openings, where it is discharged by the overflow. The two pipes, with heated and cold water going to the bottom of the tank, as well as the two shoots containing heated and cold water to go to the surface, are also made use of to equalize the temperature during the whole operation, which is ascertained by thermometer in the square wooden box.

The steeping of coarse flax-straw is	...	...	...	...	36 to 48 hours.
The steeping of medium	ditto	...	...	...	50 to 60 hours.
The steeping of fine	ditto	...	...	...	60 to 70 hours.

The wet-rolling between cylinders after the steep is accompanied by a shower of water at 78°, not on the flax but on the top of the cylinders; this removes all the impurities, and prepares the flax for being easily dried and scutched.

No. XIX.

Report by Dr. Hector on the Samples of Prepared Fibre submitted to him for Examination.

The results obtained from the examination of the fibres submitted to me by the Commissioners are not to be considered as sufficiently reliable to warrant any final deductions as to the comparative value of the samples.

The small size of the parcels, which seldom exceeded a few ounces in weight, and the late period at which the majority of them were received, rendered it impossible to apply a sufficient number and variety of tests.

I have consented to the publication of these imperfect results only in the hope that the attention of millowners may be directed to the practical importance of such experimental and comparative investigations, as being the only method of discovering the various qualities of the fibre under different influences of soil, climate, season, and processes employed.

The results have, therefore, been given without either the names of the senders or the particular localities, but in order that deductions of a general character may be made, they have been grouped as follows:—

1. Foreign fibres for comparison.
2. New Zealand flax dressed by the method of the Natives.
3. New Zealand flax dressed by processes in which chemicals or steeping is employed.
4. New Zealand flax dressed by stripping machine.

The latter class is sufficiently extensive to admit of being sub-divided according to the district where the flax grows, which gives a slight indication of the influence of the climate; but with the small number of the experiments, and the irregular manner in which the samples have been collected, it is questionable how far these indications can be depended on. The examination comprised—

(1.) The observation of the general physical characters, such as length, colour, softness, flexibility, freedom from adherent cellular tissue.

(2.) Microscopic character of the fibre. To effect this a single fibre was soaked and broken by a gentle strain under water and transferred at once to a glass slide and examined. In some cases the same specimen was afterwards carefully mounted for future reference.

(3.) The strength of the fibre was tested. To do this effectually the breaking strain of the straight fibre, the fibre when wound, spun and laid under tension for different periods, when exposed to torsion, and all the above while wet as well as dry, together with many other tests that readily suggest themselves—should have been ascertained; but as already explained, the small size of most of the samples, the absence of reliable data concerning their history, and the haste with which the experiments had to be performed amidst many other distracting employments, limited me to the determination of the single test of their comparative strength when twisted into a cord. After several trials a machine was contrived by which a gradually increasing strain is applied to the cord that is being tested; one end being attached to a spring balance and the other to a frame that is carried steadily down by a screw. The indication of the balance shows the strain on the fibre at the breaking point, while the extension of the cord can also be observed.

The ends of the cord are carried over a smooth metal bar and attached to an iron peg in the same manner as the strings of a violin. The rapidity and certainty with which this test can be applied would render it possible to operate on a very large series of cords of each sample, and so enable a fair average to be obtained.

The quantity of each sample to be tested was carefully obtained by the weight of well-cleaned fibres cut to a constant length. These weighed quantities were then carefully twisted into a double strand twine like the commonly used cracker of a whip. To insure an even twist the whole of the samples were laid by one person, which very laborious operation was undertaken by Mr. Seymour, whose material assistance in performing these experiments enabled me to accomplish them in time for this report.

The test as applied indicates fairly the breaking strain of the specimens operated on; but as only from two to five trials were made of each different kind, the average stated is frequently that of a few discordant results. A glance at the appended table will show that the discordance was greatest in the Manilla and Russian hemp; but that with few exceptions the characteristic breaking strain of the different samples of New Zealand flax, was closely approximated to in all the specimens. All unfair breaks were thrown out, and in nearly every accepted result the break took place between the points of contact at either end.

As might be expected, the scutched flax as a rule gives higher results than the unscutched, as no hand-cleaning can equal that by machinery.

The microscopic examinations disclosed two very characteristic forms of break of the fibre which are evidently caused by the amount of lateral adhesion which the minute fibres possess in proportion to their longitudinal strength.