

short fibres, *low*. This tow is not the rough substance generally known by the name: the latter is the refuse of hemp. Flax tow can be drawn, doubled, carded, and spun into yarn of coarse quality. The principal object in drawing the heckled fibres is to form a sliver of uniform thickness, or such that a foot in length taken at any one place will be equal to a foot in length taken at any other place, or as nearly so as possible. The drawn sliver is next taken to the *roving*-frame. The use of this machine is to give the sliver another drawing, also a slight twist, and to wind it upon a *bobbin*. These processes are all preparatory for the spinning of the yarn. This is effected on the *bobbin-and-fly* principle, and the flax spinning-frame acts similarly to the *throstle* used in cotton-spinning. Flax, however, differs from cotton, wool, and silk, as it is required to be wet while under the process. Formerly it was wetted with cold water, but it is now found that finer yarn can be produced when warm water is used. In general, the rove or twisted sliver, before it passes through the retaining rollers, is led through a trough of water kept hot by steam. The spun yarn is applicable either for making thread, or for weaving into linen cloth. The quality of flax is denoted by numbers expressing the number of *leas* in a pound weight,—a *lea* being a measure of 300 yards. Thus, No. 50 has 50 leas, or 15,000 yards. Flax is seldom spun finer than No. 200, which contains 60,000 yards. No. 200 is applicable for making cambric of fine quality. The manufacture of linen was introduced into the U. States by the establishment of a large mill in 1834 at Fall River, Mass., and the industry, since that time, has become largely extended.

**Linen**, *n.* [*Fr. lin*; *Ital. lino*; *Ger. lein*; *Lat. linum*; *Gr. linoon*, flax, lint.] (*Manuf.*) A general name for a cloth of very extensive use, made of flax, and differing from cloths made of hemp only in its fineness. The manufacture of linen is of so ancient a date that its origin is unknown. At a very early period linen cloths were made in Egypt, the cloth wrappings of the mummies being all composed of this substance. In the time of Herodotus linen was exported from Egypt; it also formed the dress of the Egyptian priests, who wore it at all their religious ceremonies; hence they were called *linen wearing* by Ovid and Juvenal. Linen passed from Egypt to the Romans, but not until the time of the emperors, when the Roman priests began to wear linen garments. Linen was also used as a material for writing; the Sibylline books, and the mummy bandages covered with hieroglyphics, are instances of this use of the fabric. Linen and woollen cloths formed the only material for dresses during the Middle Ages; and fine linen was held in very high estimation, the manufacture being carried to the greatest perfection in Germany and Brabant. Cotton, on account of its cheapness, has taken the place of linen for many purposes; but the best paper cannot be manufactured without linen. In the process of manufacture, the flax-fibres are first steeped and freed from woody particles. (See *FLAX*.) Very little machinery was used in the manufacture of linen cloth till recently. After being freed from the woody particles, the distaff and spinning-wheel were used in order to make the thread or yarn, and the hand-loom was employed for the purpose of weaving the cloth. About the middle of the 18th cent., the inventions of Hargreaves and Arkwright were first applied to the manufacture of linen, at Leeds. (See *COTTON MANUFACTURE*.) When brought to the spinning-mills, the flax is in small bundles, weighing a few pounds each. The first process is called *scutching*, by which the fibres are subjected to a sort of combing action, in a machine. They are next *heckled*, an operation by which they are cleaned, the coarser parts being removed and the rest arranged in a parallel direction to each other. This used to be done with the *heckle*, a sort of large comb with iron teeth; but the operation is now effected by a rotating machine, on the outer circumference of which the flax is fixed, and drawn against or between a series of sharp teeth. The fibres pass through six heckling-machines in succession, each of which has finer teeth than the one preceding it. After being heckled, the flax is divided into portions, selected according to their fineness, &c. The next process is that of *drawing*, similar to the carding process in the cotton manufacture. (See *CARDING-MACHINE*.) In this operation the flax is doubled and carded repeatedly, till it presents the appearance of a smooth glossy band, about an inch in width, called a *sliver*. All the good portion of the flax at this point is called *line*, and all the irregular