

LINEN (Fr. *lin*, Ger. *Leinen*, Lat. *linum*). Yarn, thread, or cloth made from flax (q.v.). Also, a general term for tablecloths and napkins (table linen), sheets and pillow cases (bed linen), shirts, handkerchiefs, and collars (body linen), whether of all linen, part linen and part cotton, or all cotton. Linen thread is used almost exclusively in the manufacture of hand-made laces. (See LACE.) Table linen is made almost exclusively in damask weave. (See DAMASK.) While we owe the early development of silk to China and of cotton to India, the mother country of linen is Egypt. Flax is indigenous to the valley of the Nile, and Egyptian graves from 2000 to 4000 years old have preserved for us linen tapestries, embroideries, and plain cloths, many of them of a texture almost incredibly fine. The Bible often mentions flax in Egypt and tells us that Pharaoh arrayed Joseph in vestures of fine linen (about 1700 B.C.). For centuries the Phœnicians transported linen cloths from Egypt to all parts of the Mediterranean world. Linen has from time immemorial been symbolic of purity, and purple and fine linen of royalty. This is because linen can be bleached to snowy whiteness, and on account of its resistance to coloring matter does not stain easily, the long fibres having few short ends to become fuzzy like cotton. The fact that linen absorbs water rapidly makes it the best material for towels; its hard, smooth, lustrous surface renders it unsurpassed for table use; and it is cool for summer wear, because a splendid conductor of heat. But the difficulty of dyeing it usually gives the preference to cotton, silk, or wool when color is desirable. The stiffness that causes it to lie flat and smooth on a table or around the wrist or neck makes it undesirable for clothing generally, because it retains wrinkles obstinately.

As everybody knows, the United States is primarily a cotton country. (See COTTON.) On this side of the Atlantic linen is to be classed with silk as an article of luxury. In the words of the United States census for 1904: "The linen manufacture is exotic in this country. Relatively little attention is given to the preparation of the flax fibre for manufacture, and that which is prepared is adapted only to the cheapest processes. Imported material is employed almost exclusively in the spinning of yarns and the weaving of fabrics. There has never been a successful attempt to produce fine goods at a profit." The total production of linen goods, consisting mostly of thread, twine, and toweling, was only \$6,385,218 in 1909, as compared with \$4,368,159 in 1899 and \$2,880,341 in 1889.

In Ireland the situation is quite different. Moore says, in the introduction to his book on *Linen*: "Cotton may have its probable limitation with regard to its users, but linen is universal and cosmopolitan, being found in some form or other alike in the cottage of the labourer and in the palace of the sovereign." While this is an exaggeration, it sounds natural from the mouth of a Belfast man, because Belfast is the centre of the Irish linen trade and is famous throughout the world as Linenopolis. The value of the linen exports from the United Kingdom in 1913 was £8,247,571 (about \$40,000,000), of which Ireland contributed four-fifths and Scotland most of the rest. Of these exports the United States takes about one-half, handkerchiefs alone amounting in 1913 to \$2,067,000.

That the manufacture of fine linens is likely to be transplanted to the United States as a result of the war in Europe is improbable. The amount of hand labor necessary in the preparation of the flax for spinning, and in the spinning and weaving, is prohibitive. But it is probable that the important linen and lace industries of Belgium will seek at least a temporary refuge elsewhere—in France, Holland, Scotland, or Ireland.

Spinning, Bleaching, and Weaving. After the flax plant has passed through the processes of retting, grassing, and scutching, it is ready for the spinning mill. Here there are repeated combings and cleanings to remove impurities, followed by hackling to separate the fibres, and drawing to produce roving ready to be spun. The best flax spinning is done in a moist atmosphere; indeed, the finest yarns can be spun only when wet. The hand spinner of olden time kept a bowl of water beside her, in which she moistened her fingers as she spun. Linen is more difficult to weave than cotton because less elastic, and liable to break under sudden strain. For a long time after the introduction of power looms fine damasks continued to be woven by hand. Now hand weaving is confined in Ireland to small quantities of the very finest napkins, doilies, and small tablecloths; but coarse crashes and many of the cruder varieties of European linens are woven on hand looms by the peasants of remote villages. Linen bleaching is a most elaborate procedure. Mrs. Earle, in her *Home Life in Colonial Days* (New York, 1900), says that the American colonists put linen through some 40 processes of wetting, washing, acid bleaching, rinsing, soaking, grass bleaching, etc., before attaining pure white. These processes required many weeks. Linen loses from 25 to 30 per cent of its weight in bleaching and is much more weakened by modern chemical than by the ancient grass methods. The modern half bleach is obtained by boiling the linen in sodium carbonate or in soda ash; then treating with bleaching powder, then with dilute sulphuric acid. After each operation it is thoroughly washed. For a three-fourths bleach the cloth is then spread on the grass, and sun and air do their work. For a full bleach (pure white) all of these processes are several times repeated. See BLEACHING.

One easy way to tell linen from cotton is to set one of the threads on fire. If it is cotton, it will blaze up and continue to burn. If it is linen, it will smolder. Another and even simpler way, and one commonly practiced by purchasers in shops, is to wet the finger in the mouth and place it under the cloth. If the moisture comes quickly through, the cloth is linen.

Bibliography. William Charley, *Flax and its Products* (Belfast, 1862); A. J. Warden, *Linen Trade, Ancient and Modern* (London, 1864); Hugh McCall, *Ireland: Her Staple Manufactures* (Belfast, 1865); C. M. Gibbs, *Household Textiles* (Boston, 1912); A. S. Moore, *Linen* (London, 1914); Woodhouse and Milne, *Jute and Linen Weaving* (2d ed., ib., 1914); and for its ancient uses: J. H. Pollen, "Ancient Linen Garments," in *Burlington Magazine*, vol. xxv (ib., 1914); W. W. Midgley, "Linen of the IIIrd Dynasty," in *British School of Archaeology in Egypt, Studies*, vol. ii (ib., 1910).