result in between ordinary weave and lace.



WEFT REVERSIBLE FABRIC



COMPOUND FABRIC

Weaving: Weaving is interlacing, at right angles, two or more series of flexible materials, the lengthwise members being called warp while the crosswise is called weft. Loose strands of yarn are made into cloth in very much the same manner as darning of socks.

Early history—man was a weaver from as early as the stone-age. (It is however interesting to note that man had started weaving even before spinning.)

From earliest times, there are three basic weaves and they have re-

mained substantially the same while all the latest methods are mere modifications of these three basic weaves.

The basic weaves are: (1) plain, (2) twill, and (3) satin.

In all these warp yarns run lengthwise while weft yarns run crosswise.

Weaving is interlacing of warp and weft to construct fabric.

Equipments—handloom, drawlooms, Jacquard machines, harness, power-looms, automatic looms; attachments to these are: shuttles, reed and winding beams.

Types of looms—plain, box, double, pile, Jacquard, axminster, velvet, and wilton.

Loom attachments—dobbie, lappet, swivel, leno, and pile.

Characteristic weaves as per pattern—for *plain woven fabrics*—(a) plain, (b) rib, and (c) basket

for *fabrics woven with floating yarns*—twill, satin, bedford cord, pique, huckaback, honey-comb, bird's eye, lappet, swivel, corduroy, and velveteen weaves

for *fabrics with woven-in-pile*—velvet, terry, axminster, and tapestry or velvet weaves

for *back-fabrics*—warp-backed, weft-backed and double weaves

for *Jacquard-weave*—Jacquard-pattern-fabrics

for *Leno fabrics*—leno weaves.

(*Topic Weaves should be read with this*).

Web: Partly woven cloth—that which is woven—a warp in the loom.

Webbing: A narrow woven fabric of cotton, jute, linen, etc.

Weft (Woof): The transverse threads in weaving—interlacing at right angles with longitudinal warp. Weft are the threads woven into and crossing the warp.

Weft winding: Weft yarns receive almost invariably similar treatments as warp threads (sometimes none)—caps and ring spools pass directly to looms when suitable in dimensions.

See also *warp weaving*.

Weft-piled fabrics: 2 series of weft threads, one intersecting with warp to form a firm ground texture—the other bound to ground—is lifted up at regular intervals, which gives the tufted or piled appearance.

See also *velveteen*, *chenille*.

Weft-knit fabrics: Quite distinct from warp-knit and constructed by similar knitting process where a broken yarn causes a runner—Jersey type.

See also *jersey*.

Weight of cloth: Divided into light, medium and heavy.

Weighted silk: Chemical salts used in dyeing and finishing to increase weight.

See also *weighting*.

Weighting: Compensates for the loss of weight in degumming and is used in case of silk. Fabric to be weighted is placed in the weighting bath and kept there for several hours. Fabric absorbs about 10 per cent of the 'weight' in each bath. If more is required a second bath is generally given.

Silk weighting: In degumming of silk the loss of weight is about 25 per cent—since silk is sold on weight something about this loss must be done and compounds are used for this purpose since these compounds are tenaciously held by the fibre.

Cotton: Common practice and weighting agent is $MgSO_4$ (Epsom Salts) Na_2SO_4 , zinc or calcium chloride, etc.

See also *weighted silk*, *finishing*.

Welt: Hem or garter top in hose.

See also *hose*.

Wetting agent: (a) Chemicals which help the fibre to be wetted quickly.

(b) Alkyl-aryl-sulphonates are much better wetting agents.

(It is wonderful to note that kerosene is the quickest wetting agent as yet known).

See also *soaps*, *syndets*, *scouring*, *detergents*.

Whip cord: Twill weave of wool, cotton or rayon. Fabric with the heavi-

est rib of all standard twilled fabrics. Steep prominent twill usually running from left to right. Cotton fabric with back napped. Uses—trousers, riding suits, sports-wear.

See *weaving*.

White-silk cotton: *Bombax Malabaricum*.

Silk-cotton-tree

Ceiba-floss (Kapok)

See also *seed fibres*, *vegetable fibres*, *fibres*.

Whitening agents: Bleaching agents. Bleaching liquors.

See also *optical bleaching agents*, *bleaching*.

Wicking (Wick): The twisted threads of cotton (or other substance) in a candle or lamp which draw up the inflammable liquid to a flame.

Wig: An artificial covering of hair for the head (worn to conceal baldness and also for fashion's sake). Still worn by Speakers and Judges.

Wigan: A stiff canvas-like fabric for stiffening shirts, borders, etc.

Name derived from town Wigan where the stiff canvas-like cloth was made for shirt lining. Now it is commonly applied to medium or heavy makes of calico.

Wild silks: True-silk against wild-silk.

Besides *Bombyx mori* which gives the true silk, there are other species (at least six) which are also mulberry feeding but which differ from *Bombyx mori*. All these yield reelable cocoons which are the wild-silks.

See also *Bombyx*, *Anthaerae*, *Attacus*, *tussore*, *silk-mfg*.

Wilton rug: (First made in Wilton—England). Here pile-warp beam is replaced by a creel in order that each thread of pile may be wound upon a bobbin and separately tensioned. This is essential as in weaving and design it is probable that no two threads of pile will be required in equal lengths.

See also *Brussels carpet*, *tapestry carpets*.

Wilton carpet: *Figured warp-piled-carpets*—Brussels Carpet.

By providing several sets of pile threads no two of which are similar in colour. If 5 sets are available, 1/5th of all the pile warp must be lifted over each wire—but any colour at any place.

Wire: Thread of metal.

Wire gauze: A kind of stiff close fabric made of fine wire.

Wool: Fibres (woollen and worsted mfg.)

The soft curly hair of sheep or other animals. Short thick hair, or any light fleecy substance. Wool is a modified form of hair and is distinguished by its slender, soft, wavy or curly structure.

Wool is the most important textile fibre owing to care with which it is spun into yarn and woven into fabrics, as also the absolute comfort derived from woollen clothing.

Amongst the best varieties merino wool is undoubtedly the finest.

The following are the more important wool producing countries—Australia, South Africa, Spain, Britain, U.S.A.

Physical and chemical characteristics of wool:

The chief difference between wool and hair is the fineness, softness, and delicate wavy fibres combined with a highly serrated surface. This serrated surface of the wool fibre is of considerable commercial importance since it markedly aids in Felting—a peculiar property upon which depends a number of applications.

Under influence of pressure and moisture (and aided by acids or alkalis) masses of wool thoroughly mat together by mutual interlocking of fibres—(a peculiar property of wool). In fine wool serrations are numerous, acute pointed and distinct, about 2700 per 0.03m (inch) in Merino wool, while they are as low as 500 per 0.03m (inch) in coarser fibres.

(2) Other distinct characters are—uniformity and strength and absence of weak or tender portions in fibres. (See Kemp or Kempy wool).

(3) Softness to feel and an elasticity which is distinct in wool only.

(4) Wool has a very complex physical structure and consists of (a) wool-yolk—a natural impurity (b) Wool-fat (c) Wool-structure proper.

Average composition:

Moisture—4.24%
Yolk—12.47%
Dirt—3.24%
Wool fibre—15.72%

Simple tepid water with Na or K salt can remove this.

Wool-yolk: A natural impurity and is truly a skin product and protects the fibre proper.

Wool-fat: Quite independent of fibrous substance but necessary. Its absence causes considerable damage to fibre which loses its plastic and elastic characters.

Natural wool-fat (called Lanoline) has the following average chemical composition:

Wool-fat composition:

C —50.8	} Probable formula—
H ₂ —7.2	
N ₂ —18.5	
O ₂ —21.2	
S —2.3	

$C_{42}H_{157}N_5SO_{15}$

Burning—when burnt, wool burns with a characteristic odour (smell of burning of hair) since it resolves into ammonia gas.

The wool of commerce comes on the market in the form fleece-wool. This fleece-wool is usually “in the grease” (or unwashed) or in washed and scoured state.

A skilful shearer can clip the fleece from a sheep in an unbroken continuous length retaining the form and relative position of hairs. In this unbroken condition, each fleece is sorted up by itself and tied. This greatly facilitates sorting and stapling.

Wool-Classing: One of the most important operations. The fleece taken from the sheep are skirted and trimmed on a table and then classed in 56s, 64s, 70s, 80s, 90s, etc., according to their fineness—the numbers approximately identical with those of worsted comb in which they will spin.

Processing of wool: for subsequent operations.

Wool thus has to undergo the following processes.

Sequence in Wool-preparing:

- sheep-washing
- shearing
- wool-classing
- wool-sorting
- wool-scouring
- wool-drying
- wool-teasing
- burring

<i>Woollen manu- facture</i>	<i>Worsted manu- facture</i>
willowing	preparing
blending	back-washing
oiling	combing
teasing	drawing
carding (2 or 3 operations)	carding
condensing	combing
roving	drawing (straightening)
spinning (on Mules)	doubling and drafting
yarns	spinning
weaving	doubling and twisting
finishing	yarns weaving finishing

See also *animal fibres, fibres*.

Wool-printing or printing of wool: In general, this is done on the same lines as cotton, and most of the colours used are the same and the operations like steaming, washing, and soaping are also identical.

However, unlike cotton, wool has to be specially prepared, after bleaching, if full tinctorial value of colour is desired.

There are two methods of preparation as follows:

- 1) Chlorination of wool:
 Woollen fabrics are passed through bl. powder solution
 Well squeezed
 Direct pass through dilute H_2SO_4 or HCl
 Squeezed again
 Well washed in water
 Dried.
- 2) Preparation of stannic acid on fibre:
 Cloth padded with stannate of soda
 Well squeezed
 Passed through dil. H_2SO_4
 Well washed
 Dried.

Although, alizarine, mordant colours and dyewood extracts can be used on wool, vast majority of designs are done by means of acid dye-stuffs and basic colours, since for both of these, the fibre possesses a natural affinity.

In most cases the colours are simply dissolved in a little acetic and citric acids thickened with gum and straightway printed (without any further addition).

The addition of tannic acid: This can be made to considerably increase the fastness of the dyes. Mordant colours like logwood black are also applied as usual. The printing is exactly like that of cotton. It is however advantageous to have the roller engraving rather deeper, the blanket as soft as possible and the dyeing effected very gently.

After printing, the cloth is moist steamed.

Too little moisture—the colour lacks strength and brilliancy.

Too much moisture—the colours run.

After steaming, the goods are washed with plenty of water. Then dried and finished with little glycerine or some waxy preparation.

Discharges may be obtained easily on wool dyed in acid-dyestuffs by stannous chloride and basic colours for colour effects and hydrosulphite for whites.

See also *printing*.

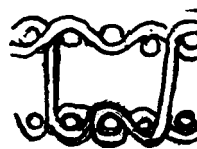
Wrinkle-resistance: A finishing treatment that has to be given to some fabrics to prevent these from wrinkling. The inherent property of certain fibres, especially hydrophylic, is to absorb moisture from the surroundings. This naturally causes the fibres to swell which ultimately results in disturbing the dimensional stability of the fabrics. Cotton fabrics shrink which also produce ridges and furrows on the surface while in case of wool, distinct wrinkles are observed. To prevent these, certain chemical treatments have to be given to such fabrics which prevent or minimize such tendencies.

See also *finishing (special finishes), shrinkage control, sanforized, tumbled, dimensional stability, water*

repellency, serviceability of fabrics, resiliency, permanent set, anti-crease.

W-shaped pile: Used in case of transparent velvets and some grades of corduroy when pile ends are more closely woven or anchored than in case of V-shaped pile.

See also *piled fabrics, V-shaped pile.*



W-SHAPED PILE

X

X-51: (TM) An acrylic fibre in continuous filament and crimped. Bulky, light-weight with a soft feel. Used for blankets, pile type fabrics. Fabric

with a good chemical resistance.

See also *synthetic fibres, dynel, acrilan, fibres.*

Y

Yard-goods or Yardage: Cloth sold by yard measure as against garments or rugs, blankets, etc.

Yarn: Name given to any textile fibre when prepared in spinning process for being woven into fabric. Yarn is the most diverse description and its value varies according to its lustre, bleaching, dyeing properties, its fineness, strength, elasticity, uniformity of diameter, smoothness, suppleness, and natural colour.

Yarns can be single, folded or fancy or twisted to right or warp way; twisted to left or weft way.

Single yarns are fibrous matter twisted together in spinning.

Cotton yarn is dull, soft, pliable and of moderate strength and elasticity.

Cotton waste yarn of low-counts is of two varieties.

Linen yarn is of 2 varieties—line and tow—both are stiff, rough and are elastic.

If spun wet, they are compact, smooth, brighter than when dry spun. Both bleach pure white and become lustrous and soft.

Woollen yarn is soft, spongy, hairy, elastic, moderately strong and possesses felting properties. Bleaches indifferently but dyes easily.

Woollen waste yarns are several kinds such as shoddy, mungo, extract.

Worsted yarn from combed wool, has uniform diameter, lustre, and are

smooth, very elastic and strong.

Silk is made into net, spun and noils yarns. Net-silk gives organzine and tram. For their diameter both are the strongest, most elastic textile threads but organzine is hard twisted for warp while tram is slight twisted for weft.

Spun silk is less lustrous and elastic.

Mixed yarn is obtained by mixing and spinning different fibres.

Folded yarns are made to impart increased strength, elasticity and smoothness and are glazed or unglazed for special purposes like lace-making, hosiery, etc.

Fancy yarn is made by twisting together threads of different materials of different counts, colour, etc., and various names are given in commerce:

Grandrelle, Mock-Grandrelle, Flaked-yarns, Knickerbocker yarns, Cork-screw yarns, Gimp yarns, Curled yarns, etc.

See also *spinning, twist yarns (yarn-twists).*

Yarn count: Count from single yarn are expressed differently.

Folded yarn counts are expressed as number of threads twisted together—such as:

$2 \times 50s - 3 \times 60s$ — which indicates 2 threads of 50s, etc.

Yarn-numbering:

Asbestos —100 yds. length per lb. Av.

Cotton	—(768.04m) hanks of 840 yds. per lb. Av.	Woollen (cut)—300 yds. cut per lb. Av.
Glass	—(91.44m) 100 yds. length per lb. Av.	Woollen (run)—(1462.8m) 1600 yds. hank per lb. Av.
Jute	—(9547.01m) 14,400 yds. of yarns per lb. Av.	Worsted (type)—No. of 1000s of yds. per lb. Av.
Linen	—(274.32m) 300 yds. hanks or lea per lb. Av.	Worsted (hank)—(493.77m) 560 yds. hanks per lb. Av.
Rayon	—Gms. per 9000 m-length.	See also <i>count, denier, tex.</i>
Silk (raw)	—Gms. per 9000 m-length.	Yuzen process: Dyeing by Yuzen process (practised in Japan) is an innovation of modern times. The design is painted on the fabric and afterwards steamed and ultimately fixed by a secret process.
Silk (spun)	—840 yds cut per lb. Av.	See also <i>habutai, pongee, dyeing.</i>

Z

Z-twist: Direction of twist in the yarns or cords, appearing like the letter Z. See also *S-twist, twist-yarns.*



S AND Z TWISTS

Zein: A protein found in the Indian corn. Synthetic fibres manufactured from zein-proteins. Vicara-fibre (manufactured by Virginia Carolina Corp.) is a fibre made from zein-protein.

See also *vegetable protein fibres, re-generated protein fibres, man-made fibres, fibres, vicara.*

Zephyr: Thin, light, worsted or woollen yarn. A close fitting jersey or under garment made of this yarn. Any light and fine cloth. A thin, finely spun woollen cloth for women's gowns.

Zibelin:

- of wool, and satin weave
- a sleek, lustrous, velvety, soft fabric
- heavy woollen coating with long shaggy nap in one direction... 1.30m (51")
- name of a small fur-bearing animal in Siberia (a member of Sable family).

See also *satin weave, fur.*

Zinc-chloride solution: Used for dissolving cellulose, in substantially the same manner as cuprammonium solution. 50 per cent solution of ZnCl₂ in alcohol dissolves cellulose.

See also *cuprammonium process, cellulose.*