

FLAX. The terms flax or lint (Ger. *Flachs*, Fr. *lin*, Lat. *linum*) are employed at once to denote the fibre so called, and the plant from which it is prepared. The flax plant (*Linum usitatissimum*) belongs to the natural order *Linaceae*, and, like most plants which have been long under cultivation, it possesses numerous varieties, while its origin is doubtful. As cultivated it is an annual with an erect stalk rising to a height of from 20 to 40 in., with alternate, sessile, narrowly lance-shaped leaves, branching only at the top, each branch or branchlet ending in a bright blue flower. The flowers are regular and symmetrical, having five sepals, tapering to a point and hairy on the margin, five petals which speedily fall, ten stamens, and a pistil bearing five distinct styles. The fruit or boll is round, containing five cells, each of which is again divided into two, thus forming ten divisions, each of which contains a single seed. The seeds of the flax plant, well known as linseed, are heavy, smooth, glossy and of a bright greenish-brown colour. They are oval in section, but their maximum contour represents closely that of a pear with the stalk removed. The contents are of an oily nature, and when liquefied are of great commercial value.

The earliest cultivated flax was *Linum angustifolium*, a smaller plant with fewer and narrower leaves than *L. usitatissimum*, and usually perennial. This is known to have been cultivated by the inhabitants of the Swiss lake-dwellings, and is found wild in south and west Europe (including England), North Africa, and western Asia. The annual flax (*L. usitatissimum*) has been cultivated for at least four or five thousand years in Mesopotamia, Assyria and Egypt, and is wild in the districts included between the Persian Gulf, the Caspian Sea and the Black Sea. This annual flax appears to have been introduced into the north of Europe by the Finns, afterwards into the west of Europe by the western Aryans, and perhaps here and there by the Phoenicians; lastly, into Hindustan by the eastern Aryans after their separation from the European Aryans. (De Candolle, *Origin of Cultivated Plants*.)

The cultivation and preparation of flax are among the most ancient of all textile industries, very distinct traces of their

existence during the stone age being preserved to the present day. "The use of flax," says Ferdinand Keller (*Lake Dwellings of Switzerland*, translated by J. E. Lee), "reaches back to the very earliest periods of civilization, and it was most extensively and variously applied in the lake-dwellings, even in those of the stone period. But of the mode in which it was planted, steeped, heckled, cleansed and generally prepared for use, we can form no idea any more than we can of the mode or tools employed by the settlers in its cultivation. . . . Rough or unworked flax is found in the lake-dwellings made into bundles, or what are technically called heads, and, as much attention was given to this last operation, it was perfectly clean and ready for use." As to its applications at this early period, Keller remarks: "Flax was the material for making lines and nets for fishing and catching wild animals, cords for carrying the earthenware vessels and other heavy objects; in fact, one can hardly imagine how



FIG. 1.—Flax Plant (*Linum usitatissimum*).

navigation could be carried on, or the lake-dwellings themselves be erected, without the use of ropes and cords; and the erection of memorial stones (menhirs, dolmens), at whichever era, and to whatever people these monuments may belong, would be altogether impracticable without the use of strong ropes."

Manufacture.—That flax was extensively cultivated and was regarded as of much importance at a very early period in the world's history there is abundant testimony. Especially in ancient Egypt the fibre occupied a most important place, linen having been there not only generally worn by all classes, but it was the only material the priestly order was permitted to wear, while it was most extensively used as wrappings for embalmed bodies and for general purposes. In the Old Testament we are told that Pharaoh arrayed Joseph "in vestures of fine linen" (Gen. xlii. 42), and among the plagues of Egypt that of hail destroyed the flax and barley crops, "for the barley was in the ear, and the flax was balled" (Exod. ix. 31). Further, numerous pictorial representations of flax culture and preparation exist to the present day on the walls of tombs and in Egypt. Sir J. G. Wilkinson in his description of ancient Egypt shows clearly the great antiquity of the ordinary processes of preparing flax. "At Beni Hassan," he says, "the mode of cultivating the plant, in the same square beds now met with throughout Egypt (much resembling our salt pans), the process of beating the stalks and making them into ropes, and the manufacture of a piece of cloth are distinctly pointed out." The preparation of the fibre as conducted in Egypt is illustrated by Pliny, who says: "The stalks themselves are immersed in water, warmed by the heat of the sun, and are kept down by weights placed upon

them, for nothing is lighter than flax. The membrane, or rind, becoming loose is a sign of their being sufficiently macerated. They are then taken out and repeatedly turned over in the sun until perfectly dried, and afterwards beaten by mallets on stone slabs. That which is nearest the rind is called *stupa* ['tow'], inferior to the inner fibres, and fit only for the wicks of lamps. It is combed out with iron hooks until the rind is all removed. The inner part is of a whiter and finer quality. Men are not ashamed to prepare it" (Pliny, *N.H.* xix. 1). For many ages, even down to the early part of the 14th century, Egyptian flax occupied the foremost place in the commercial world, being sent into all regions with which open intercourse was maintained. Among Western nations it was, without any competitor, the most important of all vegetable fibres till towards the close of the 18th century, when, after a brief struggle, cotton took its place as the supreme vegetable fibre of commerce.

Flax prospers most when grown upon land of firm texture resting upon a moist subsoil. It does well to succeed oats or potatoes, as it requires the soil to be in fresh condition without being too rich. Lands newly broken up from pasture suit it well, as these are generally freer from weeds than those that have been long under tillage. It is usually inexpedient to apply manure directly to the flax crop, as the tendency of this is to produce over-luxuriance, and thereby to mar the quality of the fibre, on which its value chiefly depends. For the same reason it must be thickly seeded, the effect of this being to produce tall, slender stems, free from branches. The land, having been ploughed in autumn, is prepared for sowing by working it with the grubber, harrow and roller, until a fine tilth is obtained. On the smooth surface the seed is sown broadcast by hand or machine, at the rate of 3 bushels per acre, and covered in the same manner as clover seeds. It is advisable immediately to hand-rake it with common hay-rakes, and thus to remove all stones and clods, and to secure a uniform close cover of plants. When these are about 2 to 3 in. long the crop must be carefully hand-weeded. This is a tedious and expensive process, and hence the importance of sowing the crop on land as free as possible from weeds of all kinds. The weeder, faces to the wind, move slowly on hands and knees, and should remove every vestige of weed in order that the flax plants may receive the full benefit of the land. When flax is cultivated primarily on account of the fibre, the crop ought to be pulled before the capsules are quite ripe, when they are just beginning to change from a green to a pale-brown colour, and when the stalks of the plant have become yellow throughout about two-thirds of their height.

The various operations through which the crop passes from this point till flax ready for the market is produced are—(1) Pulling, (2) Rippling, (3) Retting, (4) Drying, (5) Rolling, (6) Scutching.

Pulling and rippling may be dismissed very briefly. Flax is always pulled up by the root, and under no circumstances is it cut or shorn like cereal crops. The pulling ought to be done in dry clear weather; and care is to be taken in this, as in all the subsequent operations, to keep the root-ends even and the stalks parallel. At the same time it is desirable to have, as far as possible, stalks of equal length together,—all these conditions having considerable influence on the quality and appearance of the finished sample. As a general rule the removal of the "bolls" or capsules by the process of rippling immediately follows the pulling, the operation being performed in the field; but under some systems of cultivation, as, for example, the Courtrai method, alluded to below, the crop is made up into sheaves, dried and stacked, and is only balled and retted in the early part of the next ensuing season. The best rippler, or apparatus for separating the seed capsules from the branches, consists of a kind of comb having, set in a wooden frame, iron teeth made of round-rod iron $\frac{3}{8}$ ths of an inch asunder at the bottom, and half an inch at the top, and 18 in. long, to allow a sufficient spring, and save much breaking of flax. The points should begin to taper 3 in. from the top. A sheet or other cover being spread on the field, the apparatus is placed in the middle of it, and two ripplers sitting opposite each other, with

the machine between them, work at the same time. It is inadvisable to ripple the flax so severely as to break or tear the delicate fibres at the upper part of the stem. The two valuable commercial products of the flax plant, the seeds and the stalk, are separated at this point. We have here to do with the latter only.

Retting or rotting is an operation of the greatest importance, and one in connexion with which in recent years numerous experiments have been made, and many projects and processes put forth, with the view of remedying the defects of the primitive system or altogether supplanting it. From the earliest times two leading processes of retting have been practised, termed respectively water-retting and dew-retting; and as no method has yet been introduced which satisfactorily supersedes these operations, they will first be described.

Water-retting.—For this—the process by which flax is generally prepared—pure soft water, free from iron and other materials which might colour the fibre, is essential. Any water much impregnated with lime is also specially objectionable. The dams or ponds in which the operation is conducted are of variable size, and usually between 4 and 5 ft. in depth. The rippled stalks are tied in small bundles and packed, roots downwards, in the dams till they are quite full; over the top of the upper layer is placed a stratum of rushes and straw, or sods with the grassy side downwards, and above all stones of sufficient weight to keep the flax submerged. Under favourable circumstances a process of fermentation should immediately be set up, which soon makes itself manifest by the evolution of gaseous bubbles. After a few days the fermentation subsides; and generally in from ten days to two weeks the process ought to be complete. The exact time, however, depends upon the weather and upon the particular kind of water in which the flax is immersed. The immersion itself is a simple matter; the difficulty lies in deciding when the process is complete. If allowed to remain under water too long, the fibre is weakened by what is termed “over-retting,” a condition which increases the amount of codilla in the scutching process; whilst “under-retting” leaves part of the gummy or resinous matter in the material, which hinders the subsequent process of manufacture. As the steeping is such a critical operation, it is essential that the stalks be frequently examined and tested as the process nears completion. When it is found that the fibre separates readily from the woody “shove” or core, the beets or small bundles are ready for removing from the dams. It is drained, and then spread, evenly and equally, over a grassy meadow to dry. The drying, which takes from a week to a fortnight, must be uniform, so that all the fibres may spin equally well. To secure this uniformity, it is necessary to turn the material over several times during the process. It is ready for gathering when the core cracks and separates easily from the fibre. At this point advantage is taken of fine dry weather to gather up the flax, which is now ready for scutching, but the fibre is improved by stooking and stacking it for some time before it is taken to the scutching mill.

Dew-retting is the process by which all the Archangel flax and a large portion of that sent out from St Petersburg are prepared. By this method the operation of steeping is entirely dispensed with, and the flax is, immediately after pulling, spread on the grass where it is under the influence of air, sunlight, night-dews and rain. The process is tedious, the resulting fibre is brown in colour, and it is said to be peculiarly liable to undergo heating (probably owing to the soft heavy quality of the flax) if exposed to moisture and kept close packed with little access of air. Archangel flax is, however, peculiarly soft and silky in structure, although in all probability water-retting would result in a fibre as good or even better in quality.

The theory of retting, according to the investigations of J. Kolb, is that a peculiar fermentation is set up under the influence of heat and moisture, resulting in a change of the intercellular substance—pectose or an analogue of that body—into pectin and pectic acid. The former, being soluble, is left in the water; but the latter, an insoluble body, is in part attached to the

fibres, from which it is only separated by changing into soluble metapectic acid under the action of hot alkaline ley in the subsequent process of bleaching.

To a large extent retting continues to be conducted in the primitive fashions above described, although numerous and persistent attempts have been made to improve upon it, or to avoid the process altogether. The uniform result of all experiments has only been to demonstrate the scientific soundness of the ordinary process of water-retting, and all the proposed improvements of recent times seek to obviate the tediousness, difficulties and uncertainties of the process as carried on in the open air. In the early part of the 19th century much attention was bestowed, especially in Ireland, on a process invented by Mr James Lee. He proposed to separate the fibre by purely mechanical means without any retting whatever; but after the Irish Linen Board had expended many thousands of pounds and much time in making experiments and in erecting his machinery, his entire scheme ended in complete failure. About the year 1851 Chevalier Claussen sought to revive a process of “cottonizing” flax—a method of proceeding which had been suggested three-quarters of a century earlier. Claussen’s process consisted in steeping flax fibre or tow for twenty-four hours in a weak solution of caustic soda, next boiling it for about two hours in a similar solution, and then saturating it in a solution containing 5% of carbonate of soda, after which it was immersed in a vat containing water acidulated with $\frac{1}{2}$ % of sulphuric acid. The action of the acid on the carbonate of soda with which the fibre was impregnated caused the fibre to split up into a fine cotton-like mass, which it was intended to manufacture in the same manner as cotton. A process to turn good flax into bad cotton had, however, on the face of it, not much to recommend it to public acceptance; and Claussen’s process therefore remains only as an interesting and suggestive experiment.

The only modification of water-retting which has hitherto endured the test of prolonged experiment, and taken a firm position as a distinct improvement, is the warm-water retting patented in England in 1846 by an American, Robert B. Schenck. For open pools and dams Schenck substitutes large wooden vats under cover, into which the flax is tightly packed in an upright position. The water admitted into the tanks is raised to and maintained at a temperature of from 75° to 95° F. during the whole time the flax is in steep. In a short time a brisk fermentation is set up, gases at first of pleasant odour, but subsequently becoming very repulsive, being evolved, and producing a frothy scum over the surface of the water. The whole process occupies only from 50 to 60 hours. A still further improvement, due to Mr Pownall, comes into operation at this point, which consists of immediately passing the stalks as they are taken out of the vats between heavy rollers over which a stream of pure water is kept flowing. By this means, not only is all the slimy glutinous adherent matter thoroughly separated, but the subsequent processes of breaking and scutching are much facilitated.

A process of retting by steam was introduced by W. Watt of Glasgow in 1852, and subsequently modified and improved by J. Buchanan. The system possessed the advantages of rapidity, being completed in about ten hours, and freedom from any noxious odour; but it yielded only a harsh, ill-spinning fibre, and consequently failed to meet the sanguine expectations of its promoters.

In connexion with improvements in retting, Mr Michael Andrews, secretary of the Belfast Flax Supply Association, made some suggestions and experiments which deserve close attention. In a paper contributed to the International Flax Congress at Vienna in 1873 he entered into details regarding an experimental rettery he had formed, with the view of imitating by artificial means the best results obtained by the ordinary methods. In brief, Mr Andrews’ method consists in introducing water at the proper temperature into the retting vat, and maintaining that temperature by keeping the air of the chamber at a proper degree of heat. By this means the flax is kept at a uniform temperature with great certainty, since even should the

heat of the air vary considerably through neglect, the water in the vat only by slow degrees follows such fluctuations. "It may be remarked," says Mr Andrews, "that the superiority claimed for this method of retting flax over what is known as the 'hot-water steeping' is uniformity of temperature; in fact the experiments have demonstrated that an absolute control can be exercised over the means adopted to produce the artificial climate in which the vats containing the flax are situated."

Several other attempts have been made with a view of obtaining a quick and practical method of retting flax. The one by Messrs Doumer and Deswarte appears to have been well received in France, but in Ireland the invention of Messrs Loppens and Deswarte has recently received the most attention. The apparatus consists of a tank with two chambers, the partition being perforated. The flax is placed in the upper chamber and covered by two sets of rods or beams at right angles to each other. Fresh water is allowed to enter the lower chamber immediately under the perforated partition. As the tank fills, the water enters the upper chamber and carries with it the flax and the beams, the latter being prevented from rising too high. The soluble substances are dissolved by the water, and the liquid thus formed being heavier than water, sinks to the bottom of the tank where it is allowed to escape through an outlet. By this arrangement the flax is almost continually immersed in fresh water, a condition which hastens the retting. The flow of the liquids, in and out, can be so arranged that the motion is very slow, and hence the liquids of different densities do not mix. When the operation is completed, the whole of the water is run off, and the flax remains on the perforated floor, where it drains thoroughly before being removed to dry.

The Department of Agriculture and Technical Instruction for Ireland, and the Belfast Flax Supply Association, have jointly made some experiments with this method, and the following extract from the Association's report for 1905 shows the success which attended their efforts:—

"By desire of the department (which has taken up the position of an impartial critic of the experiment) a quantity of flax straw was divided into two equal lots. One part was retted at Millisle by the patent-system of Loppens and Deswarte; the other was sent to Courtrai and steeped in the Lys. Both lots when retted and scutched were examined by an inspector of the department and by several flax spinners. That which was retted at Millisle was pronounced superior to the other" . . .

"To summarise results up to date—

1. It has been proved that flax can be thoroughly dried in the field in Ireland.
2. That the seed can be saved, and is of first quality.
3. That the system of retting (Loppens and Deswarte's patent) is at least equal to the Lys, as to quality and yield of fibre produced."

Since these results appear to be satisfactory, it is natural to expect further attempts with the same object of supplanting the ordinary steeping. A really good chemical, mechanical or other method would probably be the means of reviving the flax industry in the remote parts of the British Isles.

Scutching is the process by which the fibre is freed from its woody core and rendered fit for the market. For ordinary water-retted flax two operations are required, first breaking and then scutching, and these are done either by hand labour or by means of small scutching or lint mills, driven either by water or steam power. Hand labour, aided by simple implements, is still much used in continental countries; also in some parts of Ireland where labour is cheap or when very fine material is desired; but the use of scutching mills is now very general, these being more economical. The breaking is done by passing the stalks between grooved or fluted rollers of different pitches; these rollers, of which there may be from 5 to 7 pairs, are sometimes arranged to work alternately forwards and backwards in order to thoroughly break the woody material or "boon" of the straw, while the broken "shoves" are beaten out by suspending the fibre in a machine fitted with a series of revolving blades, which, striking violently against the flax, shake out the bruised and broken woody cores. A great many modified scutching machines

and processes have been proposed and introduced with the view of promoting economy of labour and improving the turn-out of fibre, both in respect of cleanness and in producing the least proportion of codilla or scutching tow.

The celebrated Courtrai flax of Belgium is the most valuable staple in the market, on account of its fineness, strength and particularly bright colour. There the flax is dried in the field, and housed or stacked during the winter succeeding its growth, and in the spring of the following year it is retted in crates sunk in the sluggish waters of the river Lys. After the process has proceeded a certain length, the crates are withdrawn, and the sheaves taken out and stooked. It is thereafter once more tied up, placed in the crates, and sunk in the river to complete the retting process; but this double steeping is not invariably practised. When finally taken out, it is unloosed and put up in cones, instead of being grassed, and when quite dry it is stored for some time previous to undergoing the operation of scutching. In all operations the greatest care is taken, and the cultivators being peculiarly favoured as to soil, climate and water, Courtrai flax is a staple of unapproached excellence.

An experiment made by Professor Hodges of Belfast on 7770 lb of air-dried flax yielded the following results. By rippling he separated 1946 lb of bolls which yielded 910 lb of seed. The 5824 lb (52 cwt.) of flax straw remaining lost in steeping 13 cwt., leaving 39 cwt. of retted stalks, and from that 6 cwt. 1 qr. 2 lb (702 lb) of finished flax was procured. Thus the weight of the fibre was equal to about 9% of the dried flax with the bolls, 12% of the balled straw, and over 16% of the retted straw. One hundred tons treated by Schenck's method gave 33 tons bolls, with 27.50 tons of loss in steeping; 32.13 tons were separated in scutching, leaving 5.90 tons of finished fibre, with 1.47 tons of tow and pluckings. The following analysis of two varieties of heckled Belgian flax is by Dr Hugo Müller (Hoffmann's *Berichte über die Entwicklung der chemischen Industrie*):—

Ash	0.70	1.32
Water	8.65	10.70
Extractive matter	3.65	6.02
Fat and wax	2.39	2.37
Cellulose	82.57	71.50
Intercellular substance and pectose bodies	2.74	9.41

According to the determinations of Julius Wiesner (*Die Rohstoffe des Pflanzenreiches*), the fibre ranges in length from 20 to 140 centimetres, the length of the individual cells being from 2.0 to 4.0 millimetres, and the limits of breadth between 0.012 and 0.025 mm., the average being 0.016 mm.

Among the circumstances which have retarded improvement both in the growing and preparing of flax, the fact that, till comparatively recent times, the whole industry was conducted only on a domestic scale has had much influence. At no very remote date it was the practice in Scotland for every small farmer and cotter not only to grow "lint" or flax in small patches, but to have it retted, scutched, cleaned, spun, woven, bleached and finished entirely within the limits of his own premises, and all by members or dependents of the family. The same practice obtained and still largely prevails in other countries. Thus the flax industry was long kept away from the most powerful motives to apply to it labour-saving devices, and apart from the influence of scientific inquiry for the improvement of methods and processes. As cotton came to the front, just at the time when machine-spinning and power-loom weaving were being introduced, the result was that in many localities where flax crops had been grown for ages, the culture gradually drooped and ultimately ceased. The linen manufacture by degrees ceased to be a domestic industry, and began to centre in and become the characteristic factory employment of special localities, which depended, however, for their supply of raw material primarily on the operations of small growers, working, for the most part, on the poorer districts of remote thinly populated countries. The cultivation of the plant and the preparation of the fibre have therefore, even at the present day, not come under the influence (except in certain favoured localities) of scientific knowledge and experience.

Cultivation.—The approximate number of acres (1905) under cultivation in the principal flax-growing countries is as follows:—

Russia	3,500,000 acres.
Caucasia	450,000 "
Austria	175,000 "
Italy	120,000 "
Poland	95,000 "
Rumania	80,000 "
Germany	75,000 "
France	65,000 "
Belgium	53,000 "
Hungary	50,000 "
Ireland	46,000 "
Holland	38,000 "

Although the amount grown in Russia exceeds considerably the combined quantity grown in the rest of the above-mentioned countries, the quality of the fibre is inferior. The fibre is cultivated in the Russian provinces of Archangel, Courland, Esthonia, Kostroma, Livonia, Novgorod, Pskov, Smolensk, Tver, Vyatka, Vitebsk, Vologda and Yaroslav or Jaroslav, while the bulk of the material is exported through the Baltic ports. Riga and St Petersburg (including Cronstadt) are the principal ports, but flax is also exported from Revel, Windau, Pernau, Libau, Narva and Konigsberg. Sometimes it is exported from Archangel, but this port is frost-bound for a great period of the year; moreover, most of the districts are nearer to the Baltic.

The raw flax is almost invariably known by the same name as the district in which it is grown, and it is further classified by

The marks in the Crown flaxes have the following signification:—

K	means Crown and is usually the base mark.
H	Light and represents a rise of about £1
P	Picked " " " £3
G	Grey " " " £3
S	Superior " " " £4
W	White " " " £4
Z	Zins " " " £10

Each additional mark means a rise in the price, but it must be understood that it is quite possible for a quality denoted by two letters to be more valuable than one indicated by three or more, since every mark has not the same value.

If we take £25 as the value of the base mark, the value per ton for the different groups would be:—

K	£25	HSPK	£33
HK	£26	GSPK	£35
PK	£28	WSPK	£36
HPK	£29	ZK	£35
GPK	£31	HZK	£36
SPK	£32	GZK	£38, &c.

The Hoffs flaxes are reckoned in a similar way. Here H is for Hoffs, D for Drieband, P for picked, F for fine, S for superior, and R for Risten. In addition to these marks, an X may appear before, after or in both places. With £20 as base mark we have:—

HD	£20 per ton.
PHD	£23 " "
FPHD	£26 " "
SFPHD	£29 " "
XHDX	£32 " "
XRX	£35 " "

The following Prices, taken from the Dundee Year Books, show the Change in Price of a few well-known Varieties.

	Dec. 1897.	Dec. 1898.	Dec. 1899.	Dec. 1900.	Dec. 1901.	Dec. 1902.	Dec. 1903.	Dec. 1904.	Dec. 1905.	Dec. 1906.
Riga—										
SPK	£ 23½	21 to 22	28 to 32	42	28 to 32	32	39	33	35	32
XHDX	27	26½	32½ to 33	43½	34	35	42	34	36	33
W	16 to 16¼	15½ to 16	22½ to 24	31	18 to 19	22	29	23	24	24
St Petersburg—										
Bajetsky	28 to 29	26 to 27	32 to 32½	46	37	33	49	36	42	38
Jaropol	24 to 25	23 to 23½	30	42	32	30	42	33	35	33
Tows—										
Mologin	24 to 24¼	23 to 23½	24½ to 25	31½	32	32	42	32	34	32½
Novgorod	1 23½ to 24¼	1 23	1 26 to 26½	33	31½	32½	41	31½	37	34½
Archangel—										
½ and ¾ tow	25	24 to 24½	26 to 27	32	31	32	41	31½	32½	31
2nd Codilla	25	24 to 24½	25½ to 26	32	31	32	41	32	33	31

special marks. The following names amongst others are given to the fibre:—Archangel, Bajetsky, Courish, Dorpat, Drogobusher, Dunaberg, Fabrichnoi, Fellin, Gjatsk, Glazoff, Griazourtz, Iwashkower, Jaransk, Janowitz, Jaropol, Jaroslav, Kama, Kashin, Konigsberg, Kostroma, Kotelnitch, Kowns, Krasnoholm, Kurland (Courland), Latischki, Livonian Crowns, Malmuish, Marienberg, Mochenetz, Mologin, Newel, Nikolsky, Nolinsk, Novgorod, Opotchka, Ostroff, Ostrow, Othornoy, Ouglitch, Pernau, Pskoff, Revel, Riga, Rjeff, St Petersburg, Seretz, Slanitz, Slobodskoi, Smolensk, Sytcheffka, Taroslav, Tchesna, Totma, Twer, Ustjuga, Viatka, Vishni, Vologda, Werro, Wiasma, Witebsk.

These names indicate the particular district in which the flax has been grown, but it is more general to group the material into classes such as Livonian Crowns, Rija Crowns, Hoffs, Wracks, Drieband, Zins, Ristens, Pernau, Archangel, &c.

The quotations for the various kinds of flaxes are made with one or other special mark termed a base mark; this usually, but not necessarily, indicates the lowest quality. The September–October 1906 quotations appeared as under:—

Livonian	basis K	£26 to £27	per ton.
Hoffs	HD	£21 to £22	"
Pernau	D	£28 to £28 : 10	"
Dorpat	D	£32 to £32 : 10	"

It will, of course, be understood that the base mark is subject to variation, the ruling factors being the amount of crop, quality and demand.

¹ 8 and 2, which means 80 % of one quality and 20 % of another. Sometimes other proportions obtain, while it is not unusual to have quotations for flaxes containing four different kinds.

Of the lower qualities of Riga flax the following may be named:

W, Wrack flax.	PW, Picked wrack flax.
WPW, White picked wrack.	GPW, Grey picked wrack flax.
D, Dreiband (Threeband).	PD, Picked Dreiband flax.
LD, Livonian Dreiband.	PLD, Picked Livonian Dreiband.
SD, Slanitz Dreiband.	PSD, Picked Slanitz Dreiband.

The last-named (SD and PSD) are dew-retted qualities shipped from Riga either as Lithuanian Slanitz, Wellish Slanitz or Wiasma Slanitz, showing from what district they come, as there are differences in the quality of the produce of each district. The lowest quality of Riga flax is marked DW, meaning Dreiband Wrack.

Another Russian port from which a large quantity of flax is imported is Pernau, where the marks in use are comparatively few. The leading marks are:—

LOD, indicating Low Ordinary Dreiband (Threeband).
OD, " Ordinary Dreiband.
D, " Dreiband.
HD, " Light Dreiband.
R, " Risten.
G, " Cut.
M, " Marienburg.

Pernau flax is shipped as Livonian and Fellin sorts, the latter being the best.

Both dew-retted and water-retted flax are exported from St Petersburg, the dew-retted or Slanitz flax being marked 1st, 2nd, 3rd and 4th Crown, also Zebrack No. 1 and Zebrack No. 2, while all the Archangel flax is dew-retted.

Some idea of the extent of the Russian flax trade may be gathered from the fact that 233,000 tons were exported in 1905. Out of this quantity a little over 53,000 tons came to the United Kingdom. The chief British ports for the landing of flax are:—Belfast, Dundee, Leith, Montrose, London and Arbroath, the two former being the chief centres of the flax industry.

The following table, taken from the annual report of the Belfast Flax Supply Association, shows the quantities received from all sources into the different parts of the United Kingdom:—

Year.	Imports to the United Kingdom.	Imports to Ireland.	Imports to England and Scotland.
	Tons.	Tons.	Tons.
1895	102,622	33,506	67,116
1896	95,199	36,650	58,549
1897	98,802	37,715	61,087
1898	97,253	34,440	62,813
1899	99,052	40,145	58,907
1900	71,586	31,563	40,023
1901	75,565	28,785	46,780
1902	73,611	29,727	43,884
1903	94,701	38,168	56,533
1904	74,917	33,024	41,893
1905	90,098	40,063	50,035

The extent of flax cultivation in Ireland is considerable, but the acreage has been gradually diminishing during late years. In 1864 it reached the maximum, 301,693 acres; next year it fell to 251,433. After 1869 it declined, there being 229,252 acres in flax crop that year, and only 122,003 in 1872. From this year to 1889 it fluctuated considerably, reaching 157,534 acres in 1880 and dropping to 89,225 acres in 1884. Then for five successive years the acreage was above 108,000. From 1890 to 1905 it only once reached 100,000, while the average in 1903, 1904 and 1905 was a little over 45,000 acres.

(T. Wo.)