

but sometimes a considerable interval is allowed to elapse before it is again placed in the crates and submerged in the water, it being considered that the quality is improved by storage between the first and second steeping. One of the tests before described is relied upon to indicate the proper degree of retting. The "ballons" are then hauled out of the water and the flax again put up on end to dry. When dry the flax is sorted by an expert, the over-retted flax being kept by itself, and the under-retted or "hard" again exposed to the action of the water.

There is another method of rendering the separation of the fiber from the straw easy. We mean the system of "dew-retting," as practiced in the districts surrounding Archangel, St. Petersburg, etc. Where this system is in vogue the flax straw is spread out upon the fields and exposed to the action of the sun and rain for a lengthened period, the duration of which depends upon the weather. This system seems to render the coloring matter difficult to remove, and consequently yarns made from fiber treated in this way will not easily become the desired color when boiled.

The "water" and the "dew-retting" systems are the only methods which have stood the test of practice. Attempts have been made at various times to introduce methods by which the desired results should be accomplished in a shorter time; but one after another has failed either to effect the ready separation of the filaments from the boon or to produce fiber equal in spinning quality to that separated by the older methods. The first of any importance was that of Shenk in the early part of the present century. He, recognizing the fact that the time required by the retting process depends to a large extent upon the temperature of the water, and that a high temperature hastens fermentation, determined to substitute water, heated and kept at a given temperature under cover, for the irregular action of out-of-door dews. He found that by keeping the water at a temperature of from 80° to 90° F. the retting process was completed in 60 or 70 hours. The fiber produced by this system was said to be quite equal in apparent quality to that obtained in the ordinary way; but it did not work out to its appearance, yielded badly, and was, in consequence, not favored by spinners. Shenk's process was tried on an extensive scale in Ireland, England, and on the Continent. After a few years' trial the system proved a failure in Ireland. It was more successful in England, however, and may still be carried on to a small extent.

Another system which has come and gone is that of Watt, which came out shortly after Shenk's, from which it differed considerably. By Watt's process the straw was placed in a closed chamber, having a condensing tank in its upper portion. Steam was introduced down below and condensing upon the cold tank dropped down over the flax straw. Retting by this process usually took 10 to 18 hours. When retted, the straw, while

still wet, was rolled and broken by rollers, and then dried and scutched. The fiber produced by this process was said to look well, but did not work out to its appearance. It is questionable if any hasty or forced process can produce fiber equal in spinning quality to that obtained by the older and slower method. During the retting process fermentation decomposes the gummy matter called pectose, which unites the flax fiber to the woody part of the stem, transforming it into soluble pectine and insoluble pectic acid. The former is washed away; the latter although softened, if not removed by mechanical means, or washed off by a rapid current in the water, remains attached to the fiber. It is this substance which binds the individual filaments of the "reed" together, and which constitutes the gummy matter always more or less present in flax, and which, when softened by the hot water in the spinning process, assists in binding the individual fibers of the thread together, thus adding considerably to its strength. The scutching process, by which the flax fiber is separated from the woody matter which composes the stem of the plant, is effected either by hand or by power.

Hand scutching, now almost extinct in Ireland, is frequently practiced in Belgium. Unlike the Irish, the Flemings never dry their straw in the smoke of the fire, a process which may facilitate the scutching, but renders the flax hard and dry, evaporating as it does the natural volatile oil of the fiber.

Just previous to scutching the boon is broken up as short as possible by rolling or by beating the flax stems with a mallet. Traces of the old method of rolling the flax are still to be found in the country parts of Ireland, in the shape of a large round stone fixed upon a long pole, the free end of which rests upon the ground. A horse was attached to the pole and the wheel pulled round in a circle, the flax straw being spread in its track and crushed beneath its weight. Of more recent date is the flax-breaker, composed of heavy rollers coarsely fluted, which work in pairs, through which the beets of flax straw are passed. An improvement on this breaker was brought out some years ago by the Fiber Machinery Company, Limited, of London. Its object was to prevent the flax straw being crushed or nipped at regular intervals, as in the older breaker. To effect this object five pairs of finely-fluted rollers were employed. A feature of the fluting was a variation in the pitches of the flutes upon the same roller, the roller working with it being fluted and placed in gear to correspond. Davison's breaker, brought out in 1892, consisted in a pair of feed rollers which passed the straw onward through three sets of vertical slotted plates. Between each set of plates and beyond the last set were rollers which carried the straw forward. The vertical plates reciprocated vertically to the extent of an inch or so, the odd numbered plates always moving in an opposite direction to the even numbered plates.