CATALOGUE OF NATURALIZED PLANTS OBSERVED AT KORORARIKI, BAY OF ISLANDS.

Ranunculus, sp.
Nasturtium officinale
Erysimum officinale
Senebiera coronopus
„ pinnatifida
Capsella Bursa-pastoris
Lepidium ruderale
Brassica campestris
Silene quinquevulnera
Stellaria media
Cerastium viscosum
Portulaca oleracea
Polycarpon tetraphyllum
Spergula arvensis
Malva rotundifolia
„ sp.
Pelargonium quercifolium
Erodium circutarium
„ „ var. littorale
„ moschatum
Trifolium repens
„ pratense
„ minor
Melilotus arvensis
Medicago lupulina
„ maculata
Rosa rubiginosa
Lythrum hyssopifolium
Apium leptophyllum*
Erigeron canadensis
Senecio vulgaris
Carduus Marianus
Carduus lanceolatus
Hypochæris radicata
Xanthium spinosum
Anagallis arvensis
Physalis peruviana
Lycium barbarum
Veronica serpyllifolia
Mentha aquatica
Stachys arvensis
Marrubium vulgare
Prunella vulgaris
Plantago major
Rumex obtusifolius
„ Acetosa
Chenopodium murale
Amaranthus Blitum
„ retroflexus
Euphorbia Peplus
„ Helioscopia
Iris germanica
Agave americana
Phalaris canariensis
Holcus mollis
Anthoxanthum odoratum
Panicum sanguinale
Cynodon Dachtylon
Agrostis vulgaris
Poa annua
Dactylis glomerata
Festuca bromoides
Lolium perenne

ART. XI.—*On some Experiments in Hydraulic Mortar, in Auckland.* By JAMES STEWART, Esq., C.E., Assoc. Inst. C. E.

[Read before the Auckland Institute, July 6, 1868.]

THE importance of obtaining, in Auckland, a lime of sufficient hydraulicity to enable it to be used in mortar intended for wet situations, has long impressed the writer. The absence of such, in regular supply, leads to great expence in the employment of cement, which is always, when obtainable, very dear, and, so far as has come within the writer's experience, of not more than one-half the value of the best as used in England.

The lime commonly used in the making of mortar in Auckland, is

* This plant was observed in the forest at Kawau, and is not unlikely to prove indigenous. It is found in East Australia, and North and South America.

obtained from sea shells, or limestone from Mahurangi. The shell lime is, of course, rich lime, and possessing no hydraulicity more than that from pure chalk. The stone lime usually worked, is not in any appreciable degree hydraulic; neither is it so rich as the shell lime. If properly used however, it is preferable to shell lime for all work. In dry situations it sets very hard, and takes a good surface by the gradual reversion to the state of carbonate of lime. The writer has never seen an analysis of this lime, but he has tried, mechanically, several samples of it in the state of hydrate of lime, by separating the sand mechanically combined, and has usually found about twenty per cent. of sand present.

Having ascertained that lime had, on several occasions, been obtained at Mahurangi and Whangarei, possessing some qualities very different from the ordinary Mahurangi lime, the writer was induced to investigate the properties of some limestone from Mahurangi, but obtained on the opposite side of the river from whence that commonly used is procured.

A freshly burnt sample was obtained, as also a portion of the unburnt stone. The latter was analyzed by Mr. Strehey, then in Auckland. The result was

Carbonate of lime.	78·0
„ Iron	4·2
„ Magnesia . . .	0·4
Silicate of Alumina.	13·5
Water.	3·9
	100·0

The above analysis indicates a moderately hydraulic lime, and it agrees well with the practical tests to which the sample was put. The rock as then worked was, however, by no means homogenous, so that neither test could be depended on as fairly representing the whole. It will be observed that the silicate of alumina, or clay, is 13·5 per cent. of the whole, and it is now pretty well agreed that it is this which is the active substance in giving hydraulicity to lime. Also, that even in the most highly burnt limes and cements, the lime and silicate of alumina are only mechanically combined, until the formation of a hydrate takes place.

The practical tests to which the lime was subjected were:

(1.) The slaking, by immersing a piece in water for about half a minute, and observing the time which elapsed before it became powdery. This was generally about ten minutes.

(2.) A strong paste was formed by the addition of water, and a saucer was filled and immersed in water. The hardening process was observable in about three weeks, and in two months it required considerable pressure to force a penknife into the mass.

(3.) A portion was made into mortar with common sharp sand, and it exhibited middling setting powers under water.

(4.) Another portion was mixed with sifted volcanic sand, in various proportions, and made into mortar. This showed a considerable improvement in the hardening under water. The best proportions were found to be equal parts of sand and lime.

The above investigations were undertaken about three years ago, and were mainly instigated by the scarcity of Portland cement in Auckland,

£2 to £3 being asked for this, per barrel, at the time; and some of the samples, to the writer's knowledge, were about as much worth as so much road dust. The railway was then in progress, and the contractor for the first section had failed to procure a supply of cement in time. The results of the trials of the lime, induced the writer, as Engineer in charge of the works, to authorize the employment of the above lime and pure volcanic sand, as mortar, in the construction of the tunnel. The lime was brought to the works unslaked, and used as soon as possible. No more water was used than sufficed to work the mortar, and the working up of mortar that had partially set in the heap, was forbidden. The best proportions were found in practice to be, 5 parts of lime to 4 parts of sand. This was owing to the extreme sharpness of the volcanic sand, and also to the fact that it was often sifted too large. The same cause renders the joints of the brickwork too large for sightliness, but the result so far as strength is concerned is very satisfactory. If the sand were obtained from volcanic gravel ground by edge runners, it is likely that the common proportions of lime and sand would suffice.

It is to be regretted that a regular supply of this lime was not obtained after all the trouble about it. It was also often not well burnt, causing great waste in slaking and sifting. Hence, common lime was often smuggled into the work, and where such was the case it has not failed to show itself.

During the progress of the works, specimens were regularly taken and tested. They showed more of the properties of cement than of mortar made by lime; and the writer is confident that with further investigations, and with due precautions, Hydraulic lime, equal to the bulk of the imported Portland cement, may be obtained.

Most of the foundations of the stone work in the viaduct in Mechanic's Bay, are laid in the above lime. Often, however, common lime was used with a small mixture of cement. When both these materials are good, this has always been found, in the writer's experience, to produce hydraulicity to an extent proportional to the quantity of the latter.

The writer regrets that all the specimens of the test bricks were not carefully preserved. They were commonly left on the works, in some pool of water or running stream, and often broken for examination. One only has been retained, and that more by accident than design. It is now produced. The bricks are joined by the mortar used in the foundation of the sea abutment of the viaduct. The materials then being used were, the hydraulic lime 2 parts, volcanic and common sand each 1 part. The specimen was laid at once in a pool of water, and a short time afterwards circumstances caused it to be looked for and preserved. Samples of the volcanic sand mentioned, are also here shown, of the black and red. The latter is more abundant in the necessary fineness, but both were used as they could be procured.

It is not believed that this sand possesses properties in the same degree as the Puzzuolanos of Italy; but it is possible that, on analysis, it may be shown to possess a somewhat similar composition.

The limestone of Whangarei is believed by many, to be eminently hydraulic. It is of great importance that such should be ascertained by careful and complete analysis of fair samples of the stone. The importance of the subject to Hydraulic Engineering, and to the colony at large,

cannot be overrated. Should the above remarks prove of interest or use to any one, the writer will feel amply repaid for the trouble of collecting them; he only regrets that they are so crude and incomplete.

ART. XII.—*Notes on the Birds of the Great Barrier Island.* By Captain F. W. HUTTON, F.G.S.

[Read before the Auckland Institute, July 6, 1868.]

HAVING spent two months, this summer, in exploring the Great Barrier Island, I am enabled to lay before the Society, what I consider to be a tolerably complete list of the birds found there.

I have given the English names of those birds that I know to possess one, but many, of course, are known by their scientific names only. The native names were obtained from Maories on the Island.

* 1. Hieracidea Novæ Zelandiæ. Sparrow-Hawk.
* 2. Circus Gouldi. Hawk. Common.
* 3. Athene Novæ Zelandiæ. More-Pork. Heruru. Kou-kou.
4. Halcyon vagans. King-fisher.
* 5. Prosthemadera Novæ Zelandiæ. Tui. Very abundant.
* 6. Pogonornis cincta. Ihi. Not uncommon.
* 7. Anthornis melanura. Bell-bird. Korimoko. Abundant.
* 8. Acanthisitta chloris. Miru-miru. At Harataonga.
* 9. Mohoua albicilla. Popokotea. Very common.
10. Sphenœacus, sp. Matata. Kaitoke swamp.
* 11. Gerygone flaviventris. Riro-riro. Common.
12. Certhiparus Novæ Zelandiæ. Seen by Mr. Kirk on Arid Island.
13. Zosterops dorsalis. White eye. I did not see this bird, but Mr. Allom informed me that it had been on the island for the last four years.
* 14. Petroica longipes. Totowai. Robin. Common.
* 15. Petroica toi-toi. Miro-miro.
16. Anthus Novæ Zelandiæ. Pihoihoi. Lark. Common.
* 17. Rhipidura flabellifera. Piwaka-waka. Fantail. Common.
18. Callæas cinerea. Kokako. New Zealand Crow.
* 19. Creadion carunculatus.† Tieke. Saddle-back. Not uncommon.
* 20. Platycercus pacificus. Kakariki. Parrakeet. Common.
* 21. Platycercus auriceps. Parrakeet. Common.
* 22. Nestor meridionalis.† Kaka. Not common.
23. Eudynamys taitensis. Long-tailed Cuckoo. Koekoea.
24. Chrysococcyx lucidus. Shining Cuckoo. Pipiuwaroa.
* 25. Carpophaga Novæ Zelandiæ. Pigeon. Kuku.
26. Charadrius obscurus. Tuturiwata. East Coast. Common.
27. Thinornis Novæ Zelandiæ. Kukuruatu. At Whangapoua.
* 28. Hæmatopus unicolor. Torea. Red-bill. East Coast.
29. Ardea Matook. Heron. Matuku. Port Fitzroy.
30. Botaurus poicilopterus. Matuku-nurepo. Bittern. Kaitoke swamp. Rare, not seen by me.
31. Limosa Novæ Zelandiæ. Kuaka. Godwit. East Coast.

† Very common on Little Barrier.