necessity there is of overcoming the law of double cohesion by the assisting mechanical, while acting at the same time by the law of double elective affinity, and while the vegetable juices are in the nascent state, so that nascent affinity (*i.e.*, the proper chemical action,) acts speedily in effecting all that the manipulator requires previous to the drying and common hackling operations. You will see by this that my views run counter to what is called the "successful dry process," as recently adopted by some parties in the North Island. Exposure to the air, which the dry process implies, must effectually fix the gum into the fibre, and so defeat its own ends. In one word, it will be found a failure; for while even a slight amount of the gum remains, the ultimate fibres or fibrillæ will not separate, whereas by the use of my solvent, it will be found that the ligneous covering and the gum pass off together,—in one word, the chlorophyll and all extraneous matters are effectually brought under control. The solvent, rightly assisted, will do all that is required in the run of from four to six hours, at the cost of, upon an average, about £2 per ton of the dressed leaf, when it will, after rough hackling only, be fit for exportation.

Herewith I forward you a few specimens. I reserve to myself the right of manufacturing the solvent.

A few of the specimens, identical with the ones I send you, have been sent to Manchester, coupled with others dressed in the ordinary way, and that which was marked "Florance's process," was pronounced the best.

The following are Messrs. G. and J. A. Noble's report:—"Sample flax, No. 3, dressed with Dr. Florance's solvent is the best, and valued at £8 to £9 per ton more than the best dressed flax yet to hand from Canterbury."

A friend of mine, living near me, who communicated the above information as to the relative value of our flax fibre, as quoted above from his brother's report, dated London, 5th November, 1869, adds,—"I have not given you the quotations for the several other samples sent; they, however, averaged from £22 to £32 per ton."

I might add that, from several specimens of mechanically well-dressed flax by Booth's (Dunedin) improved machine, coupled with the subsequent use of my solvent, very beautiful silky-looking fibre could be turned out, equal to the shell-scraped and then passed through my solvent, a specimen of which I enclose for you. With such a machine and my solvent, the great problem of how perfectly and economically to dress the New Zealand flax for the higher textile usages is answered.

I have, &c.,

To T. H. Potts, Esq., M.H.R. AUGUSTUS FLORANCE.

No. VII.

ON THE STRUCTURE AND COLOUR OF THE FIBRE OF PHORMIUM TENAX. By T. NOTTIDGE.

[Read before the Philosophical Institute of Canterbury, September 1, 1869.]

As the preparation of the fibre of New Zealand Flax has now become one of the staple industries of this Province, I thought that the following account of certain observations and experiments that I have made on the structure of the leaf, and colour of the fibre, of *Phormium tenax*, might not prove uninteresting to the members of the Institute.

As is well known to all botanists, the fibre of the *Phormium tenax* is the woody tissue or pleurenchyma of the leaf. This woody tissue consists of cells very much elongated, and tapering at each end, arranged side by side in bundles, the ends of the proximate cells overlapping.

When the carefully-cleaned fibre is teased out with a needle, and examined under a microscope by reflected light, with a power of 120 linear, it appears to be white and transparent, like filaments of spun glass, and where it lies in bundles it has a lustre like satin.

When mounted in "Deane's gelatine," and examined by transmitted light with a power of 225 linear, the ultimate fibres appear to be cylindrical tubes of considerable length (probably one and a half to two inches, but I have not succeeded in tracing any one cell through its whole length), the margins extremely smooth and regular, the finest of the fibres quite as fine as the silk of the *Bombyx mori*, or mulberry silkworm. The cells taper gradually to each end, and are slightly rounded at the point. A central canal of considerable size is plainly visible. I observed no transverse or longitudinal markings on the fibre. The central canal appeared to be filled with air only, when I examined the fibre in August, but this may not be the case at all seasons of the year.

Transverse sections of the upper part of the leaf, mounted in "Deane's gelatine," and examined by transmitted light with a power of 225 linear, show that the fibres are not round, but roughly hexagonal, with slightly-rounded angles packed closely together in bundles, but so that small interspaces are left at the rounded angles. The central canal is marked by a well-defined spot on each ultimate fibre; and around this spot are slight indications of concentric lines, showing how the cell has been built up by successive deposits of cellulose.

The ultimate fibres vary considerably in diameter, those near the green or upper surface of the leaf being much finer than those near the dull under-surface of the leaf.

When the ultimate fibres are broken, they break transversely, and the fracture has a ragged edge. I could not discover any tendency to tear longitudinally into finer filaments.

The bundles of fibre are in the form of flattened bands, arranged with tolerable regularity, parallel to each other, lengthwise in the leaf, one edge of the band being close to the green or upper surface of the leaf, the other edge close to the dull or under surface. Some of the bands appear to be incomplete, and extend only to a short distance from the surfaces of the leaf.

In the centre of each complete bundle of fibres is a brown bundle of spiral or vascular tissue; the central canals in this tissue are larger than the central canals in the fibre. This spiral tissue appears to break up very easily, and to separate readily from the woody tissue or fibre.

The bundles of fibre are imbedded in the cellular tissue known as the parenchyma, or, more accurately as the merenchyma, of the leaf, and are immediately surrounded by a layer of cylindrical cells, very similar to the cells just beneath the cuticle of the leaf.