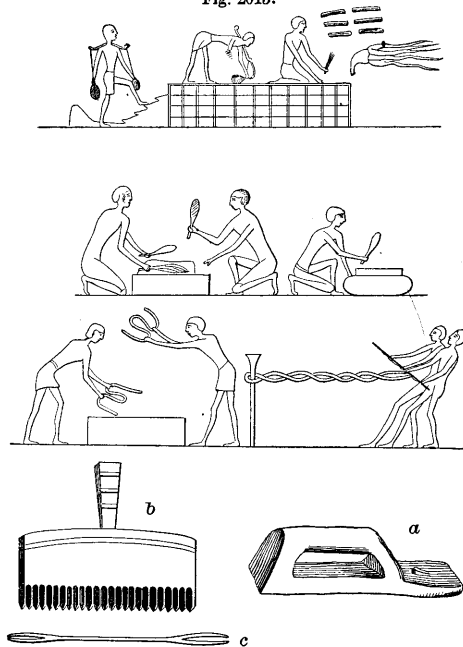


Flax. The first mention of flax in history is perhaps that in the account of the hail-storm in Lower Egypt, Exodus ix. 31: "The flax was bolled." The Hebrew word is rendered *linon* in the Septuagint; *linum* in the Vulgate: with us it is *lime* and *linen*. (See LINEN.) Flax was used to the exclusion of wool for priestly garments and cerements. Isaiah refers to the fine linen of Egypt; Herodotus refers to linen shirts as the ordinary dress of the people of the Nile land.

The manipulations of flax to render it fit for use are shown at Beni Hassan in Egypt, about 1500

Fig. 2015.



Flax Rotting, Braking, etc. (Beni Hassan).

B. c. In the illustration the men on the left are carrying water in jars to pour on the flax, which is placed in an elevated cistern, partitioned off into cells. Another man removes the rotted flax and lays it out to dry, as represented by the six bunches. Another bunch is shown in a loose condition, probably a handful in condition for the next operation, which is performed by the three kneeling men, who beat upon a stone with a mallet *a*. The flax is thus made into a rough hank, and is then cleaned

and opened out more fully by striking it upon a stone. The hank is held in two places, swung in the air, and beaten upon the flat stone. In the next scene the hank is twisted and worked to give it a farther finish.

The description given of the process by Pliny, who wrote about 1500 years afterwards, will nearly apply to the serial picture just described. He 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 to the rind is called *stupa* (tow), inferior to the inner fibers and fit only for the wicks of lamps. It is combed out with iron hooks until all the rind is removed. When made into yarn it is polished by striking it frequently on a hard stone, moistened with water; and when woven into cloth it is again beaten with clubs, being always improved in proportion as it is beaten."

Answering to the "iron hooks" described by Pliny, and to our *hackle*, were the combs like that shown in the cut *b*; two of which were found at Thebes, with some flax-tow attached, and are now in the Berlin Museum. One of them has 29 and the other one 46 teeth. *c* is a netting-needle from the same place.

Flax was exported from Egypt to Gaul as late as the Christian era, and was ordered to be grown in England by statute of Henry VIII., 1533. A braking and scutching machine was run by water-power in Scotland in 1750.

To prepare flax for manufacture, after the removal of the seeds, the *haxe* (useful, fibrous portion) is separated from the *boom* (the refuse portions of the stalk). For this purpose the uniting gluten must be dissolved and removed. This is effected by rotting, either in ponds or by exposure to dew. In either case a fermentation ensues which renders the gluten soluble in water. Caustic alkali has the same effect on gluten, and forms the basis of many modern processes whereby woody fiber is rendered suitable for spinning or for paper pulp. The next process is to *break* and *scutch* the flax to detach and remove the rind and cellulose matter, and prepare the fiber for *hackling* and subsequent operations.

In one large establishment in Leeds, England, the series of machines is as follows:—

The seed is removed by rollers which act upon the bolls. Then come the *flax-braking machines*; these have fluted or grooved rollers, between which the flax stem is made to pass, so that the woody portion becomes thoroughly broken without cutting the fiber. Next come the *flax-scutching machines*, in which revolving blades or arms beat out the woody fragments, and the fibers are to a certain degree separated. After this the *flax-hackling machines* give the flax a thorough combing, by means of long rows of teeth or spikes; the fibers are combed out straight and tolerably clean; and the tow or short fibers are removed, to be used for other purposes. The hackled flax is then in a state to be acted on by the various machines which bring it into the state of yarn for weaving; these machines are of three kinds, according as tow, long flax, or cut flax is to be acted upon. The *tow-carding* and the *tow-rov-ing machines* serve for the first kind; the *flax-spread-ing*, *flax-carding*, and *flax-rov-ing machines* for the second; and the flax-cutting machine, followed by those for carding and roving, for the third. The

FLAX-BRAKE.

spinning-machine follows all these ; and it differs from cotton-spinning machines chiefly in having a provision for wetting the flax either with cold or hot water ; there is still a little gum or mucilage among the fibers, and this becomes more manageable in the machine when moistened.

A Swedish method of treating flax is by boiling in sea-water with the addition of birch-ashes and quicklime. It is then rinsed in sea-water ; soaped, rubbed, bleached in the air, being turned and watered every day. The washing, soaping, and bleaching are repeated. The flax is beaten, dried, and then carded and spun like cotton.

For list of appliances in the treatment and manufacture of flax, see COTTON, FLAX, WOOL, ETC., APPLIANCES.