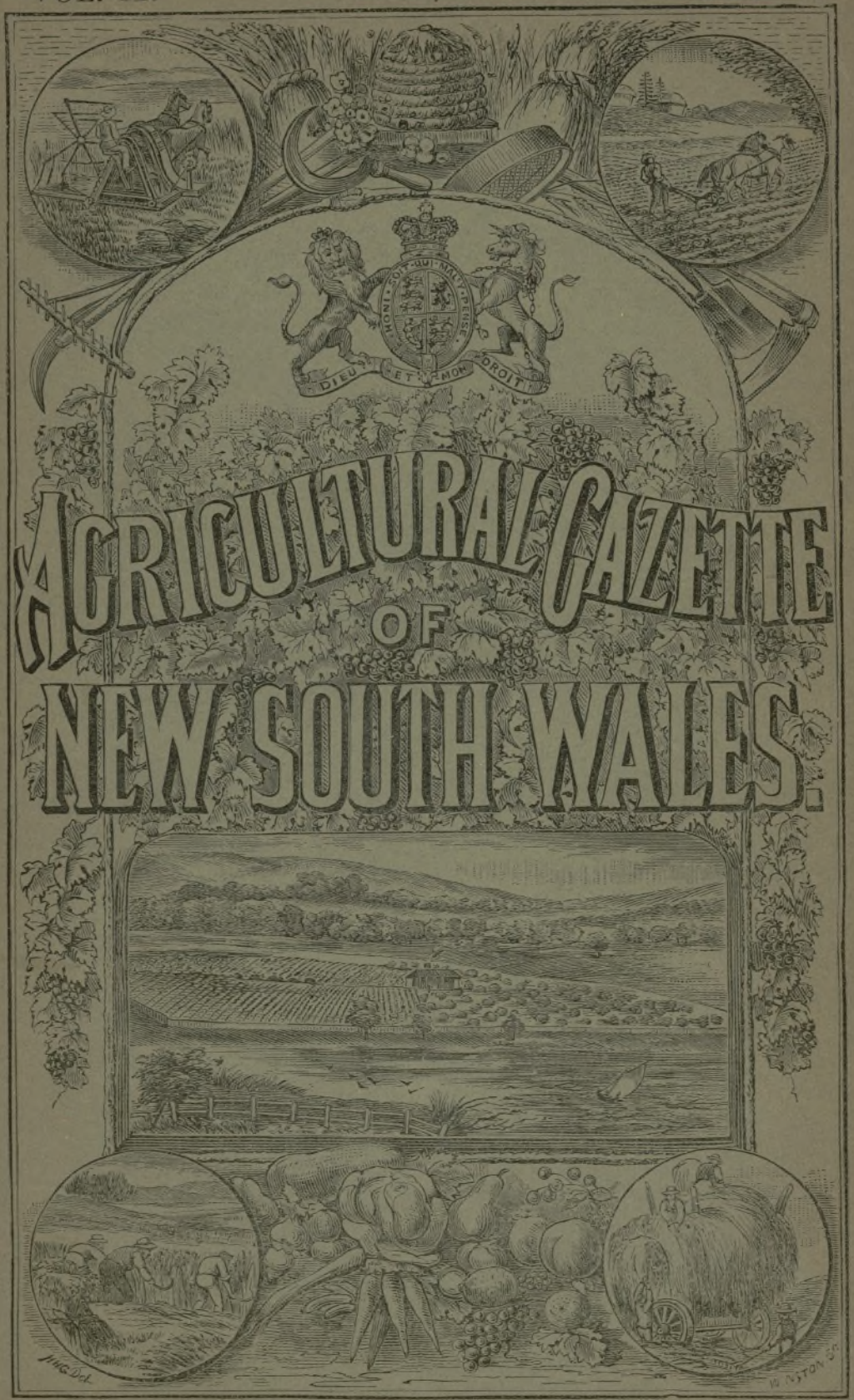
VOL. II. APRIL, 1891. PART 4.



SYDNEY: GEORGE STEPHEN CHAPMAN, ACTING GOVERNMENT PRINTER.
57—91 [1s. for a Single Number, or 10s. per Annum.]

THE AGRICULTURAL GAZETTE

OF

NEW SOUTH WALES,

ISSUED BY DIRECTION OF

THE HON. SYDNEY SMITH, M.P.,
SECRETARY FOR MINES AND AGRICULTURE.

H. C. L. ANDERSON, DIRECTOR.

VOL. II. PART 4.

APRIL, 1891.

By Authority:
SYDNEY: GEORGE STEPHEN CHAPMAN, ACTING GOVERNMENT PRINTER.
1891.
[1s. for a Single Number, or 10s. per Annum.]
11b 57—91

CONTENTS.

PAGE.

THE UNITED KINGDOM AS A MARKET FOR SURPLUS MEAT, DAIRY, AND OTHER PRODUCE 167

THE GRASSES OF NEW SOUTH WALES ... ... F. Turner 172
Panicum crus-galli, Linn. ("Barn-yard grass"); Panicum sanguinale, Linn. ("Summer Grass"); Danthonia pallida R. Br. ("Silver-topped Grass").

THE WEEDS OF NEW SOUTH WALES ... ... F. Turner 175
Argemone mexicana, Linn. ("Devil's fig" "Mexican Poppy").

NOTES ON ECONOMIC PLANTS 176
Sisal Fibre Ramie; Tree Tomato; Alligator Pear.

NOTES ON WEEDS 177
Black Oats, Psoralea adscendens, F. v. M.; Acæna ovina, A. Cunn.; Rumex pulcher, Linn.; Epilobium junceum, Forst.; Melilotus parviflora, Forst.; Eryngium rostratum, Cav.; Anagallis arvensis, Linn.; Vittadenia australis, A. Rich. var. dissecta; Chenopodium carinatum, R. Br.; Centaurea calcitrapa, Linn.; Sisymbrium officinale, Scop.; Chenopodium album, Linn.; Eryngium rostratum, Cav.; Calocephalus citreus, Lees.; Centaurea melitensis, Linn.; Carthamus tinctorius, Linn.; Centaurea solstitialis, Linn.; Polygonum aviculare, Linn.; Amarantus paniculatus, Linn.; Amarantus viridis, Linn.; Vittadenia australis, A. Rich.; Oxalis corniculata, Linn.; Verbena officinalis, Linn.; Gnaphalium japonicum, Thunb.; Mentha satureioides, R. Br.; Plantago varia, R. Br.; Sonchus oleraceus, Linn.; Xanthium spinosum, Linn.; Carduus marianus, Linn.; Onopordon acanthium, Linn.; Dodder (Cuscuta epithymum, Willd.)

RATIONAL PRINCIPLES OF FEEDING.—No. I 182

THE PROFITABLE COW... ... ... J. A. Robertson 186

THE PIG... ... ... J. L. Thompson 188

FOOT-ROT IN SHEEP ... ... E. Stanley 203

SUSCEPTIBILITY OF KANGAROO TO ANTHRAX. M. Loir and E. Stanley 206

PAGE.

THE SUGAR BEET ... ... J. A. Despeissis 208

HAIR WORM, Gordius sp. ... ... N. A. Cobb 213

PATHOLOGICAL NOTES ... ... N. A. Cobb 215
Maize Rust, Apple Scab (Fusicladium dendriticum).

LAND DRAINAGE, Article I ... ... The Director 217

INSECT PESTS ... ... A. S. Olliff 218
The Fig-leaf Beetle (Galerucella semipullata, Clark).

ANALYSES OF COMMERCIAL FERTILIZERS, &c. 220
Bone-dust Manure (Sydney Soap and Candle Co.)—Sugar Co's. No. 5.

ANALYSES OF SOILS (Table) ... ... A. Helms 222

GENERAL NOTES 223
Gum-leaf extract for destroying insects.—Pest-proof tree stocks.—Grafting reputed blight-proof apples on blighty stocks.—Analysis of water from Hay.—The Strawsonizer.—Fruit from Young.—Sugar beet for distribution.—Hawkesbury Agricultural College, list of officials.—Saving cabbage seed.

The United Kingdom as a Market for our Surplus Meat, Dairy, and other Produce.

While some of our pastoralists and dairy farmers are availing themselves of the advantages which the introduction of artificial cold has conferred, comparatively few of them have, as yet, given this discovery, now turned in other parts of the world to such practical account, the consideration it deserves, and fewer still have a correct idea of the extent and importance of the markets which it has opened up in the United Kingdom for Australian produce. The Chief Inspector of Stock (Mr. Alex. Bruce) has therefore suggested that the following tables, taken from the last Annual Report of the Royal Agricultural Society of England, should be published for the information of those concerned. These show what a grand opening there is in the home markets for our produce, provided always that it is of high quality.

As bearing upon this point (quality), the following extract from the Trade Circular of Messrs. Cruickshank & Lovell, of Lower Thames-street, London, E.C., dated 21st January, 1891, is both interesting and important. "The fine quality of Australian butter received this season continues to meet a good market, and is readily cleared. All our consignments we receive direct from Australia, and from present advices we have over 50 tons *en route* for us. We expect shipments *ex* s.s. "Oceana," docked yesterday, in warehouse to-morrow. Comparing quality and value with French and Danish butter it is undoubtedly the best value on the market."

In connection with this particular trade it may be well to mention that the Minister of Mines and Agriculture has approved of the establishment of a travelling dairy, to proceed from district to district throughout the Colony, in order to impart instruction to the settlers in the multitudinous subjects relating to this branch of the Farming Industry. Applications have been invited for the position of Manager.

Table No. 4 will be interesting as showing the relative wealth of the principal countries of the world in horses, cattle, sheep, and pigs.

TABLE I.

NUMBER and Value of live Cattle, Sheep, and Swine imported into the United Kingdom in the undermentioned years.

(*From Trade and Navigation Returns.*)

	Number.			Value.		
	1887.	1888.	1889.	1887.	1888.	1889.
OXEN & BULLS.				£	£	£
From Denmark	25,079	27,385	30,047	295,295	334,451	359,245
,, Germany	7,873	10,304	.....	123,672	176,347	.....
,, Spain	6,653	11,484	11,587	108,428	188,614	190,754
,, Canada	62,537	58,761	82,207	1,089,352	1,036,269	1,424,731
,, United States	94,642	142,865	294,128	1,849,307	2,840,911	5,793,366
,, Other Countries	22,438	36,467	23,842	336,601	554,245	365,372
Total	219,222	287,266	441,811	3,802,655	5,130,837	8,133,468
COWS.						
From Denmark	28,711	35,439	47,895	329,253	410,867	539,436
,, Sweden	1,872	3,061	2,887	22,933	34,648	32,409
,, Germany	2,263	4,239	.....	32,908	66,415	.....
,, Canada	2,588	2,216	2,237	45,470	40,354	39,342
,, United States	215	630	262	3,567	12,415	4,285
,, Other Countries	3,117	4,139	7,085	54,882	70,283	116,913
Total	38,766	49,724	60,366	489,063	634,982	732,385
CALVES.						
From Denmark	4,044	4,235	10,911	16,163	15,959	39,474
,, Holland	32,734	35,494	41,214	129,424	128,863	160,282
,, Canada	29	167	144	58	454	249
,, United States	1	.....	33	5	.....	111
,, Other Countries	265	202	742	1,437	879	3,338
Total	37,973	40,098	53,044	147,087	146,155	203,454
SHEEP & LAMBS.						
From Denmark	97,845	94,454	153,362	134,843	134,949	226,163
,, Germany	321,085	299,589	193,191	554,596	536,851	318,939
,, Holland	501,701	498,458	198,035	867,673	954,268	422,129
,, Canada	35,473	45,339	55,857	65,738	89,272	111,128
,, United States	1,027	1,203	18,690	2,040	1,956	33,288
,, Other Countries	14,272	17,167	58,923	20,947	23,253	80,760
Total	971,403	956,210	678,058	1,645,837	1,740,549	1,195,407
SWINE.						
From Denmark	885	16,325	19,719	2,485	56,521	70,036
,, Holland	20,947	8,173	1,675	61,549	18,230	3,183
,, Canada	3	.....	.....	6	.....	.....
,, United States	.....	.....	.....	.....	.....	.....
,, other Countries	130	11	3,930	384	33	13,154
Total	21,965	24,509	25,324	64,424	74,784	95,373
Total value of all kinds	.....	.....	.....	6,149,066	7,727,307	10,300,087

TABLE II.

QUANTITY and Value of Dead Meat imported in the four years, 1886–89.

(*From Trade and Navigation Returns.*)

[Thousands ("000") omitted.]

Dead Meat.	1886.		1887.		1888.		1889.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
BACON.	cwt.	£	cwt.	£	cwt.	£	cwt.	£
From United States	2,578	4,321	2,203	4,229	1,865	3,853	2,548	4,810
,, other Countries	678	1,822	798	2,101	989	2,540	950	2,477
Total	3,256	6,143	3,001	6,330	2,854	6,393	3,498	7,287
BEEF.								
Salted.								
From United States	183	304	206	310	213	325	254	352
,, other Countries	12	22	15	24	13	24	11	19
Total	195	326	218	334	226	349	265	371
Fresh.								
From United States	762	1,768	645	1,456	785	1,815	1,270	2,812
,, other Countries	45	94	13	25	52	106	110	203
Total	807	1,862	658	1,481	837	1,921	1,380	3,015
HAMS.								
From United States	841	1,971	814	2,097	647	1,697	873	2,217
,, other Countries	102	266	107	293	81	227	104	284
Total	943	2,237	921	2,390	728	1,924	977	2,501
MEAT, UNENUMERATED.								
Salted or Fresh.								
From United States	2	3	6	13	3	6	22	48
,, other Countries	40	110	41	103	53	114	69	149
Total	42	113	47	116	56	120	91	197
Preserved, otherwise than by salting.								
From Australasia	57	136	167	387	123	267	65	156
,, United States	293	663	228	531	263	630	412	932
,, other Countries	80	368	124	432	151	480	166	544
Total	430	1,167	519	1,350	542	1,377	643	1,632
MUTTON, FRESH.								
From Holland	52	131	63	152	88	190	78	175
,, Australasia	383	842	441	925	543	1,104	613	1,292
,, other Countries	217	432	281	500	358	647	536	1,112
Total	652	1,405	785	1,577	989	1,941	1,227	2,579
PORK.								
Salted or Fresh (not Hams).								
From United States	213	295	192	275	150	238	192	283
,, other Countries	159	335	236	498	338	679	194	393
Total	372	630	428	773	488	917	386	676
Total of Dead Meat	6,697	13,882	6,577	14,351	6,720	14,942	8,467	18,258

TABLE III.

QUANTITIES and Values of Butter, Margarine, Cheese, and Eggs imported into the United Kingdom in each year, from 1887 to 1889 inclusive.

(*From Trade and Navigation Returns.*)

	Quantities.			Values.		
	1887.	1888.	1889.	1887.	1888.	1889.
BUTTER.	cwt.	cwt.	cwt.	£	£	£
From Denmark	487,603	604,512	677,491	2,669,125	3,335,064	3,743,576
,, Germany	156,430	160,915	111,027	793,579	813,198	588,660
,, Holland	164,474	155,020	151,073	851,467	784,523	767,457
,, France	416,067	439,993	566,524	2,264,669	2,378,835	3,073,473
,, Canada	32,623	9,173	22,634	139,566	40,779	95,167
,, United States	52,329	23,207	110,187	213,712	93,243	448,825
,, Other Countries	205,379	276,494	288,533	1,084,651	1,456,533	1,526,570
Total	1,514,905	1,669,314	1,927,469	8,016,769	8,902,193	10,243,728
MARGARINE.						
From Norway	16,650	7,784	11,051	61,962	25,045	33,399
,, Holland	1,172,074	1,043,401	1,137,094	3,546,591	2,951,522	3,280,628
Belgium	22,895	6,676	10,527	70,301	18,130	30,269
,, Other Countries	61,476	80,313	82,083	191,094	269,129	308,426
Total	1,273,095	1,138,174	1,240,760	3,869,948	3,263,826	3,652,722
CHEESE.						
From Holland	362,014	328,801	327,384	883,934	822,498	807,037
,, France	30,260	29,304	32,941	99,667	92,428	106,057
,, Canada	631,837	667,461	675,900	1,552,764	1,523,833	1,565,526
,, United States	759,463	812,430	827,626	1,847,412	1,905,776	1,899,864
,, Other Countries	50,893	79,545	45,694	125,160	197,743	116,070
Total	1,834,467	1,917,541	1,909,545	4,508,937	4,542,278	4,494,554
EGGS.	great hundreds.	great hundreds.	great hundreds.			
From Germany	3,209,799	3,707,091	2,998,865	943,914	1,146,739	893,902
,, Belgium	1,678,420	1,582,929	1,817,353	552,598	490,011	565,057
,, France	3,070,525	2,692,057	2,950,566	1,251,688	1,053,309	1,181,335
,, Other Countries	1,111,093	1,338,540	1,649,855	332,361	387,050	482,519
Total	9,069,837	9,320,617	9,416,639	3,080,561	3,077,109	3,122,813

TABLE IV.

NUMBER of Horses, Cattle, Sheep and Pigs, in the undermentioned Countries, for each of the years indicated.

(*From Board of Trade Returns.*)

Countries.	Years.	Horses.	Horned Cattle.	Sheep and Lambs.	Pigs
		No.	No.	No.	No.
United Kingdom	1887	1,936,925	10,639,960	29,401,750	3,720,957
	1888	1,936,702	10,268,600	28,938,716	3,815,643
	1889	1,945,386	10,272,765	29,484,744	3,905,865
Australasia	1886	1,373,346	8,228,628	86,245,720	1,053,453
	1887	1,438,551	8,873,574	97,239,986	1,071,773
	1888	1,485,923	9,106,695	96,121,148	1,071,773
Canada*	1886	617,376	2,192,099	1,643,534	941,446
	1887	629,144	2,158,306	1,440,136	868,530
	1888	596,218	1,928,638	1,349,044	819,079
Cape Colony	1888	266,120	1,292,039	13,177,285	142,479
	1889	295,370	1,502,845	14,463,445	166,835
Natal	1886	50,012	629,725	676,437	32,927
	1887	54,326	611,794	484,288	46,306
	1888	49,548	655,932	609,805	45,569
Austria	1869	1,384,623	7,421,915	5,026,392	2,551,973
	1880	1,463,282	8,584,077	3,841,340	2,721,541
Hungary	1870	2,158,819	5,279,193	15,076,997	4,443,279
	1880	2,078,528	5,311,378	9,838,133	4,160,127
	1884	1,748,859	4,879,033	10,594,831	4,803,639
Belgium	1866	283,163	1,242,445	586,097	632,301
	1880	271,974	1,382,815	365,400	646,375
Denmark	1876	352,262	1,348,321	1,719,249	503,667
	1881	347,561	1,470,078	1,548,613	527,417
	1888	375,533	1,459,527	1,225,196	770,785
France	1885	2,911,392	13,104,970	22,616,547	5,881,088
	1886	2,938,489	13,275,021	22,688,230	5,774,924
	1887	2,908,527	13,395,259	22,880,190	5,978,916
Germany	1873	3,352,231	15,776,702	24,999,406	7,124,088
	1883	3,522,545	15,786,764	19,189,715	9,206,195
Holland	1886	272,700	1,530,800	802,700	458,200
	1887	274,300	1,525,600	804,300	490,254
Italy	1875	657,544	3,489,125	6,977,104	1,553,582
	1881	660,123	4,783,232	8,596,108	1,163,916
Norway	1865	149,167	953,036	1,705,394	96,166
	1875	151,903	1,016,617	1,686,306	101,020
Russia in Europe	1877	17,589,118	27,323,219	51,822,238	10,839,093
	1882	20,015,659	23,845,104	47,508,936	9,207,666
	1883	17,880,792	23,628,031	46,724,736	9,361,980
Sweden	1885	480,330	2,366,286	1,442,396	515,556
	1886	484,885	2,381,467	1,443,676	548,210
	1887	481,257	2,330,706	1,377,685	571,114
United States of America	1886	12,496,744	48,033,833	44,759,314	44,612,836
	1887	13,172,936	49,234,777	43,544,755	44,346,525
	1888	13,663,294	50,331,042	42,599,079	50,301,592

* The figures given for Canada in 1886 and 1887, relate to the Provinces of Ontario, Manitoba, and the N. W. Territories. In 1888 the numbers for Ontario only are shown.

The Grasses of New South Wales.

(*Continued from page* 123.)

By F. TURNER, F.R.H.S.,
Botanist to the Department of Agriculture, New South Wales.

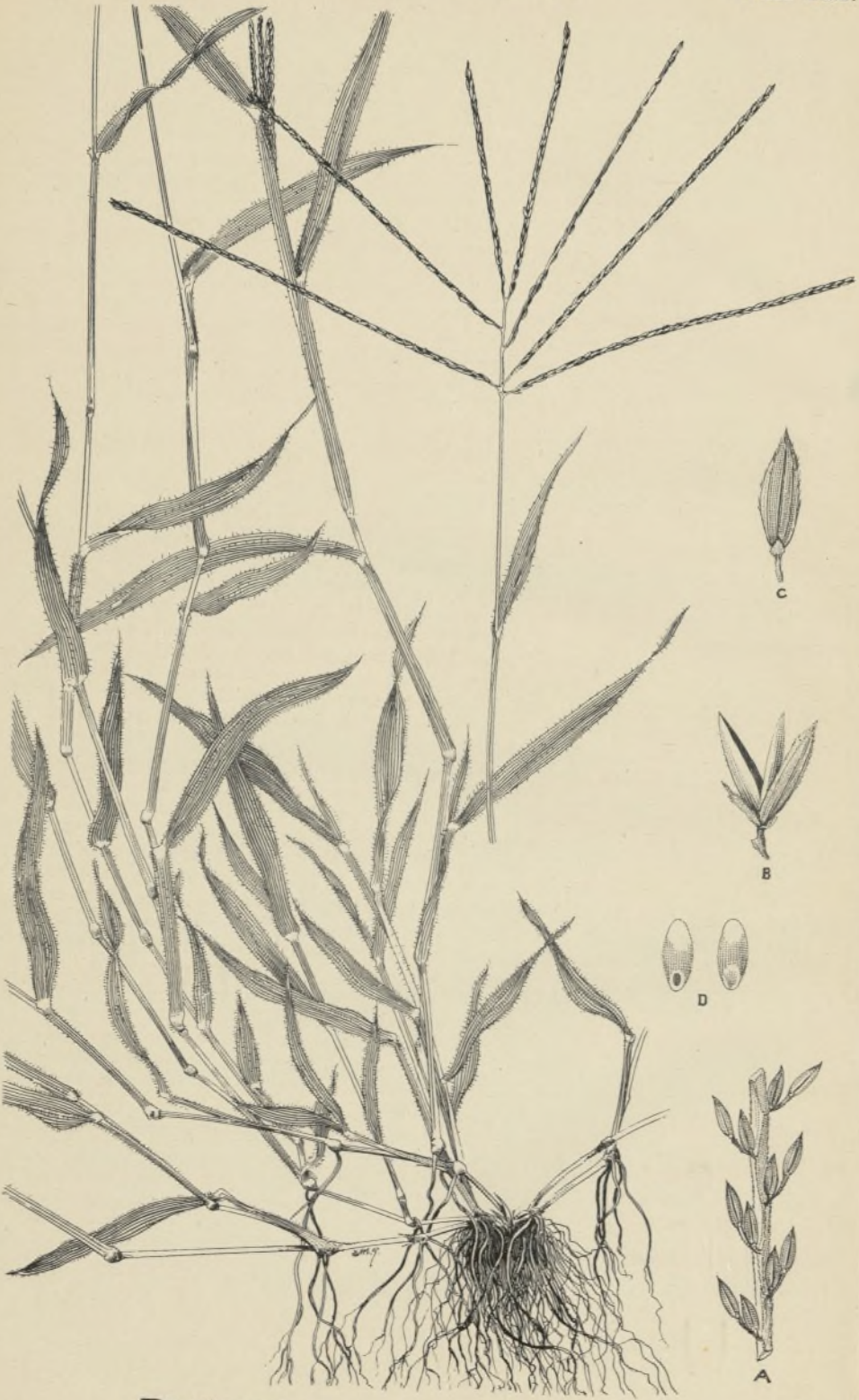
PANICUM CRUS-GALLI, *Linn.* "Barn-yard Grass."
Flora Austr., Vol. VII, p. 479.

A COARSE decumbent annual, ascending to 2 or more feet. The leaves rather broad, without any ligula. Panicle dense and usually secund; of simple branches or sessile spikes, the lowest 1 inch to 2 inches long, the upper ones gradually shorter; the whole panicle in some varieties densely hispid with long purplish or green awns. Spikelets about 1½ lines long, more or less pubescent, acuminate, or awned, crowded and clustered along the branches; the rhachis usualy bearing numerous cilia or capillary bristles amongst or below the spikelets. Outer glume very short and broad; second and third glumes nearly equal, and three nerved, usually ciliate on the margins; the second produced into a rather short awn, the third in the common Australian form with an awn varying from ½ to 1 inch, and a thin palea, and very rarely a male flower in its axil. Fruiting glume smooth and shining, without any, or only a very short, point.

An annual species, growing from 2 to 8 feet high, which is found generally in the coastal districts, and in some places is fairly plentiful. On moist land this strong grass yields an enormous amount of rich succulent herbage, which is much relished by stock of all kinds. It is especially valuable for milch cows. Some few years ago I saw this grass cultivated on the low moist lands between Cook's and George's Rivers, and bundles of it sold for green feed in Sydney during the summer months. It is worthy of extensive cultivation on low moist lands in the coastal districts, not only as supplying valuable forage, but from the enormous amount of herbage it yields it ought to make good ensilage. There would be no difficulty in bringing this grass under systematic cultivation, as it produces a great amount of seed, which is easily collected. From the accompanying engraving a collector cannot mistake this species for any other. The seeds ripen during the late summer and autumn months. Within the suburban railway line enclosure, near the Newtown Railway Station, I saw a fine patch of this grass growing recently, from which as much seed could have been gathered as would have sown several acres. This species is very common in nearly all the hot and temperate parts of the earth. In America it is very highly prized. One writer says that "it gives 5 tons of hay per acre without care or cultivation, and that on the Mississippi hundreds of acres are annually mowed on single farms."

Reference to plate.—A, Showing the arrangement of the spikelets on the rhachis; B, an open spikelet, showing the three outer glumes, and thin palea, the fruiting glume, and palea; C, showing the size of the outer glume on the spikelet; D, grain, back and front views. All variously magnified.

Panicum crus-galli. Linn.
(Barn Yard Grass.)



Panicum sanguinale. Linn.

(Summer Grass.)

PANICUM SANGUINALE, *Linn.* "Summer grass."

(*Flora Austr., vol. VII., p.* 469.)

DECUMBENT, and often shortly creeping and rooting at the base, ascending to 1 foot or rather more. Leaves flaccid, flat, usually pubescent, and sprinkled with long hairs, especially on the sheaths, but sometimes nearly glabrous. Spikes or panicle-branches three to eight, crowded at the end of a long peduncle, all from nearly the same point or shortly distant, 1½ to 3 inches, or, in some varieties, above 4 inches long; the rhachis slender but angular, flexuose, scabrous-ciliate; spikelets in pairs, one nearly sessile, the other pedicillate, oblong, rather acute, and about 1½ lines long. Outer glume minute, rarely above ¼ line long; the second glume lanceolate, three nerved, from one-half to three-quarters the length of the spikelet; the third glume usually five-nerved, glabrous, or slightly ciliate, in the Australian specimens, empty; fruiting glume shorter, smooth.

An annual species, which is common all over the eastern portion of the Colony. It is a creeping, quick growing grass, and a great pest in cultivated ground to farmers, orchardists, and gardeners. It will grow in almost any kind of soil and in any situation, provided that it is not too cold. This grass produces a great amount of forage in an incredibly short space of time, and being of a succulent nature it is relished by all pasture animals. In America this grass is highly spoken of, and it is said that horses are so fond of the hay made from it that they leave all other fodder for it. This species produces an abundance of seed, which ripens in January, February, and March. It is said that Linnæus gave the specific name "sanguinale" to this grass, from a trick that the boys had in Germany of pricking one another's noses with the spikes until they bled.

In the *Hortus Gramineus Woburnensis*, occurs the following passage with reference to this grass:—"It produces much seed, of which birds are very fond, and requires to be protected by nets, or otherwise, during the time of ripening. The smaller birds pick out the ripe seed, even when only a small quantity is formed among the blossoms. The common method of collecting it and preparing it in Germany is as follows: At sunrise the seed is gathered or beaten into a hair sieve from the dewy grass, spread on a sheet, and dried for a fortnight in the sun; it is then gently beaten with a wooden pestle in a wooden trough or mortar, with straw laid between the seeds and the pestle till the chaff comes off; they are then winnowed. After this, they are again put into a trough or mortar in rows, with dried marigold flowers, apple and hazel leaves, and pounded till they appear bright; they are then winnowed again, and being made perfectly clean by this last process, are fit for use. The marigold flowers are added to give the seeds a fine colour. A bushel of seed with the chaff yields only about two quarts of clean seed. When boiled with milk and wine it forms an extremely palatable food, and is in general made use of whole in the manner of sago, to which it is in most instances preferred.

Reference to plate.—A, showing the arrangement of the spikelets on the rhachis; B, an open spikelet showing the three outer glumes, the fruiting glume, and palea; C, showing the size of the outer glume on the spikelet; D, grain, back and front views. All variously magnified.

DANTHONIA PALLIDA, *R. Br.* "Silver-topped Grass."

(*Flora Austr., Vol. VII, p.* 592.)

STEMS 2 feet high or more; often rigid but not stout. Leaves long, terete when dry, very narrow, and sometimes as slender as in *D. longifolia*; the sheaths more or less ciliate at the orifice. Panicle usually loosely branched, pale coloured, 3 to 6 inches long. Spikelets rather numerous, the outer glumes under half an inch long. Flowering glumes, three or four, not exceeding the outer ones, with long hairs on the back as well as on the margins, but scattered or in vertical lines, without the transverse ring of *D. semiannularis*; lateral lobes, lanceolate, three nerved at the base; often scarious upwards, but the central nerve continued to the apex, or produced into a point or short awn.

A perennial species, growing from 2 to 3 feet high, which is found generally on rich soils, both in the coastal and western districts. During the summer months it yields a great amount of rich succulent herbage, which is greedily eaten by stock of all kinds, sheep being particularly fond of it. This grass would well repay systematic cultivation, either for pasture or for making into hay. Like many other species of this genus of grasses, it produces an abundance of seed, which will, when ripe, germinate readily after showery weather in spring time, and in consequence it has withstood the overstocking of runs much better than many other species of grasses, for in some places it is still fairly plentiful. On the western line of railway, during the early summer months, the beautiful silvery-white panicles of this grass are often a conspicuous feature in the pastures, so that anyone desiring to collect the seed would have no difficulty in recognising the plant. In the interior this grass ripens its seeds in October and November, but in the coastal districts it is generally one month later.

Reference to plate.—A, spikelet; B, floret, showing the arrangement of the long hairs on the back, as well as on the margins; C, floret; D, grain, back and front views. All variously magnified.

Danthonia pallida. R. Br.

(Silver-topped Grass.)

Argemone Mexicana. Linn.
(Devil's Fig, or Mexican Poppy.)

The Weeds of New South Wales.

(*Continued from page* 94.)

By F. TURNER, F.R.H.S.,
Botanist to the Department of Agriculture.

ARGEMONE MEXICANA, *Linn.* "Devil's Fig," "Mexican Poppy."

An annual plant of spreading habit, growing to a height of 2 to 3 or more feet, of a light grey colour. Leaves glaucous, inciso-pinnatifid, sharply spinous. Flower-buds erect, the three sepals surrounded by three horn-like processes, which arise from their backs. Petals six, yellow, resembling those of a poppy. Capsule prickly, oblong, containing numerous pitted seeds. The juice of the plant is yellow. This thistle-like plant is the "devil's fig" of the West Indies, and the "prickly poppy" of America. It has become naturalised in several places in this Colony, and it is a suspected poison plant; but one can hardly credit that stock would browse upon a plant having such harsh spiny leaves as this one has, even if they were pressed by hunger. Once the plant gets fairly well established it is difficult to get rid of, as it produces an abundance of seed which, when ripe, germinate readily, even under adverse circumstances. No pains, therefore, should be spared to clean the land of this pest, for it not only exhausts the ground of its fertility by its long tap roots, but the thick foliage smothers the more tender and valuable herbage, and in the autumn time, when the poppy dries off, it leaves large barren patches in the pastures. The poppy being an annual plant, it can be got rid of by close attention. Keeping it cut down when it is in flower will prevent it producing seed, thereby destroying its only natural means of reproduction. If this was done for two or three years all the seeds that had previously ripened and fallen upon the ground would, have germinated, when, of course, there would be an end of the pest, or, at any rate, there would not be much left to exterminate. The Hon. Dr. Norton informs me that the plant is growing plentifully near the Nepean River, above Penrith, and also near Wellington. Dr. Woolls says the plant is plentiful on the flats near Richmond. Mr. Helms forwarded me a specimen from Bourke for identification and several specimens have been sent to the Department from various parts of the Colony for identification.

According to Dr. Lindley's *Flora Medica*, "the Spaniards call this plant *Figo del inferno*, on account of the powerful narcotic effects of its seeds, which are stronger than opium. An emulsion prepared from them acts first as an anodyne, and afterwards as a purgative. This effect is denied by some. By others it is stated that the oil obtained from the seeds is used in Nevis as a substitute for castor oil. In India the juice of the plant is used in chronic ophthalmia and in primary syphilitic sores. The infusion is said to be diuretic, and to give relief in strangury from blisters."

Reference to plate.—A, open capsule, showing some of the numerous pitted seeds which it contains; B, ovary, the sepals, petals, and stamens all taken away; C, showing the arrangement of the stamens round the ovary, the sepals and petals taken away; D, showing the pitted seeds. All the details, with the exception of the capsule, variously magnified.

Notes on Economic Plants.

Sisal Fibre.

In connection with the cultivation of sisal, the want of proper machinery for separating the fibre was a drawback which there has been some difficulty in overcoming. An application to the Colonial Secretary at Nassau, Bahamas, brought a reply to the effect that what might be considered a standard machine for the extraction of sisal fibre had not reached that part of the world, but when one was obtained full particulars would be forwarded. The Department, however, communicated with Messrs. Death & Ellwood, of Leicester, England, who forwarded a photograph of the machine made by them for this purpose. In their letter which accompanied the photograph they stated that they had already manufactured about 1,200 of these machines, principally for Progress, Yucatan, which are suitable for leaves about 4 feet long. Each machine is worked by two men, and boys supply the leaves and remove the fibre. The average yield of fibre from leaves is 4 per cent., and of each machine, per day, about 300 lb. It would take a 2½-horse power engine to drive a single machine, and the price of the machine complete, with wooden frame, is £32, and packing £2 10s. extra. The manufacturers advise that the wooden frame should accompany the first machine purchased. The diameter of the wheel is 50 inches. They also make a machine for the separation of Ramie fibre at a cost of £50, with £3 10s. extra for packing. This machine requires a pump, the cost of which is £12 10s., in addition to which a 2½-horse power engine is also required. It appears that either of the machines will extract various other fibres, but in every case the leaves must be green and fresh cut.

The Tree Tomato.

In reply to a request by Mr. H. A. Volckers, of Grafton, for some information respecting a tree tomato, the botanical name of which he gave as Cyphomandra betacea, but which he said he was unable to find in any botanical work he had by him, the Botanist supplied the following: "This name is really a synonym of Solanum betaceum, Cav. The plant is a native of Central America, but it is now cultivated in most of the warmer parts of the earth. In the second year after being raised from seed it will bear its tomato-like berries in great quantities during the summer months. The berries can be eaten raw when quite ripe, and are of a pleasant taste. The plant is worth cultivating in the warmer portions of the Colony."

The Alligator Pear.

In reply to a further inquiry, Mr. Volckers was informed that the botanical name of the alligator pear is Persea gratissima, Gaertn. It was originally a native of Mexico, but is now extensively cultivated in most of the tropical and sub-tropical parts of the world. It is a noble evergreen, bearing fruit prolifically in Southern Queensland, and there is no doubt it would grow well in the north-eastern portion of this Colony. The large pear-shaped fruits have a taste peculiar to themselves, which, once acquired, is strangely fascinating.

Notes on Weeds.

Black Oats.

In reply to inquiries by Mr. Thomas Quick, of Liverpool Plains, as to the best means of eradicating black oats, that gentleman was supplied with the following information: "Black oats are often introduced into fields along with other cereals when sufficient care has not been taken in sowing clean samples. Once the plant gets fairly well established it is not easily got rid of, especially amongst growing crops, because it seeds so prolifically, and the seeds germinate so readily. A twelve-months' fallow is the only practical way to clear land of black oats. Whilst the land lies fallow the scarifier should be put over it occasionally, which will kill the young plants before they have the opportunity to produce seed. Sufficient care is not always exercised in selecting the cleanest samples for sowing, but this is a very great mistake on the part of the farmer. It not only deteriorates the crop as regards its market value, but the land is often fouled for years afterwards with some pest or another.

Weeds from Gundaroo.

From Gundaroo, Mr. Affleck has forwarded to the Department a number of weeds growing in that district for identification. These specimens have been dealt with by the Botanist, and the following names and descriptions were forwarded to that gentleman:—

No. 1 is a native leguminous plant, known to botanists as Psoralea adscendens, F. v. M. It is allied to the species mentioned by Sir Thomas Mitchell, in the record of one of his expeditions, as being very tough and wiry in the stems.

No. 2 is a native rosaceous plant, known to botanists as Acæna ovina, A. Cunn. Its ovoid fruits are covered with short-barbed prickles, which are often very troublesome to the salivary glands of sheep; moreover, the prickly fruits are often troublesome to get out of wool.

No. 3 is Rumex pulcher, Linn., commonly known as the "Fiddle Dock." This plant is one of the greatest pests in cultivated land. It is supposed to be of European origin, but it is now well established in all the warmer and temperate parts of the earth. The only way to get rid of it is to grub it up, dry it, and burn it. If it is not possible to do this work at once, the plant should be kept cut down with the scythe to prevent it from seeding.

No. 3 is Epilobium junceum, Forst. A native plant, of which it is said an infusion is made, and given to persons suffering from the effects of strong drink.

No. 4 is Melilotus parviflora, Desf.; commonly known as "Hexham Scent" or "Scented Trefoil." This plant has been sent to the Department as a "capital forage plant," and also as the "greatest weed pest that ever appeared in pastures." Its peculiar odour is due to the presence of coumarine, a principle which exists likewise in several plants and grasses.

No. 5 is Eryngium rostratum, Cav. A native plant of rather striking appearance. Many exotic species of the genus are cultivated in gardens as ornamental plants. Some of them are commonly known as "Sea Hollies."

No. 6 is Anagallis arvensis, Linn., and commonly known as "Red Pimpernel" and "Shepherd's Clock." It is a weed of European origin, which has become established in many temperate parts of the earth. The plant produces a great amount of seed if left undisturbed for a time, and the fact of the seed germinating after rainfall at almost any season of the year causes it to spread over large areas in a very short period if left to grow at its own sweet will.

No. 7 is Vittadenia australis, A. Rich.; var. dissecta. A native plant of the composite order, the leaves of which are most variable in shape: sometimes they are linear, and sometimes they are twice three-lobed. Sheep occasionally eat this plant when it is in a young state, but its nourishing qualities are not considered very high.

No. 8 is Chenopodium carinatum, R. Br. A native plant which is found growing in many parts of the Colony. In the interior this plant is considered to be good forage, especially during the hot summer months while it is young. It is an annual, and generally starts into growth in October, and dies out in March.

No. 9 is Vittadenia australis, A. Rich. The same description given to No. 8 answers for this plant also.

No. 10 is Centaurea calcitrapa, Linn.; "Star Thistle." This plant, which is of European origin, is one of the worst pests ever introduced into the Colony. Although it is only an annual, still it produces, when allowed to grow undisturbed, a large amount of seed, which is easily disseminated by winds over large areas of land, so that in a few years the area occupied by it becomes considerably extended. When this plant gets established in wheat fields, it becomes really dangerous to harvesters, since the numerous spines attached to the flower heads will, on coming in contact with the skin, often cause sores which will take some time to heal. The plant might be got rid of by cutting it down just as it shows its flower heads, for at that time it readily dies.

No. 11 is Sisymbrium officinale, Scop.; "Hedge Mustard," "Crambling Rocket." A weed pest of European origin, which has spread very much in the Colony of late years. In high-class cultivation it may be kept in check by the persistent use of the hoe or scarifier. On pasture land, however, it is a rather difficult weed to get rid of, once it gets fairly established. It not only impoverishes the ground, but milch cows are fond of browsing upon it when young, and, being possessed of a pungent flavour, it taints both milk and butter, often so strongly that it is spoilt for domestic use, but in no other way does it do any harm. The plant should be kept cut down with the scythe when it appears in pastures, to prevent it seeding. By attending to it in this way it might be got rid of.

No. 12 is Chenopodium album, Linn.; "Fat Hen," "White Goose-foot." A common weed in Europe and temperate Asia, and spread as such over many parts of the world. Although it produces an abundance of seed, still it is not a bad weed to get rid of, and, besides, it is of some economic value, for the young succulent shoots can be cooked as spinach, for which it is a very good substitute during the hot summer months.

Weeds from Bathurst.

The receipt of a large number of specimen weeds for identification from Mr. J. Halstead, of Eglinton, Bathurst, caused the following detailed information to be forwarded to that gentleman, which will doubtless be of service to agriculturists, particularly in the Bathurst district:—

No. 1. "A Blue Thistle," is Eryngium rostratum, Cav., and is indigenous to the Colony. It belongs to the natural order Unbelliferæ, and is a plant of rather striking appearance. Some species are cultivated in gardens and are known by such common names as "Sea Hollies."

No. 2. "A yellow species of tussock grass," is not a grass. It is a native plant of the order Compositæ, known to botanists as Calocephalus citreus, Lees. Many composite plants are eaten by sheep, although their nutritious qualities are not considered very high.

No. 3. "A Thistle" is Centaurea melitensis, Linn. an introduced European plant, which is becoming a great pest in many parts of the Colony. The involucral spines often cause harvesters much trouble when the plants become established in wheat fields. The plant produces a great amount of seed if it is allowed to grow undisturbed, and which, when ripe, is easily disseminated by winds. Being an annual plant, it might be kept in check by united efforts. The best time to cut it down is when if shows its flowers; then it readily dies. If this were done for three or four years in succession, the plants would have no chance of seeding, and what seeds had previously laid in the ground would have germinated.

No. 4. "A Garden Thistle" is Carthamus tinctorius, Linn. The "Safflower" or "Bastard Saffron," "the Koosumbha" of India and "Hoang-tchi" of China and other parts of Asia, also found in Egypt and Southern Europe, but its native country is unknown. Under the name of safflower tons of the flowers of this plant, made up into flat circular cakes, about the size of half-crowns, are imported into Great Britain. Safflower contains two colouring matters, yellow and red, the latter being that for which it is most valuable. It is chiefly used for dyeing silk, affording various shades of pink, rose, crimson, and scarlet. Mixed with finely-powdered "talc" it forms the well-known substance called rouge. Another common use of the safflower is for adulterating saffron, a more expensive dye stuff. The seeds yield an oil much used in India for burning and for culinary purposes. A few plants cultivated in any garden would yield a dye ready at hand for any domestic purposes.

No. 5. "A Thistle" is Centaurea solstitialis, Linn. An introduced European plant, which is even worse than C. melitensis, Linn., when it gets fairly established, because of its involucral spines being longer and if anything sharper.

No. 6. "A Thistle" is Centaurea calcitrapa, Linn., an introduced European weed, which is also a great pest in many parts of the Colony.

No. 7. Polygonum aviculare, Linn., commonly known as "crab weed," "iron weed," "wire grass," "hog weed," &c. A common weed apparently of European or Asiastic origin, but now found over a greater part of the globe, especially in temperate regions. It is spreading very rapidly in cultivated places in Australia. In clover or lucerne paddocks it is often a great pest, and makes the crop difficult to cut on account of its long wiry stems being in the way of the scythe or reaper. It is a prolific seed-bearing plant, so that the area of its occupation is gradually widening from year to year. In Europe birds are fond of its seeds, as its specific name indicates; therefore the plant is kept somewhat in check. If the plant has any natural enemies in this country, they certainly are not very formidable ones, judging by the increase of the plant in many districts.

No. 8. Amarantus paniculatus, Linn., commonly known as the "Wild amaranth." This plant is probably a native of Asia, but it is now found growing in most of the warmer parts of the globe. On rich soils it sometimes grows to a height of 5 or 6 feet, and being a prolific seed-bearer, it is

somewhat difficult to get rid of in such situations if it is allowed to seed. The plant is easily killed in a young state, however, either with the hoe or scarifier.

No. 9. Amarantus viridis, Linn., commonly known as the green "amaranthus." This plant is a native of the warmer parts of Europe, Asia, and Africa, but is found also in the warmer parts of America, and has been growing for a number of years in the warmer parts of Australia. Its seed-bearing qualities are much the same as the preceding plant, but it never grows so tall; at least that is my experience of it.

No. 12. Vittadenia australis, A. Rich. A native plant of the composite order, the leaves of which are most variable in shape; sometimes they are linear, sometimes they are twice three-lobed. Sheep occasionally eat this plant when it is in a young state, but its nourishing qualities are not considered to be of a very high order.

No. 13. Oxalis corniculata, Linn., commonly known as the "yellow-flowered sorrel." This is such a widely-spread weed in many parts of the world that its native habitat cannot be fixed to a certainty. It is a great pest in cultivation, and if allowed to grow undisturbed for a time, it produces a great amount of seed, so that the area of its occupation gradually widens from year to year. Persistent cultivation will get rid of it.

No. 14. Verbena officinalis, Linn., commonly known as the "native vervain." Although it is a native plant it is not endemic. It is common in a great part of Europe and temperate Asia. It is found also in North America.

No. 15. Gnaphalium japonicum, Thunb. Although this plant is a native of all the Australian colonies, and in some places very plentiful, it is not endemic. It is common in New Zealand, and extends over some parts of the Eastern Archipelago and northwards to Japan, from which country it takes its specific name. So far as I have heard it is not a formidable weed to vanquish, although it produces plenty of seed when left to grow on undisturbed for a time.

No. 16. Mentha satureioides, R. Br., "Native pennyroyal." This is a very common plant in New South Wales. It is not particular as to soil or situation, for it may be found on dry stony ridges and on rich alluvial bottoms. In some places it forms a dense turf. It yields by distillation an oil, which may be found to possess medicinal properties. From 1 cwt. of the fresh plant about 7 oz. of oil was obtained. This plant has long been used for medicinal purposes by bushmen.

No. 18. Plantago varia, R. Br., "variable plantain." The specific name given to this plant is very appropriate, for it is a most variable plant as regards the size of its leaves and stature generally. Bentham says "the variations of this polymorphous species are so complicated that I have been unable to assign them any definite limits as to characters or geographical range." It is considered an excellent forage plant in some parts of the country, and during the winter and early summer months it yields a rich succulent herbage, which herbivora of all kinds are remarkably fond of.

No. 19. Sonchus oleraceus, Linn., "common sow thistle." A common weed in cultivation, probably indigenous to Europe and temperate Asia, but now distributed over the greater part of the globe, and perhaps truly indigenous in Australia. It is a prolific seed-bearing plant, and the seeds with their adherent calyx (thistle down) being very light when ripe, are often carried by winds miles away from the plants that bear them, so that it is very easy to account for its wide geographical range.

No. 20. Xanthium spinosum, Linn., "Bathurst burr." This exceedingly troublesome weed is supposed to be indigenous to Chili, but is now infesting many warm countries. This plant is so well known both to pastoralists and farmers that a description of it would be superfluous here.

No. 21. Carduus marianus, Linn., "milk thistle," "blessed thistle." A plant of European origin, which has become established in many parts of Australia. Many pastoralists and farmers consider it a good forage plant, and it is reported to make good ensilage.

No. 22. Onopordon acanthium, Linn., "the Scotch thistle." A weed pest that is too well known to pastoralists and farmers in this country to need a description being given.

A thistle with no mark or number on it, is Centaurea calcitrapa, Linn., the "star thistle." The specimen forwarded had white flowers, which is a very unusual thing, the prevailing colour being purple. It is one of the worst of the introduced weeds, and its area of occupation is gradually widening from year to year. The only way to keep the plant from spreading is to cut it down directly it comes into flower; when this is done the plant dies.

Dodder. *Cuscuta epithymum, Willd.*

In reference to specimens of a weed sent to the Department for identification by Mr. J. D. Leese, of Uralla, that gentleman was informed that the weed was the European dodder (Cuscuta epithymum Willd.), a parasitical plant, found in many parts of the Colony. It is one of the worst pests that farmers have to contend against. The dodder seeds have been introduced with unclean samples of clover and lucerne seed, and our climate being favourable to its growth, it has spread of late years over large areas. The dodder plant begins life as a terrestrial plant, and in favourable weather will soon push its stems above ground; when these are 2 or 3 inches long they attach themselves by a few coils round the future foster-parent plant. Then the dodder begins its life as a parasite, and it keeps on increasing, under favourable circumstances, at a great rate. It intercepts and lives upon the sap of the clover or lucerne until the foster-parent becomes sickly, and eventually dies. When a crop of lucerne or clover becomes badly effected with dodder it is advisable to plough it up, then harrow it into heaps and burn it. The land should then lie fallowed. The scarifier should be put on the ground about once in six weeks, according to the state of the weather. This will keep the surface of the soil loose, and the dodder seeds that lie in the ground will germinate more easily, and, not finding any plant to become their foster-parent, will soon die. Under ordinary conditions, twelve months of such treatment will rid the land of dodder, no matter how bad it may be. Farmers should be more careful when buying clover and lucerne seed to obtain a guarantee that it has been properly cleaned. The dodder seeds, being so small, are not easily detected amongst other seeds. Another remedy is given in Vol. II, Part 3, page 143.

Rational Principles of Feeding.

No. I.

To rear flesh producing animals and to improve their breeds has been one of the principal pursuits in the Australian colonies. Without the aid of agriculture properly speaking the native grasses have supplied all the ingredients out of which the bodies of cattle and sheep have been built up, and the scientific principles according to which meat of all kinds can be produced in the most economic manner will probably be regarded by many Australian graziers, as, though interesting from a scientific point of view, yet of no practical value to the pastoralist. It will probably be said that during any good season there is no difficulty in turning out first-rate cattle for home consumption or for shipment abroad in a frozen condition.

The time is not very far distant, however, when many a native pasture of Australia will be turned into a cultivation paddock, and subjected to a judicious system of irrigation and manuring, will produce large quantities and great varieties of more nutritious fodder plants than the best native grasses. As soon as capital has been freely invested in cultivation paddocks the question will become of paramount importance, how to utilise these expensive fodder plants to the best possible advantage.

As there are probably, even now, many intelligent farmers who have considered this subject with great interest, it may not be out of place here to say a few words about the principles of rational feeding.

Given the same class of animals, and the same kinds and quantities of fodder, some of them may be fed much more profitably than others, according to the methods employed. It is possible that a fairly-well fed animal, not really fat, may, at the time being, be sold to a much greater advantage to the producer than a few weeks or month later, when, though more appreciated in the sale-yard it does not pay the owner so well as it would have done some time ago. The value of the food which the animal has consumed within the last few weeks or months has not been in payable proportion to the money it has realised at the sale.

A very fat animal may not be so profitable to the producer as a moderately lean one. To the consumer of meat it matters very little how much inside or other fat an animal has yielded, so long as the meat itself is wholesome, juicy, and of a pleasant flavour. It is not rational to over-fatten animals, especially when the nutritive and the commercial value of fat is very limited.

How to feed domestic animals most economically and effectively is a question which has been made the subject of extensive experiments on the part of scientific and practical men for some time. Much has been learnt, and much has to be learnt still. In order to understand the drift and the results of these inquiries we must make ourselves acquained with the principal laws of nutrition.

One point of difference, amongst many others, to be observed between plants and animals is the fact that whilst the former take up the substances of which they are composed, either from the air or from the soil, the latter have no means of doing so, but they are compelled to consume for their subsistence plants or other animals. Hardly any of the materials consumed as food pass directly into the animal tissues in their vegetable form, but they are previously decomposed into their elements, and these again enter into fresh combinations in different proportions, so as to form entirely new substances. Liquid fats and sugar (in solution) might pass unchanged into the cells by osmosis. This process of splitting up into elements, where everything consumed is reduced to oxygen, hydrogen, carbon, nitrogen, phosphoric acid, &c., this chemical dilapidation on the one hand, and chemical rebuilding on the other, can be followed step by step to its ultimate terminations this or that way. Meat, for instance, will be reduced to carbonic acid when it has reached the lungs to urea when it is found in the kidneys, and we notice it as ammonia when leaving the body in the form of perspiration, &c. During this process of chemical dilapidation and rebuilding certain physical forces are set free, are stored up, or come to play as various forms.

Some decomposed (digested) vegetable matters readily combine with oxygen, and produce heat. The least, as well as the most important, changes that constantly occur in the body can be traced to a variety of chemical changes which take place within the cells of which every tissue of the body is composed. This, however, cannot be accomplished unless the various materials are completely dissolved in water. In this state only can they pass through the membranes which form the cell walls, and pass from cell to cell right through the whole tissue. Water charged with nutritious elements thus permeates every part of the body, and no proper growth or development, no speedy accumulation of flesh or fat in the body is possible, unless the animal body is amply supplied with that element. Different fluids are thus constantly circulating through the body, not alone in the form of blood or lymph, but also by the process of osmosis, or that communication of fluids which is constantly going on from cell to cell, from organ to organ, from the stomach through the bowels to the blood, through the kidneys, the lungs, the sweat glands, the skin, &c., and out again.

Notwithstanding, however, the fact that every part of the body of a bullock or a sheep, &c., has been built up by more or less expensive materials, he can utilise as food a comparatively small portion only of the carcass. In a well-fed animal the weight of the bones alone amounts to 8 or 9 per cent., that of the flesh and the sinews 40·1 per cent., that of the fat (separated by the chemical means), 23·9 per cent., and the remainder, 27·1 per cent, is made up by the skin, the bowels, their contents, and the blood, which is lost in killing. Deducting sinews and gristle only about one third of the whole weight of the whole animal is really available as valuable food.

To increase the tendency in an animal to produce larger quantities of flesh and fat, and less bone and hide, has been the object of all intelligent cattle-breeders for some time. Matters connected with breeding, properly speaking, however, would be rather foreign to the subject before us, and we cannot enter into it here. In the meantime it stands to reason that of two animals of equal ages, of equal living weight, &c., that one must be more profitable to the producer, the butcher, and the consumer. which yields the larger proportion of available nourishment, *i.e.*, the palatable muscle flesh. So far as the flesh and the fat of the various races of domestic animals are concerned, there is, chemically speaking, no appreciable difference between

them. In form, appearance, taste, and in the physical conditions of the various kinds of flesh a great difference certainly exists. The flesh of well-fed animals has a better flavour ; it is more juicy, and it may be easier digested, but chemical analysis would not show much difference in the flesh of a fat or a lean animal in the flesh of a bullock or a lion, a goose or a horse.

Every substance, whether taken from an animal or from a plant, is composed of either three or four chemical elements, viz., of oxygen, hydrogen, and carbon, or of oxygen hydrogen, carbon, and nitrogen. The substances composed of three elements only are generally called hydrocarbons, they comprise the different kinds of fat, sugar, starch, &c. In the bodies of plants these substances are convertible into each other,—starch will change into sugar or fat, sugar into starch or fat, &c. The latter class, viz., those substances which contain nitrogen in addition to oxygen, hydrogen, and carbon, are called albuminoids or protein substances,—to them belong albumen (viz., the white of the egg), glue, fibrine, casein, &c.

As the animal body is principally composed of albuminoid substances, containing nitrogen, no kind of food can sustain animal life for any length of time unless it contains nitrogen, or unless some nitrogenous matter is consumed along with it. This has been proved by many experiments in different countries, and on different races of animals, with the same results. A dog, for instance, exclusively fed on starch cakes, containing fat and sugar, died with all the symptoms of being starved to death. On the other hand, however, we observe that a nitrogenous diet, consisting of eggs, meat, cheese, milk, &c., the diet of carnivorous animals, is quite sufficient to keep up life without the aid of hydrcarbons. Phosphoric acid sulphur, lime, soda, chlorine, and potash are likewise indispensable. Chloride of soda and potash assist in dissolving the elements in water. In solution they permeate the whole of the animal body, and facilitate the free passage of all fluids throughout the cells and tissues.

The vegetable food introduced into the animal body chiefly consists of vegetable albuminoids, starch, sugar, and fatty matter. Vegetable albumen is first changed into peptone, and from it into animal albumen. Starch and the various kinds of woody fibre are changed into sugar, and are then absorbed. Some kinds of fat are taken up in their natural condition, others are reduced to a soapy condition, or they are changed into an emulsion very thoroughly mixed up with other substances, so that the fatty matter is reduced to multitudes of exceedingly small drops, and thus passes into the blood.

Thus constantly passes throughout all the tissues of the body, a steady flow of perfectly liquid matter, containing in solution various albuminoids, hydro-carbons, phosphoric acid, sulphur, and minerals. This comes into contact with a current of oxygen introduced into the blood by the lungs. The great affinity of oxygen to many substances, especially to carbon and hydrogen, causes the formation of carbonic acid and also of water. The formation of carbonic acid is presumably the principal source of animal heat. The combination of oxygen and hydrogen, *i.e.*, the formation of water within the body is, no doubt, the reason why so many animals live and prosper although they hardly ever drink water. When an animal is at rest considerable quantities of oxygen are stored up in the body, and part of this passes out again in conjunction with carbon as carbonic acid when the animal moves about.

Considering, now, that albuminoids are the principal constituents of the animal body, we must look upon the vegetable albuminoids as the most

indispensable ingredients of all classes of vegetable food for animals. These substances should be introduced into the body at exactly the same rate as they leave it. Insufficient supply of them would cause starvation, whilst excessive introduction would be waste. Animals that have not attained full maturity would naturally require a greater amount of nourishment—a quantity of nitrogenous matter in excess of that which is lost; but in full-grown animals we should be able to regulate the amount of vegetable albuminoids in proportion to that of the nitrogenous matter which has left the body. To do that we must ascertain, firstly, how much nitrogenous matter an animal will lose within a certain time under ordinary circumstances, and how much of it can possibly be introduced into its body during the same time in the food to be consumed.

The analysis of plants will show us how much albumen is contained in, for instance, 100 lb. of lucerne, grass, turnips, meadow-hay, &c., how many pounds, at least, of any particular kind of fodder will be required to make up the loss of nitrogenous matter which the animal has sustained.

A method has been discovered by which an extremely accurate estimate can be arrived at of all substances, gaseous, fluid, or solid, that an animal loses within a certain space of time. A comparison, therefore, of the quantities of nitrogenous matter that have been entered into the body in the shape of food with the quantities of that substance which have left it, will give us a clear idea of the quantities necessary for the maintenance of the body and of those which are superfluous—a subject which will be considered later on.

J.H.S.H.

The Profitable Cow.

By Professor J. A. ROBERTSON,
Ontario Agricultural College, Canada.

The cow the farmer should keep should have three powers: the power to breathe well first, because by her breathing she purifies her blood, and takes in enough oxygen from the air to keep herself warm. She should have strong heart action, so as to circulate her blood well; and should have vigorous stomach power and good digestion. This she must have to have a good constitution. You look for evidence of this in the cow having a deep chest. In getting good lung power you look for a deep chest, not a broad chest; if you have a broad chest you have lung room in breadth, and then a mountain of beef and bone on top of that. That means you have a Polled Angus. It is a good breed, but I do not want a Polled Angus for my dairying. I want a cow with a broad nose, and oblong nostrils; I want a cow that is very full behind the fore legs. She wants heart room and heart power, and the best indication of heart power will be found in the skin of the animal. The better the heart pumps the more effectually it will circulate the blood to the very extremities of the cows body. The skin of the beast is one of the best evidences of its heart power. The best evidence of stomach power will also be found in the skin of the animal. If there is vigorous circulation, and the blood is defective in nourishment, then you have a skin that is hard and tight, and bristly hair, because the digestive action or heart action are interfered with, and are not regular. Many men contend that the milk veins should be very large. I consider that to be immaterial, but the milk veins should be prominent. A cow's nose should be dewy and moist; when it is dry it is an indication of ill-health. It means bad digestion, waste of feed, and waste of profits. She should have flat ribs, and wide apart. You want beyond those three powers the peculiar power in an animal of directing her energy to do what she is kept for. You want the directive power towards beef if you keep the animal for beef; you want the directive power towards milk if you want to keep her for milk. The directive power in an animal is the valuable power whereby you find her directing her energies to where you are to find the biggest profits. A scrub has good lungs as a rule. A scrub hog will often outrun a dog. You will have heart power in a scrub; sometimes you have very powerful digestion, but she lacks the directive power that will concentrate those three powers to service, and not to waste. In the milking cow you will find first evidence of the directive power in the kind of face she has—a rather long, lean face, with no superfluous skin; no indication of flabbiness; large, lustrous eyes, standing very wide apart and very prominent, with a forehead dished downward. A long, broad forehead; a large muzzle; a wide mouth, indicating large eating powers—the only coarse part of a cow's head that is justifiable. It indicates the power to keep on grinding her food, and indicates a strong constitution. She should have a long, thin, tapering neck. A bulky, beefy neck indicates a short milking season.

Her shoulder bones should be right above the leg and wide apart, and the joints loose; the wider these are apart the better indication you have of a large flow of milk when the cow is doing her best. I do not think it indicates anything of the length of the season. Thick beefy hips mean beef, not milk. The cow's udder should be long and shapely, with a long line of attachment between the udder and the cow's body. You never find a coarse cow a good milker. I like a cow to have all the angles possible, but the bones themselves and skin ought to be fine in quality. Having a cow of this kind it is possible to make her serve you well, but she never could do so without getting care, right feed and proper handling.

Begin the habit of long milking with a heifer, and persist in it, and she will keep it up afterwards. She should be kept in a comfortable stable. If a man will write one word over every stall in his stable, and observe it, he will become a successful feeder and stockman. That one word is "comfort." Whatever will increase the cow's comfort will increase her productive power; whatever in watering, or feeding, or care, lessens her comfort, lessens also her milking capacity. She should have lots of water in the summer time, and have access to salt every day.

A cow should have the right kind of feed, and should get a properly balanced ration when possible. A man might as well, in a certain sense, live on bread and potatoes, as live on bread and butter, potatoes and beefsteak; but if he had only potatoes to live on, he would come to be, in a short time, small potatoes of a man. A man must have well balanced food if he is to do hard work. He cannot continue to do hard work unless he gets his energy from some outside source. Bread and butter make well balanced food; potatoes and beef are well balanced food for a man. Corn and clover, or corn and peas, in the same way, make a balanced ration for the cow. You must remember that a cow should have her bread and butter—albuminoids and carbo-hydrates.

NOTE.—The above article is taken from "Addresses on Practical Farming and Dairying," delivered at a meeting of the Stormont Farmers' Institute, Ontario, Canada.

The Pig.

By J. L. THOMPSON,
Principal Hawkesbury Agricultural College.

Various Breeds—Their Breeding, Management, and Commercial Value.

There is no branch of farm husbandry that has been so seriously neglected by the northern farmer as pig-breeding, and the conditions under which this industry can be carried on are entirely favourable. The pig likes a temperate climate, and even in hot weather will put on flesh at an amazing rate if allowed plenty of room, fresh air, and suitable food. In these colonies we have not to contend with the severe winters, the excessive frosts, and snowstorms of the old country and many of the states of America and Canada, and as it consequently takes less food to keep up the animal heat in our temperate climate, greater results under good management can be obtained from a given quantity of food.

The Origin of the Pig.

The wild hogs from which the domestic breeds have taken their rise are natives of Europe, Asia, and Africa, and are found wherever the climate is mild enough to afford sustenance in winter. In America, in Australia, and in the Polynesian group pigs were unknown until introduced. In England the wild species have long been extinct; in France they are nearly so; but in some parts of Germany, Denmark, Italy, Greece, and in Asia Minor they are still met with. I have seen hundreds of wild pigs on the Australian Alps in Gippsland, but they must have wandered away from some farm or station, and by degrees returned to a wild state.

The fecundity of the pig is one of its most remarkable characteristics. Their natural life (if permitted) extends to fifteen or twenty years, and they are capable of reproduction at nine months old. The production of fifteen or twenty in a litter is not infrequent, and instances have been known of thirty-seven. The celebrated naturalist "Vauban" has made a calculation of the probable production of an ordinary sow during the space of ten years. He has not included the male animals in his estimate. The result shows that the product of a single sow in eleven years, which is equivalent to ten generations, *will be* 6,434,838, or, allowing for accidents and disease, in round numbers six million of pigs. "Youatt," on the pig, also gives the same illustration with regard to their power of reproduction.

Teeth of the Pig.

The domestic pig, when full grown (say at two years of age), has 44 teeth, divided as follows:—

12 incisors—6 upper, 6 lower.
4 wolf teeth—1 upper, 1 lower on each side.
4 canine teeth—1 upper, 1 lower on each side.
24 molars—6 upper, 6 lower on each side.

44 in all.

The age of the pig can be determined up to two years of age by an examination of the teeth, but, as this cannot at all times be very easily accomplished, it is not of much consequence to the pig breeder.

The Various Breeds of Pigs.

It is not my intention to particularise the numerous breeds of pigs, a great number of which are now extinct. I will confine myself to a few of the more modern breeds, both white and black.

White Pigs.

Yorkshire possesses the largest and best white breed of pigs in England, as well as an excellent medium and small breed. The old Yorkshire pig was a large narrow animal with a strong coat of hair. It had a long head, great ears, long legs, and was very strong in the bone. It was a long time in coming to full size, but could be fed to upwards of 800 lb. It was exceedingly hardy and very prolific. The steps taken to improve this class of pigs was to introduce a cross with the white Leicester. These were a large sort also, but had smaller heads, more erect ears, finer in the hair, and lighter in the bone. The result was the production of the improved Yorkshire pig of the present day. They are in great request in every part of the United Kingdom as well as in France, Germany, and the United States. I saw a few pens of these pigs at the Centennial Show held in Sydney in January last, and they appeared excellent specimens of the breed. The working man's pig in Yorkshire plays an important part. Every village has its little event termed a pig and poultry show, with rules that completely exclude all but working men. At these shows there is often a row of from 30 to 40 pigs, worth from £8 to £12 each, all as white as soap and water can make them, stretched out on beds of clean straw. Many a working man will send his sow many miles to a good boar and pay his guinea cheerfully for the service, and make a good profit by the speculation. The following is the weight of two Yorkshire sows (half sisters) slaughtered at North Allerton:—No. 1, 11 cwt. 2 qr. 17 lb; No. 2, 11 cwt. 2 qr. 27 lb. They were about three years old. A Yorkshireman has a great aversion to a black pig, and, if he knew it, would not eat them. An amusing story is told of a Yorkshire shepherd who paid a visit to the great fat show at Birmingham, and saw a pen of very fat black porkers snoring away in the corner. He, doubtless, never had seen black pigs in his life before, and asked the man in charge, "Where do you get those frae?" The man named his master's residence in the south. "And do you ate sike as them in your country?" said the Yorkshireman, in utter astonishment

Cheshire Large White Pigs.

The Cheshires are pure white in colour, with little hair. The snout is often long, but very slender and fine. The jowls are plump, and the ear erect, fine and thin. The shoulders are wide, and the hams full. The flesh is fine-grained, and the breed is commended on account of the extra amount of pork in proportion to the amount of offal.

The white Leicesters have been very successful prize takers at the fat shows in England and France. As before mentioned, they have been much used to improve the Yorkshire pigs. Ordinary fed pigs of this breed—

	lb.	lb.
Weigh at 6 months	from 140	to 180
,, ,, 8 ,,	,, 200	to 240
,, ,, 10 ,,	,, 240	to 300
,, ,, 12 ,,	,, 300	to 360

There is really not much in the terms small, middle and large breeds. Exhibitors in England have been known to take prizes in the small and medium classes, and afterwards with the same pigs, at a mature age, in the large breed classes.

Black Breeds.

1st. The Berkshire. This now magnificent breed has been bred in Berkshire, England, and in adjacent countries from a very early period. The family of pigs which was the foundation of the present improved class, was of a sandy or buff colour, about equally spotted with black. They were of a large size, slow feeders, and did not fully mature until nearly three years old. They were always highly esteemed, however, for the proportion of lean to fat in their meat, and for the superior weight of the hams and shoulders. The improvement is reported to have commenced during the last century, through the importation of a Siamese boar, who was mated with the Berkshire sows. This breed (the Siamese) were generally of a jet black colour; of medium size, quick to mature, very fine on all points, with short small legs and head, thin jowls, a dish face, slender erect ears; broad deep compact body, well ribbed up, extra heavy hams and shoulders, a slender tail, thin skin, and firm elastic flesh. After using the Siamese boar to the old style of sows as long as it was considered necessary, he was discarded, and the cross pigs then bred together.

Characteristics of the Improved Berkshire.

Colour black, white on feet, face, tip of tail, and occasional splashes of white behind the shoulder. While a small spot of white on other portions of the body does not condemn the animal as being impure, yet it is to be discouraged, as uniformity of colour is highly desirable. Markings of white other than that above mentioned are suspicious, and a pig so marked should be rejected for stud breeding purposes. The face should be short, fine, and well dished, broad between the eyes; ears generally, almost always, small, thin, soft, and showing veins, jowl full; neck short and thick; shoulders short from neck; back broad and straight, or very little arched; ribs long and well sprung, giving rotundity of body; hips good length from joint of hips to rump; hams thick, round, and deep, holding their thickness well back and down to the hocks; tail fine and small; legs set wide apart; size medium; length medium (extremes are to be avoided); bone fine and compact; offal very light; hair fine and soft; skin pliable. A well bred Berkshire will attain a weight of from 450 to 500 lb. at eighteen months old if well fed.

The Improved Essex.

The Essex pigs originated in the South of England, and are entirely black. They are medium in size and are extensively used in England and elsewhere to cross with coarse swine with a view to improving their fattening qualities. The best specimens may be known as being entirely black in colour; face short and dishing; ears small and soft, standing fairly erect. Carcass long, straight, and deep; hams heavy and well let down; bone fine; hair generally rather thin; fattening qualities very superior. Although the Essex is dark skinned, like most other black pigs when dressed, the skin is beautifully white and clean. The Essex has been much improved by the introduction and use of the Neapolitan boar. Lord Western, an Essex squire, while travelling in Italy, observed, admired, and secured a male and female of this breed, which he used with good results upon the Essex breed of pigs of his day.

The Poland China Pig.

The Poland China is a strictly native American breed of swine, the product of skill and perseverence of the American breeders. The breed originated in the Miami Valley of Ohio, the first attempts having commenced about half a century ago. They were first called "Magie," from one of the pioneer breeders, then Butler County, Warmer County, and other local names, which led to much confusion. In 1872 the National Swine Breeders' Association of America decided upon the name of "Poland China," by which they have ever since been known. The breed is a combination of the Bedford, the Irish Grazier, the Byfield, the China, the Polish, and the Berkshire. Of these the first four are white or spotted breed; the Polish is red or sandy, with black spots; and the Berkshire is of course mainly black. In the rich valley of the Miami, with its luxuriant grass and corn crops, pure and abundant water, and above all, its skilful farmers, the various breeds were crossed, the progeny carefully selected and bred, until a thoroughly well-established type was fixed. In the hands of energetic men the pigs of this breed have spread throughout the great corn-growing regions until they out-number by far every other breed of American swine. They are good graziers, thriving and making good progress on grass. They fatten rapidly on good food, attaining a good weight at an early age. Their pork, when raised on grass and finished with corn, is well marbled or streaked with fat and lean. The hams are round and well shaped. In the small proportion of waste or offal, these hogs, by tests, in Chicago, have been shown to be unsurpassed by any other breed.

The best specimens of the breed have great length, short legs, broad straight backs, deep sides, flanking well down on the legs; very broad full square hams and shoulders, drooping ears; medium short heads, wide between the eyes. They are of spotted or dark colour; are hardy, vigorous and prolific, and when fat are simply models. In order to give some idea of their early maturing qualities and evenness of weight, I herewith append the weights of hogs sent to the Chicago packers in one season by Mr. David M. Magie, the founder of the breed. The ages of the hogs ranged from eighteen to twenty-one months old, and are as follows:—

				lb.
One lot of	63	averaged	dressed	444
„	40	„	„	417
„	80	„	„	433
„	60	„	„	400
„	72	„	„	413
„	100	„	„	408
„	43	„	„	467
„	35	„	„	451
„	120	„	„	458

Other breeders of these pigs show even a higher weight. It is therefore evident that the Butler county farmers know how to raise and fatten hogs.

The Form of a Good Pig of any Breed.

The aim of all breeders of animals designed solely for meat, be they bullocks, sheep, or pigs, is to have the body as nearly as possible filling the four squares of a rectangle; in proportion to the size, an animal of this shape contains the greatest weight. Hence, inexperienced people are often deceived with the weight of these compact square animals, as compared with the old-fashioned ill-formed pig of much greater apparent size. Another advantage of the

square form is that it gives a much greater proportion of the most valuable parts of the pig, namely, the hams and shoulders. Many people object to the improved breeds because they are too short; but they appear short because they are so broad. A minimum of bone and a maximum of flesh are the desiderata necessary for a good profitable pig. No animal will give a better return for the care and food bestowed upon it than the pig. The weight of the stomach, in proportion to each 100 lb. of live weight is, in the ox, 3 lb; sheep, 3½ lb.; fat pig, 0·66 lb. This shows that the stomach of an ox or sheep, in proportion to live weight, is about five times as great as that of the pig. But although the stomach is small the intestines are *capacious*, and this enables the pig to eat, digest, and assimilate more nutriment in a given time, in proportion to his size, than any other of our domestic animals.

The Points of a Good Pig.

	Points.
1. Head wide in front, ear erect and pointed forward	6
2. Chest wide and rising well to the shoulders, shoulder blades well sloped backwards	6
3. Ribs well sprung, loins wide and slightly arched	10
4. Hind quarters not to slope nor narrow towards the tail ...	10
5. Hams well let down and full at the twist	12
6. Chest wide, with elbows well out	10
7. Fore-ribs wide underneath, flanks well let down and straight...	12
8. Legs straight and small in the bone, feet small and compact...	10
9. Hair plentiful, bright, and vigorous	10
10. Tail thick at root and tapering to a fine point...	4
11. Size (according to breed) should be medium, extremes are undesirable	10
Perfection	100

The Profitable Management of Pigs.

Works on the Pig.

There are very few books of any consequence on the pig, compared with the number devoted to the horse, the bovine race, and other domestic animals. Youatt wrote a work on the pig in 1846, but died before the manuscript was through the press. This work, however, never had the reputation of Youatt's other publication, viz., that on the horse, cattle, and sheep, &c. I have tried to obtain a copy of Youatt on the pig in three capitals of the Australian colonies, but have not been able to do so. Mr. S. Sidney wrote an English work on the pig in 1860, and a second edition appeared in 1871, at the low price of one shilling. Perhaps the most valuable work on the pig ever written is that of Mr. Joseph Harris, of Moreton farm, Rochester, New York, who has been long connected with the American Agriculturist and the Orange Judd Publishing Company. These publications are all admirable in their way, but do not apply to the altered conditions of our Australian requirements. I maintain that with our mild comparatively temperate climate pigs can be more profitably kept in these colonies than in any part of the world. One thing is necessary to bring about this, viz.:—To so arrange the keeping and feeding of pigs as to be able to realise a maximum of profitable results from a minimum of expenditure, and to have things so arranged as to be able to feed and attend properly to their wants without the employment of much labour.

First, then, the old system of keeping pigs in dirty small styes has exploded. Styes are only necessary during the time a sow has a litter, and on such occasions she should be got into it about a week before this important event takes place. The stye should be a fair size, say 6 x 10, and the sleeping portion should have a wooden floor composed of red gum slabs or other cheap material. This is necessary as pigs are often given to cramp and rheumatism at time of parturition and while suckling their young. At all other times the breeding sows should have access to a nice lucerne paddock. Shelter, of course, must be provided alike from the excessive heat of the sun and the bleak cold wet weather in winter. This shelter shed need not be an expensive structure. The system I have adopted is cheap and cannot be said to be unsightly. Timber from the bush is simply used and the roof is composed of straw, topped well up and thatched. It serves for the two paddocks—the dividing fence between the two paddocks being in the centre. The area of the paddocks is 2½ acres each. The shelter shed is 14 x 33 feet, and with the ten styes the whole is capable of keeping over a hundred pigs. The old theory was that before you could fatten a hog you had to close him up in a small stye. In Victoria, and also in South Australia, I have proved that a hog will put on more flesh, and, moreover, that of a more healthy and better description, if allowed reasonable exercise. A pig fed in a stye, especially in the summer time, without the means of getting exercise, has a tendency to generate a sort of blubber and lard, whereas a pig who has his liberty and the means of taking exercise produces meat of a firm streaky nature so much appreciated by all lovers of a slice of bacon. The public of to-day are a lean eating public, they accept fat at a discount, the object therefore should be to produce meat that will be appreciated by the great majority of the people. The cost of the whole of the piggery at Dookie College did not exceed £100, and those going in for economy need not even go to that expense, as the fence round the enclosure need not be so strong, and four barb wires properly divided to a height of 3 feet will keep in almost any pig. The fence at the farm has two rails, as I think these rails give it a substantial appearance.

Size of Timber.

The posts are 5ft. 6in. long, 8 x 4.
Rails, 9ft. long, 8 x 2½.

Position of Rails and Wires.

1st barb wire, 3 inches from the ground; top of first rail, 13½ inches from the ground.

2nd barb wire, 17½ inches from the ground; top of second rail 3 feet from the ground. Should it be found necessary, another barb wire could be put along the tops of the posts, thus making the fence 6 inches higher; but I have never had any pigs that would jump over this fence. I would draw particular attention to the position of the first barb wire, viz., 3 inches from the ground. This prevents the pigs from rooting and making holes at the bottom, which sometimes will admit of them getting out; with the barb wire so placed, however, the pigs will be glad to let rooting alone in that quarter.

The Beefacres Piggeries, S.A.

On the 17th March, 1883, the surviving brother of Messrs. Hart Bros., proprietors of the Beefacres estate, S.A., left for England, and instructed me to construct a piggery on a large scale, capable of accommodating at least 1,000 pigs. I consulted an architect and even had plans prepared, but these

I ultimately discarded, and struck out in quite a new line. My desire was to be able to accommodate a large number of pigs and reduce the work necessary for their comfort and attendance to a minimum. The area of the paddock to be operated upon was 11 acres. It had a beautiful southern aspect with a fall of 1 foot in every 20. Not being able to take advantage of the old fence around the block, I constructed my pig fence (composed of two strong sawn rails and 1½ pickets 3 feet high) half a chain from the old fence, and in the half chain left all round I planted two rows of trees, consisting of the *Schinus molle*, to give shelter, and the carob bean, to become of some ultimate use for the feeding of the pigs. These trees are already bearing fruit. I had the remainder of the land divided into four small paddocks, so as to be able to divide the pigs. In each of these paddocks a sleeping shed was provided 60 feet long and 14 feet wide. Two flaps were provided at each end so as to give a free current of air in hot weather. These flaps could be closed at will if the weather became wet or cold. The sheds were constructed of inch upright jarrah boards, with corrugated iron roof. They were provided with large doors at each end, so that a dray or waggon could drive right through when bringing straw or taking away the manure. The pigs were never closed into this shed, but could go in when they pleased, and they had always abundance of clean straw to lie amongst. I may mention in passing that a large number of pigs can be kept together in this way. I have seen 200 porkers all sleeping quietly together. If pigs are always kept together they will not fight; but should a stranger be introduced they will, as a rule, tear him to pieces.

Feeding Arrangements.

A concrete building, with man's room, was built at the highest side of the ground. In this building was a large open half-moon shaped boiler, capable of holding 650 gallons. All the feed was mixed up in this, about the consistency of syrup, so that it would run freely. A 5-inch pipe connexion from the boiler led on to 500 feet of 18-inch mouth iron troughing. These other troughs were in 20 feet lengths, and the lower one always lapped the upper one (say about a foot). A hole was provided at the bottom of each trough so that the food could run from one to the other the whole 500 feet. For instance, when the man turned on the big feed tap the plugs at the bottom of all the troughs were opened. The feed then went from one trough to another until the bottom one was reached. Then if the troughs were required to be all half full, the man simply put in the plugs as he came up towards the feed-house. During the filling of the troughs the pigs were kept out. Gates were then opened, and all were let in simultaneously. I should mention that the fence used for keeping out the pigs was somewhat open, so as to allow small pigs access to the feed and get their fill before the big ones were let in. As a rule, however, the pigs were classified, and the four different lots were kept as near one size as possible. The pigs fed from both sides of the trough, a strong division running the whole length so as to divide the different yards and the trough. This feeding race was substantially floored with jarrah planks—with gravel and coal tar applied to the surface to prevent the pigs from slipping. An abundant supply of water is provided from the Adelaide waterworks at the feed-room, and the feeding race, troughs, &c., could be thoroughly washed down. The water used for this purpose was not wasted, but utilized for irrigating lucerne, pumpkins, &c., which were grown in close proximity to the piggery, and thrown over the fence to the pigs. The feeding race was also covered from end to end with a corrugated iron roof, so that the pigs while

feeding were protected from the sun, and also cold and wet. Sixty breeding styes were erected in a line at right angles with the feeding race, and these were always full, and by this time, I presume, they have had to build more. Of course the breeding pens could not be provided with food in the same way as the feeding race, but a splendid concrete roadway was provided, and a feed-cart, capable of holding a supply for twenty pigs, which made the working exceedingly easy. The troughs are so arranged (as at the Dookie farm) that the feeder can get full access to them from the outside. The opening to the trough is provided with a a flap door hung on a pivot. This door can be so fixed that the whole of the trough can be exposed, and at same time prevents the pigs from getting out. The man can remove any straw or other rubbish from the trough without trouble before putting in the feed.

Baths for the Pigs.

A concrete bath was provided in each of the four paddocks at Beefacres, and in hot weather the pigs thoroughly enjoyed their ablutions. I noticed that the pigs did not, even in very hot weather, care to remain in the water long, but seemed to be satisfied with an occasional dip. The baths were neatly thatched over with straw, to prevent sunstroke and keep the water cool. The introduction of the baths lowered the death rate very considerably.

Drafting and Loading Yards.

When a number of pigs are being sent to market every week, it is no easy matter getting them drafted and loaded in the ordinary way. In order to facilitate matters in this direction, I had drafting yards constructed on the same principle as for sheep, with race and swing-gate. I found that pigs could be drafted this way very easily. They came up to the swing-gate quite as well as sheep. Abutting to the yards was a loading race, with a gradual elevation of 4 feet, the height of the floor of the trolly made for the purpose of conveying the pigs to market. This trolly had three divisions, and was capable of holding from thirty-five to forty porkers. The whole work of drafting and loading was done in a very short time, without having to pull a single pig by the leg or ear; there was no squeaking, and the other pigs knew nothing of what was going on, and did not get excited. It is very undesirable to excite pigs, especially breeding sows when in a state of pregnancy, or with very young pigs suckling them. I have known premature labour to be caused by this, and the suckling mother often treads upon her offspring in her excitement. A pig is not by any means devoid of the instincts of humanity. If one gets caught in a fence, or you commence operating on one, the whole of the others will be around, and do their very utmost to defend their fellow. One peculiarity, however, I have noticed with regard to pigs is this: if a number of pigs are running together, and one becomes very sick and unable to eat, the others will set upon it like a pack of hounds, and very shortly put an end to its existence. Whether this is an act of kindness or otherwise, I cannot say.

The Feeding of Pigs.

The arrangements spoken of for feeding pigs at Beefacres can only be adopted when flour-mill sweepings, pollard, sharps, ground corn, and other mealy foods are employed. Messrs. Hart Brothers were largely engaged in the milling business, and there was generally abundance of this food, although every pound of it was debited to the farm, the very same as though any one else purchased it. In preparing this food, I found that a little meat or

fatty matter had a wonderful effect upon the appearance of the pigs, giving a fine glossy healthy skin. I used to purchase large numbers of sheep at from 2s. to 2s. 6d. per head for the pigs. The skin would be worth a shilling, and it paid well to thoroughly boil the marrow out of the bones of these sheep, and mix the liquid with a little pollard, making a sort of soup. The bones were collected and manufactured into manure. Rough fat can be at all times more profitably utilized for pig feeding than selling it at a penny, and sometimes less, per pound. Besides the feed supplied in the troughs, the Beefacres pigs had a liberal daily supply of green food in season—such as green barley and vetches, thousand-headed kale, cabbage, mangolds, pumpkins, &c., which may be fairly reckoned as half their food. I find peas about the most economical feed for fattening pigs that can be used; besides, the crop in our northern areas cannot be equalled for the restoration and fertilization of old worn-out land, as they leave a large quantity of nitrogenous (or ammonia-yielding) matter in the form of roots and fallen leaves. A pea-rake that will effectually harvest 10 acres per day can be purchased for £3 5s. There is no need to go to the expense of threshing the peas. The pigs will be only too glad to be allowed to do this for themselves, and will thrive better than if the peas were given to them threshed. All that is required is to cart the peas from the field into a stack in close proximity to the pig-yard. The stacks should be nicely topped up with straw, and they are then secure from rain. It is a very simple matter to throw out a few forkfuls every morning. Cape barley can be utilised in the same way; and, indeed, I do not see why oats and wheat may not also be fed to pigs in this way.

Some interesting experiments have just been completed as to the respective values of cooked and uncooked food for fattening pigs in America. In all of these the advantage has been decidedly in favour of uncooked food. In the barley meal series, the average quantity of cooked food required to produce 100 lbs. of pork was 628 lbs., and uncooked only 589 lbs. were required. With peas, it required 360 lbs. in a raw state, and 475 lbs. were required when cooked. With maize, the result was the same—the difference between cooked and uncooked was one-fifth in favour of the latter. Seeing that maize (or corn, as the Americans call it), can be grown to such perfection in the Hawkesbury district, I am surprised at the limited number of pigs and their general poor quality. I am convinced that it will pay far better to feed *well-bred* pigs on maize than to sell it at the low prices ruling for that product. The Hawkesbury district is, in my opinion, well calculated to produce, in great abundance, the best varieties of pig-feed, and pig-raising and bacon-curing should be leading features of the district, as I certainly intend to make them in connection with the Hawkesbury Agricultural College. At the Dookie College, during the financial year, 1889–90, a clear profit of £360 5s. was realised on pigs alone. These results prove conclusively that it is actually a decided loss to cook food for pigs. It takes seven bushels of wheat to produce 100 lbs. of pork. Now with wheat at 3s. per bushel, that would amount to 21s., and 100 lbs. of pork at 5d. per lb. is worth £2 1s. 8d. Now deduct the price of wheat (£1 1s.), and you have a clear profit of £1 0s. 8d. for every seven bushels consumed in this way. Who would dream of selling wheat at 3s. per bushel with such a result? In inland districts this result would be still more profitable. In America they can put fifteen bushels of corn into a three-bushel barrel, and transport it to distant markets. This is accomplished by converting it into pork. There is always a first-class market for good porkers and bacon pigs in our own markets, and we annually pay away thousands of pounds for

imported hams. Some people imagine that if an article is not English and imported it cannot be good. There is certainly no reason why we should not produce as good ham and bacon in the Goulburn Valley as any part of the world, and when we exceed the requirements of our own markets we can send home our produce to feed the half-starved millions of Europe. The extended system of pig-breeding will bring into existence the question of establishing bacon and pork curing factories. There is a wider scope for this industry than for the butter factories, and it is just as essential to have a uniform class of this article as it is with regard to dairy produce. The United States owes its wealth in a great measure to the hog. There are over fifty million hogs there at the present time. In Victoria they have, all told, only 240,957. At Chicago alone five million hogs are cured annually, and in the other states and the Pacific Coast the hog-raising and packing business has assumed large proportions. The average cost of keeping a hog during the winter season 1887-8 was 5·04 dols. compared with 4·19 dols. in 1886-7. With a system of irrigation such as you can boast of in the Goulburn Valley, I do not see that the Americans can beat you in the matter of cheap production of pig food. You can grow feed all the year round, whereas the Americans have to contend with a long severe trying winter. In our winter you can grow cabbage, thousand-headed kale, vetches, and green barley and turnips. In summer you can produce maize, sugar-cane, peas, and pumpkins; indeed, nothing can come amiss to a pig. Like the silo, he is the farmer's save-all, and no family should be without one, even although they may not possess any land. To those who own land, the pig certainly deserves a place thereon, and in my opinion no animal will better repay the investor. Regularity in feeding is of the utmost importance. One day's neglect through want of food or being compelled to put in a cold night in a wet, dirty, miserable stye will counteract the work of a full week's good attention. As a rule, the pig is subjected to a miserable existence. One look at the generality of the dirty little styes is enough; you turn away in disgust, and inwardly pity the poor pig. The pig is certainly not a dirty animal by nature, it is man's neglect that makes him so. A pig will never make a mess in his bed unless he has no other place to go. At Beefacres the straw in the sleeping sheds would remain beautifully clean for a fortnight. The pigs used this place for sleeping only, and invariably came outside to evacuate.

Salt for Pigs.

Lumps of salt should be placed within the reach of all pigs, and a little sulphur mixed with their food will have a beneficial effect. They are also extremely fond of coal cinders, and they will even eat coal itself: this assists digestion. Pigs should also be supplied with pure fresh water, and the water-trough should be frequently cleaned out. If cleanliness, plenty of fresh air, clean water, regularity of feeding, and shelter are attended to, you will not be troubled with much disease or death among your pigs. We have not lost a single pig (except when the mother overlay a young one) since the pigs were removed to the new piggery. Before this the deaths were numerous.

Breeding Sows.

A sow may be put to the boar when eight months old, thus having young ones when a year old, but breeding from immature animals has a tendency to degenerate the race, and, all things considered, it is better to allow the female to be twelve months old before being put to the boar. The period of gestation in the sow is sixteen weeks, and a sow will generally have two litters

each year; she will take the hog two or three days after farrowing, but if she has a good-sized litter, it is undesirable to allow her mate at this time, and as a rule she will not be in season again until the young ones are weaned, say at six or seven week old. If, however, the sow overlie her pigs and there be only a small number left, she should be put to the hog at the first opportunity in order to save time. During the time the sow is giving milk she should have abundance of good strengthening milk-giving food. Kitchen slops, crushed oats, or other corn will prove very beneficial at this time, and will have a good effect upon the young ones. At three weeks old the young pigs will also commence to eat a little food. If the litter is large, a small suitable trough should be provided for the young pigs, and this can be so arranged that the old sow cannot get into it, and a little milk or strengthing solids can thus be supplied to the youngsters.

Castration.

The males not intended to be kept for boars should be castrated when about a month old so as to be thoroughly recovered before they are weaned. The operation of castration is so simple that anyone can perform it, and it need not be explained here. As I mentioned before, about a week before the sow is expected to farrow she should be put into a clean fairly-roomy stye. It is not a good plan to have a large quantity of long straw in the stye when the little pigs come; we have often lost young pigs from this cause, as they sometimes crawl into it unseen by the mother, and she often unconsciously lies down upon them and smothers them. The straw should be like rough chaff and not more than 3 inches deep when she pigs. A good plan is to put clean dry straw into the style about a week before the event is likely to take place. If the wet portions are removed every morning the balance will be nicely cut up by the sow herself and trodden down; even with the bed prepared as stated, some clumsy sows overlie their pigs and kill many of them. Our prize monster at the Dookie farm, after waiting for nearly two years before she bred, managed to kill seven out of eight; this was very disappointing indeed. If a calf should die you can get the milk of the cow, but when a litter of pigs die your sow has to be kept many months without any profit. When a sow habitually overlies her young she should be fattened and sold to the butcher. Several plans have been introduced to prevent the young pigs from being killed in this way; the most practicable idea is the fixing of a plank round the style sufficiently high from the floor to allow the little pigs to get under and far enough from the wall to protect them from being crushed when the mother lies down. This is very good in theory, and the youngsters would be perfectly safe if behind the plank when the sow lay down, but the trouble alway is to get them to go there at the right time; and in practice I found that just as many deaths occured with this as without it; the sow would often almost flatten them against the plank itself. Some sows eat their young; I had a most valuable sow in South Australia whose dam was sold in Melbourne for 150 gunieas (name, Lady Severn 7th), and her sire (Berkley Duke) for 60 guineas, who ate one morning five young pigs (three weeks old) out of a litter of nine. After this we separated her from the young ones and allowed her to suckle them three times a day while she was watched. This was her first litter, and she never attempted to eat any of her subsequent litters. I think it was over-affection that made her eat them; she was a very excitable animal, and when she pigged the second time I put old tarpaulins round her stye and allowed no one to see her but the attendant. I took first prize with this animal for the best sow and litter at the National Agricultural Society's Show Melbourne, August, 1886. Some

authorities attribute the eating of the young to sows being fed on flesh, but I think it has more to do with the excitability of the animal. No harsh or rough treatment should on any account be permitted with breeding sows, or pigs of any kind for that matter.

Profitable Pig Breeding.

There is no more profitable animal on a farm than a well-bred pig if well attended to; but worthless scrubbers will simply ruin a man. They are machines for converting good food into manure—certainly not into good meat. I remember when we had finished our large piggery at Beefacres, not having at the time a sufficient number of pigs well bred to utilize it, Mr. Hart suggested that we might procure some ordinary pigs for fattening up until the pure breds increased. Accordingly I went into the Adelaide market and purchased eighty weaners at from 15s. to 20s. each. I suppose at the time they would have been about four months old. These pigs were kept for eighteen months on good feed all the time, and only realized 35s. a piece, while our own bred pigs averaged 45s. at eight months old to the butcher. Now with such testimony it is unnecessary for me to point out the importance of commencing with well-bred animals. I do not say that it is prudent to go in extensively for a large number of high-class pigs all at once. By a judicious selection of well-shaped lengthy and broad common sows, and a first-class pure bred boar you will not only get larger litters, but the pigs will grow well and quickly, and will prove first-class profitable butcher's pigs. By selecting the best shaped and best marked females from this connexion, and by putting them again to a first-class well shaped pure boar, you will by degrees stamp your pigs with the excellencies of the sire. It must be remembered that the sire exerts a much greater influence on the offspring than the female. Do not therefore fall into the mistake of using any of those cross-bred boars (no matter how well proportioned they may be or how well marked) as a sire, he will be almost sure to throw back to his plebeian ancestors, Good breeding and good feeding must go hand in hand. The high-class pigs of the American States are not due entirely to their good management in feeding, but the farmers are men of enterprise and sound judgment, and have brought their pigs to their present state of perfection by indomitable perseverance. Mr. John Thornton, one of the best judges of live stock in England, and proprietor of the *Shorthorn Circular*, writes of a recent visit to America as follows:—"In America, the Berkshire is the pig most in repute. In Kentucky they have truly grand specimens of this breed that would give our best English exhibitors a fight in the show yard." I do not think farmers as a rule will do any good by purchasing store pigs and fattening them up. The quality thus obtained is so uncertain. A man from the mountains on the other side of Benalla wrote me last year thus—"I feed a pig every year for my household use; the one I have at present cost me 15s. I have had him twelve months. He has eaten over £5 worth of food besides the slops from the kitchen, and he would weigh not over 150 lbs. dead weight now. Can you sell me a pig that will improve this state of affairs." I sold him a pig for 20s. just castrated and weaned; he has eaten little more than the slops from the kitchen, and at the present moment his dead weight is calculated at not less than 450 lbs. I found in South Australia that the most profitable time to dispose of pigs was at about eight months old; they would then, if well attended to, weigh not less than 130 lbs., and we had a ready sale for them at from 5d. to 6d. per lb., take the lower figure 5d. This is £2 14s. 2d. If we kept them over this age they do not give the same return for the food consumed. Now, a sow at the very lowest calculation will

produce twelve pigs per annum, that is counting two litters in the year of only six each. This would be at a round sum of 50s. each—£30 for the produce of one sow. Now, suppose you kept 50 sows, you would have a handsome income of £1,500 per annum, and I am quite sure with good management £500 will pay for the food required, and I venture to assert that the whole of this food could be produced on ten acres of land under intense culture, and a system of irrigation. I have often said and I repeat here that if I had to enter the ranks of the unemployed to-morrow I would not be cast down, but cheerfully enter into the pig rearing business, and I am convinced would realize a net profit of a thousand per annum. I know a gentleman who has spent £50,000 on bricks and mortar (city property), the greater part of which was made by pig rearing. Ever since (even to this day) he has so high a respect for the pig that when meeting one he generally lifts his hat.

The principal breeders of pure bred pigs in the Australian colonies are, of Berkshires:—J. H. Angas, Esq., Hill River, South Australia; Charles Rake, Esq., Olive farm, Enfield, S.A.; Messrs. Hart, Beefacres Estate, Paradise, S.A.; L. Chant, Esq., Beeac, near Melbourne; G. Plant, Esq., Woodlands, Northcote; F. Peppin, Esq., Hawkride, Epping, Victoria; Joseph May, Esq., Kingston, Victoria; J. Horwood, Esq., Bridgewater Park, Victoria; W. K. Thomson, Esq., Willow Bank, Gisborne, Victoria; Sir W. J. Clarke, Bolinda Vale, Victoria; James Fry, Esq., Sutton Park, Newlyn, Victoria; Edward Baker, Esq., Bolinda, Victoria; J. C. Hutton, Esq., Preston, Victoria; J. Rowe, Esq., Christchurch, N.Z.; The Bodalla Company, Bodalla, New South Wales; Geo. S. Yeo, Esq., Windsor, New South Wales; J. Treloar, Esq., Deniliquin, New South Wales.

Poland China Breed.

Mr. E. B. Woodhouse, Mount Gilead, Campbelltown, N.S.W., introduced these pigs into the Australian colonies. His importations were obtained direct from D. M. Magie, Esq., Oxford, Butler county, Ohio, U.S.A. The first shipment consisted of two boars, viz., "Crown Prince Magie" and "United States;" four sows, viz., "Perfect," "Oxford Flower," "Americus," and "Ohio Queen." These were landed in Sydney, per "City of New York," on the 29th November, 1878. The second shipment from the same breeder arrived in Sydney by the R.M.S. "Australia," on May 9th, 1880, and consisted of four sows, named "Oxford Damsel," "World Beater Maid," "Beauty Style," and "Black Rose." The Poland China pigs at the Dookie college farm were bred directly from these importations, and are grand specimens of the breed. Mr. Charles Rake, Olive Farm, S.A., is a celebrated breeder of this breed, having procured the nucleus of his herd from Mr. Woodhouse, N.S.W. Chief Justice Way, Geo. H. Dean, and Hart Bros. are also breeders of Poland Chinas in the sister colony. These pigs have not been appreciated in Victoria, the only breeder I know of is Mr. David Syme. I have had considerable experience with both this breed and the improved Berkshire, and if the question were put straight to me which I preferred for an all-round pig, I would unhesitatingly say the Berkshire, either to breed pure or cross with inferior sows. One thing I must say with regard to the Poland Chinas is, that they are not so liable to get blubbery fat, and the meat is better mixed with lean and fat than the best Berks. The Berks, too, in my opinion, are a hardier race, and certainly, so far as I have been able to judge, will give a greater weight of meat for the food consumed than any breed I know.

Ringing Pigs.

This operation is performed in order to counteract the propensity swine have to dig and furrow up the earth. Several American inventions have been introduced for this purpose, a great improvement on the horse-nail system. Pigs in young should never be rung, as the operation often causes abortion. Even the best rings often come out, and a better mode of proceeding is, when the pigs are young, to cut through the cartilage into the proper nasal. The divided edges of the cartilage will never unite again, and the snout always remains powerless.

Feeding Pigs for Show.

The feeding of pigs for exhibition purposes has been over-done, not only in the colonies, but more especially in America and in England.

They are fed on everything that is good, including new milk, rum, apples, and London porter. An amusing story is related in *Harris, On the Pig*, with reference to feeding for show purposes. Several farmers vied with one another each year in trying to produce the fattest hog, each taking a pig from the same litter. One of the farmers beat the others out and out every time so completely that his good luck could never be accounted for as accidental. The secret, however, he kept to himself, but being watched by some one determined to find it out, the discovery was made that jealousy is a grand appetizer for hogs. First, the pet monster was allowed to fill himself to his heart's content, and when he could eat no more a half-starved shoat was let into the pen by a side door. The fat one commenced to fight it off, and meanwhile to gorge himself, simply to prevent the poor squealing victim of unsatisfied cravings getting any food. This was a daily programme, with the result as already stated; and the fact may be borne in mind when preparing pigs for exhibition purposes.

Killing Pigs and Curing Pork.

A pig that is to be killed should be kept without food for twelve or sixteen hours. When the pigs are large, I find it best to shoot them with a bullet on the forehead—this prevents all squealing or exciting the other pigs. The shot pig will immediately drop, and can be stuck thoroughly with a long knife in a slanting direction towards the heart. Every effort should be made to get every drop of blood out of the body, otherwise the carcass will not cure so well. The pig is next immersed in nearly boiling water. The proper temperature of the water is very important. If either too hot or too cold, the hair will not come freely off. A good old-fashioned plan to try the temperature is to let a few drops of the pig's blood drop into the water—if it spreads all over the surface the temperature is right. Leave the pig in the water until the hair comes off freely. Pigs are not easily lifted out of the water, especially when hot, and it is a good plan to erect a block overhead, so as to facilitate this operation. The pig should now be vigorously scraped with a blunt instrument. There is nothing better for the purpose than the lid of an old billy. When the hair is all removed, the skin should be well dried. The internals are then removed in the usual way, and the inside wiped dry with a clean cloth. The pig should then be allowed to hang in a clean airy place for 24 hours. It is then cut up into hams, hands, spare-ribs, loins, and belly pieces. The spare-ribs and loins are generally used for roasting fresh. The other portions are rubbed over with coarse salt and a little saltpetre, and laid on a table flesh uppermost, so as to drain off any blood. The system of drysalting is to be

recommended, as by this system the bacon is not so flabby as is the case when steeped in brine. To make good bacon by the dry process, equal quantities of best Liverpool salt and brown sugar are used, with ¼ oz. of saltpetre to each pound of the mixture. This thoroughly rubbed into the pork every second day, and the position of the meat changed at each rubbing, that is, put the top portions at the bottom, and *vice versa*. The time required for finishing the bacon will depend upon the size of the pig and the state of the weather. The salt goes into the meat more quickly in wet than in dry weather. The place for curing should be cool, with a free circulation of air. Ventilation is equally necessary for live creatures and dead meat. From three to four weeks will be required for the curing of a good-sized hog.

Smoking Bacon.

In our old world experience bacon was generally smoked in the chimney, but this is an unsatisfactory way of doing it, especially in this country, and a bacon smoking house is very easily constructed. A hut about 8 feet square, composed of bush timber, with strong beams across the top to hang the flitch upon. The flitches can be hung as close together as not to touch. The roof may be nearly flat, with only a very small opening to let out a portion of the smoke. The floor is then covered over with about 6 inches of hardwood sawdust, and this is lighted at two different sides. It will burn, but not cause any flame to injure the bacon. The door must be kept closed. About ten days will be required to properly smoke the bacon, after which it may be packed away in sawdust or bran until required for use. Sugar is now much employed in equal proportions of salt, and its use imparts a fine rich flavour to the meat. Of course, there are many little things in connection with the killing of pigs that can be utilized by the thrifty house-wife, such as the lard, the head, sausages, pork pies, &c., &c.

Foot-rot in Sheep.

By EDWARD STANLEY, F.R.C.V.S.,
Government Veterinarian.

The past season having been such as to cause a considerable increase in foot-rot amongst sheep, the following paper on this important subject has been prepared by Mr. Stanley, at the request of Mr. Alex. Bruce, Chief Inspector of Stock :—

There is good authority for stating the disease is contagious, but it is so only when several conditions, such as the nature of the disease, unhealthy season, and a favourable locality, occur together, all favouring the propagation of the malady. At such times the products from diseased feet have produced the disease by contact with healthy feet, or by inoculation.

There are other forms of the disease that are not contagious, and these occur most frequently. They may originate from injuries to the feet, occurring when they are weakened by prolonged wet weather, causing overgrowth and softening of the hoofs.

Professor Brown describes the structural alterations as :—

"Mechanical derangement of the hoof, and the introduction of gritty particles into the canals, or into accidental fissures."

"Softening and disintegration of the horny structure by the moisture of the soil, and of the exuded fluids from the internal membranes."

"Irritation of the internal membrane, causing excessive secretion of epithelial cells with serous exudation, associated with increased vascularity and sensibility."

The symptoms are lameness, usually in one foot, but may be in more. The foot is hot ; the skin becomes inflamed between the digits ; it is swollen, moist, and exudes a purulent fluid. The hoof gets undermined by the inflammation, and gradually becomes loosened from the sensitive tissues on which it grows. A looser texture of horn takes it place, and assumes a fungoid character, which grows beneath the detached hoof. Into this fungoid tissue dirt penetrates, aggravating the disease, and preventing the process of healing.

Treatment for Foot-rot.

The disease in its maligant forms, and especially when neglected in the early stages, is difficult to cure, being very slow in its progress, as many weeks are required before new hoof can grow over and protect the sensitive tissures.

Therefore the objects of treatment are to arrest the growth of fungus and to promote a healthy action in the hoof-secreting surfaces. Having done this, nature will provide a hard crust sufficient to enable the sheep to get about until the new hoof has grown and so completed the cure.

As the disease is under some conditions contagious it is advisable not to allow the affected sheep to mix with the healthy, and the attendant dressing the feet should be careful to avoid conveying the disease by contaminated hands or instruments. These should be frequently disinfected in a watery solution of carbolic acid made of a strength one of acid to twenty of water.

The very lame sheep should be culled and marked and kept in a hospital paddock, where they can be hand-dressed two or three times a week.

To prepare the feet for dressing, overgrown hoofs should be cut into proper shape by hoof shears and knife; all the loose and diseased horn should be cut away, as it harbours dirt and prevents access of dressing; but at the same time avoid cutting into the blood, as the careless use of the knife is likely to increase the growth of the troublesome fungus. Carefully remove all dirt, maggots, &c.; then apply a strong caustic to destroy the fungous growth, so as to prepare the way for future healing applications.

There are several caustics that answer the purpose, but, as they all destroy the tissues, much care is required in their use. The following are recommended. Veterinarians use a red hot iron to destroy the fungus, and it is the best when judiciously used. As substitues, hydrochloric acid, nitric acid, sulphuric acid, have their advocates, but they cannot be safely used without more or less injury to the healthy sensitive tissues.

Butyr of Antimony:—With an equal quantity of tincture of myrrh is a favorite remedy, applied with a flat-stick once or twice a week until the fungus is checked. A safer remedy in unskilled lands, is a very strong solution of sulphate of copper (bluestone), one part to four of water, used once or twice.

Tar:—Stockholm or American tar is sold by ship chandlers. It is obtained by distilation from wood, and possesses powerful healing properties, so that it is frequently used with other drugs for foot-rot. It is very important not to confuse this with coal-tar, because coal-tar burns the feet, and will destroy sound hoofs, therefore it is not recommended.

The following healing dressings, are any of them suitable to be used after the caustics have cleansed the feet. They may be used once a week, or more frequently if necessary, being applied with a bit of rag tied on a stick. It is not a good practice to bind the foot up with rags:—

Stockholm tar	1 lb.
Melted fat	2 oz.
Sulphuric acid	1 oz.
or	
Stockholm tar	20 parts.
Carbolic acid	1 part.
or	
Stockholm tar	4 parts.
Bluestone finely powdered	1 part.
or	
Oil of tar	10 parts.
Carbolic acid	1 part.
Olive oil	1 part.

After a few applications of either of the above dressings the following powder may be sprinkled on the sores daily:—

Powdered chalk	4 oz.
Armenian bole	1 „
Charcoal	1 „
Alum	½ „
Sulphate of Zinc	½ „

Fresh slacked lime sprinkled on a bare dry surface is a convenient form of dressing, as the sheep can walk in it and so save the trouble of application by hand. As it is not always necessary to use strong dressings, the carbolic solutions, being disinfectants, known as Jey's Fluid, Little's and MacDougall's

Dips, are of great service. The strength must be regulated as required at the time. As it sometimes happens in large flocks of sheep that the disease has escaped observation in its early stages, it becomes necessary to treat large numbers, and to do so expeditiously to save expense. For this purpose shallow baths or troughs are used, and the sheep pass through them. In a general way this is all very well, but some care is, nevertheless, necessary. A sheep with a bad foot will go through the bath on three sound feet, and not dress the lame one. Others jump and rush through so quickly that the dressing scarcely touches them, and unless the loose horn and dirt has been removed from the feet the dressing will be unsatisfactory. The dressings are often so strong that they do harm to sound feet, make the hoofs brittle, arrest the natural sebacious excretions round the top of the feet, burn the healthy skin, and do more harm than good by making healthy feet inflamed and tender, when they are more likely to contract the contagion of foot-rot. Therefore it is best to cull the lame sheep and treat them separately.

The following dressings are recommended for use in the baths or troughs. A strong dressing should only be used once, to be followed by more dilute dressings, as the circumstances may require.

Arsenic.—Arsenic is a favourite remedy, but it is very insoluble in water, therefore it is necessary to add potash and to boil the liquid a few minutes, using it when cold. Care should be taken to prevent its boiling over. It is made as follows:—

Arsenic	...	...	...	...	...	...	1 or 2 oz.
Potash	...	...	...	...	...	...	2 oz.
Water	...	...	...	...	...	...	1 gallon.

Soda is sometimes substituted for potash, but it is not recommended as it increases the brittleness and injures the skin of the sound feet. After using arsenical dressing sheep should be kept on bare ground sufficiently long to allow the excess of dressing to drain off the feet, otherwise there is danger of poisoning the herbage and killing the sheep.

Sulphate of copper, ½ or 1 lb. dissolved in each gallon of cold water, or bichloride of mercury, 1 or 2 oz. dissolved in each gallon of cold water, will assist recovery if the sheep are put on battens or bare clean ground for a few hours after each dressing. A repetition of mild dressings is more likely to cure than one severe application of a strong character.

Susceptibility of Kangaroo to Anthrax.

THE following report, dated Rodd Island, 10th March, 1891, was made to Dr. Manning, Government Medical Officer, by M. Loir, agent of M. Pasteur, and E. Stanley, Government Veterinarian:—We have the honour to report the result of the experimental inoculation of the full grown kangaroo you were good enough to send us, with a virulent culture of the anthrax microbes, obtained from the blood of a sheep that died from the natural disease in the Murrumbidgee district a month ago, which was sent to the Rodd Island laboratory. On March 6th we inoculated the kangaroo at the butt of the tail with a cultivation made on the 4th instant in beef tea, injecting three drops of the fluid with a Pravaz syringe. At the same time a guinea pig was inoculated with the same cultivation, one drop of the fluid being injected subcutaneously. On the 7th, and twenty-eight hours after inoculation, the kangaroo died, without any appearance of illness during that day; the guinea pig, inoculated at the same time, during the night—that is, from thirty-two to forty-two hours after inoculation.

A *post-mortem* of the kangaroo, made twelve hours after death, disclosed that there was no indication of disease at the seat of inoculation. The hair was clipped off, otherwise the spot could not have been found. There was no trace of œdema or gelatinous effusion, most likely due to the speedy death. The inguinal lymphatic glands were very congested and swollen; the (double) spleen intensely dark in colour and soft, its structure readily breaking up; the blood was dark and not coagulated; mesenteric glands congested and dark colour. There were patches of subcutaneous hemorrhage, and many extravations of blood in the lungs; they were congested throughout. Microscopic examination revealed the presence of a great number of the bacilli anthracis in the blood, and a cultivation made in beef tea gave the typical aspect of anthrax growth.

A *post-mortem* of the guinea pig inoculated at the same time as the kangaroo showed the ordinary lessons of anthrax, and the cultivation of the blood gave the bacillus next day.

Two drops of the kangaroo's blood was injected into a guinea pig's thigh. It died about forty hours after inoculation from anthrax; so the disease seems not to have changed in its virulence although passed through the kangaroo.

Experiments have given the following results, as to the liability of animals to anthrax :—

Sheep are the animals most susceptible, whether the microbes are introduced by inoculation or ingestion.
Goats have about the same susceptibility.
Mice, guinea pigs, and rabbits are very easily killed by inoculation, but are most difficult to kill by ingestion.
Rats are very difficult to kill by either method.
Cattle take the disease easily by ingestion, as we see in epidemic outbreaks, but they are not so easily killed by inoculation.
Deer take the disease easily by inoculation and occasionally epizootics occur which indicates ingestion also.
Horses take the disease both ways.
Pigs resist the disease by both methods, and very rarely become affected.
Dogs seldom or never take the disease.
Foxes resist the disease by both methods.
Cats are more susceptible than dogs, but resist the disease by inoculation.
Bears are able to have the disesse.
It is almost impossible to give the disease to birds.
Frogs and fishes will not take it.

Seeing the difference in the susceptibility of all these animals, we thought it would be interesting to ascertain the power of resistance in some of the common marsupials, not only as a matter of scientific curiosity as to the effects of a given microbe, but as being instructive by furnishing a link in the great problem of immunity enjoyed by individuals against certain diseases, and as the disease anthrax is so well understood scientifically and so important to the stock-owners of the Colony, we trust we may be provided with other native animals in order to confirm our experiments.

The Sugar Beet.

By J. A. DESPEISSIS, M.R.A.C.

The Department of Agriculture having ascertained the suitableness of the soil and the climate of an important area of the Colony for the industrial cultivation of the sugar beet, has since procured a sufficient quantity of seeds of six of the leading varieties of beet-roots grown by Messrs. Vilmorin, Andrieux, & Co., seed-growers, Paris, with a view of testing their respective merits and their value as sugar producers in this country.

For the guidance of intending experimenters, it is thought that some information, following up the paper on the same subject published in the last issue of the *Agricultural Gazette*, and setting forth directions for the preparation of the soil and of the seed, the sowing, and other details concerning the growing of the crop, will be of service in assisting the introduction of a valuable industry to this Colony.

The six varieties, seeds of which have been secured, are those finding greater favour in France, and also extensively grown in Belgium and parts of Germany and Austria as well.

The following is a short description of the respective value in Europe of the varieties named:—

1. White Improved Vilmorin Sugar Beet.

Originally obtained from the white Silesian beet, and, the result of methodic and persevering selection, one of the richest and most regular varieties in existence. The yield is about 12 tons per acre, with a proportion of sugar in the roots amounting to 16 per cent.,* representing 1 ton 10 cwt. of extracted sugar per acre.

As regards its preservation, it is recognised that it holds its sugar content better than any other variety, and for that reason, in those factories in which the "Improved Vilmorin" is manufactured in connection with other varieties, it is the custom to keep this for the end of the season and to work up the less reliable beets soon after they have been pulled. It is also claimed to resist better than any other variety the unfavourable influence of certain soils, such as black soils, rich in organic matter, and of certain manures, while most other varieties under these circumstances become watery and saline in excess, thus seriously deteriorating the quantity as well as the quality of the sugar and checking its extraction.

This variety is very extensively grown where the excise tax is paid on the beet itself and not on the manufactured sugar.

* N.B.—About three-quarters only of the sugar in the roots can be extracted and crystallised, and the same applies proportionately to the other kinds.

2. Green-top Brabant Sugar Beet.

The top, which protrudes from the earth about a couple of inches, is coloured green and carries a foliage vigorous in growth and upright in position. The root is long, smooth, and white. It is a very prolific and vigorous variety, requires deep soil well tilled, the weight of the crop averaging 20 tons per acre, containing about 12 per cent. of sugar, representing about 1 ton 5 cwt. of extracted sugar to the acre.

3. French Rich Sugar Beet.

A variation of the Brabant beet, preserving in its general aspect, and notably in its foliage, many of the characteristics of the Brabant. It differs distinctly from it in the fact that it grows entirely under the soil, is more slender, with a more reddish skin and more compact flesh. Its yield averages 16 tons of roots per acre, containing 14 per cent. of sugar, which represents 1 ton 12 cwt. of extractable sugar.

4. White Red-top Sugar Beet.

Is about equal to Brabant Green-top in yield and percentage of sugar, but it does not require such deep soil and ripens earlier. It is very extensively grown in countries where the tax is paid on the manufactured sugar or on the alcohol and not on the roots.

5. Early Red-skin Sugar Beet.

Is a very good and distinct kind, growing entirely under ground, with leaves lying flat on the soil. It yields about 16 tons to the acre, containing 14 per cent. of sugar or 1 ton 12 cwt. of extractable sugar. It ripens early and keeps well.

6. Klein-Wanzleben Sugar Beet.

Has a wider cultivation than any other sugar beet. The root is conical, straight, and even, quite large at the head and rapidly tapering. It has a brighter colour than the Improved Vilmorin, which enters largely in the cross from which it comes; its leaves are lighter coloured, undulating, and scalloped about the edges.

This variety succeeds equally well in soil of an alluvial nature and mean richness and on level plateaus. In soils very rich in humus it ripens poorly and loses much of its richness. It yields slightly heavier crops than the Improved Vilmorin, but its saccharine richness does not exceed 14 per cent.

Cultivation of the Sugar Beet.

Intending experimenters in this country might refer to my paper on the subject, published in the last issue of the *Agricultural Gazette*, as to the requirements of soil and of climate for the profitable cultivation of beet-roots rich in sugar.

Mr. H. Vilmorin, whose name is intimately associated with everything bearing on the industry of the sugar beet, gives in this matter some valuable information, and the results of well conducted experiments, which throw considerable light on the subject of the industrial cultivation of the sugar beet.

A sugar beet, like all root crops, should be regarded in the rotation as a clearing crops.

Preparation of the Soil.

The best time for ploughing is the autumn, the plough being first run 6 to 7 inches deep and followed by a subsoiler regulated to tear the ground another 6 or 7 inches, thus breaking the arable soil to the depth of 12 to 14 inches, which is about the average length of a sugar beet root.

The land is left in this rough condition all through the winter, and is again ploughed—not subsoiled—in the spring, and prepared for sowing by means of harrowing and rolling.

Should the ploughing be delayed till the spring, a quantity of bad seeds will be brought to the surface, which, germinating at the same time as the beet, will over-run the ground and smother the crops; while, on the other hand, if the soil be ploughed in the autumn the seeds which germinate in the early spring are killed by the second ploughing, harrowing, &c., which precede the sowing.

Preparation of the Seeds.

The seeds are very often "pickled" or soaked previous to the sowing especially when they are not quite fresh; and the planting takes place in the spring, whenever the temperature reaches about 55° to 60° F. In the New England district by the end of September.

The germinating faculty is materially increased by soaking in water at 100° to 120° F. for twenty-four to thirty-six hours, and the beets thus treated show a more even growth than when the seeds are not soaked. Prolonged immersion, however, in pure water, might remove from the seeds some of their soluble constituents, and for this reason the seeds are often steeped in the juices flowing from the manure heap, which are diluted with about an equal volume of water. A mixture of urine and water in equal parts is just as good. The seeds, during this time, having absorbed about their weight of water, are taken out, mixed with ashes—superphosphate of lime is often added to the ashes—dried on the surface, passed over a screen, and used for sowing.

Germination of Seeds.

Few crops have been so thoroughly studied as regards their requirements, and the treatment they should be subjected to, as the sugar-beet. Experiment has shown that in a soil well prepared and sufficiently moist and ærated, the seeds require for germination a total of degrees of average temperature, equal to 650° F. Thus, if the average daily temperature be 55°, twelve days will be required for germination; if 65°, only ten days will be required. Should the seeds be steeped for 36 hours in water, or the liquid from the manure-heap warmed to 100° or 120° F., the number of days required for germination will be correspondingly reduced, and only nine to ten days will be occupied.

The same principle holds good for the germination and the ripening of many of our economic and ornamental plants.

Manures.

In the rich volcanic or alluvial soils of the New England district, no immediate manuring will be required, except on land which has been under crop for a great number of years. When, however, manure has to be applied, it should not be too new, but thoroughly rotten, in order that the beet-roots may not be caused to fork out by coming in contact with hard straw. This forking or branching prevents proper maturing.

For this reason, stock-yard manure is not directly applied to the beet-root crop, but to the cereal crop which precedes it. Artificial fertilisers, such as superphosphate of lime, are often used instead of stock-yard manure, and may be applied at the time of sowing, either separately or mixed with the seeds. In the case of soluble nitrogenous manures, such as nitrate of soda or sulphate of ammonia, it is always advisable to apply them when the seeds have germinated, and the plant is able to utilise them. Manures in which the phosphoric acid is to the nitrogen in the proportion of two to one give very good results as regards the production of sugar in the crop.

Sowing.

For experimental purposes, sowing may be done by hand, but when beet-growing is attempted on an industrial scale, a seed-drill should be used, which delivers the seeds regularly, without waste, and facilitates the subsequent method of cultivation and harrowing.

The seeds are sown thickly, at the rate of 16 to 20 lb. to the acre, in lines 10 to 14 inches apart, and not more than 1 to 2 inches below the ground, a light roller being run on the ground after the sowing. Experiments have shown that at that depth a higher percentage of the seeds will grow than at any other. Also, that close planting gives:—

Roots richer in sugar.

Containing less saline and organic matters.

Hence, it is less exhausting to the soil, and produces heavier crops. The inference is that close culture is more profitable, both to the grower and to the manufacturer.

In drier localities, the distance between the rows might be increased to 16 or 18 inches each way, so as to allow to each plant a greater superficial area for drawing moisture from, and also for diminishing the evaporation through the leaves. For this Colony, where hand labour is so expensive, it might be considered a good plan to sow a little wider apart—say 18 to 20 inches between the rows—so as not to impede the operations of horse hoeing and sowing 18 to 20 inches apart, whilst restricting the distance between the plants in the line to 9 inches. The thinning should be carried out when the plant has grown two to four leaves.

Hoeing is begun as soon as the plants show above the ground and mark the row, and is constantly carried on at intervals of a fortnight as long as the leaves will allow. Early and constant hoeing is strongly to be recommended, as it destroys the weeds when they just show; and also keeps the surface of the soil well pulverised, thus checking the excessive evaporations in the daytime by breaking the continuity of the capillary action in the ground, and besides favouring the absorption of the moisture and dew during the night.

After a dry summer a few seed-stalks may appear in the field, and should be removed.

Ripening.

The sugar-beets begin to mature in the autumn, and this is shown by the leaves turning yellow and drooping. The roots are then fit for pulling, which is done either by hand, after the root has been loosened by the assistance of the pick or the plough, or by machines which have been devised for the purpose. At all events care should be taken not to bruise or cut the root, which would then decay when stored or heaped up in silos. The leaves

are removed from the roots in the field, by means of a sharpened bill-hook, the earth shaken off, and the roots heaped up and covered with their leaves, till carted away to the stack or silo.

Stacking.

The beet-roots are either delivered at once to the sugar factory or stored for some time. For this purpose, they should be stacked or heaped up in trenches or cellars which should not be too dry, or the roots will wither, nor too damp, or they will rot. The roots should, moreover, be protected against frost, but a high temperature is highly undesirable, as favouring the sprouting of the roots and their fermentation; good ventilation, and means of carrying away of foul air, and the carbonic acid gas disengaged from the mass of heaped up roots, should also be provided.

These notes comprise the general treatment of the sugar beet-root from the time of sowing to the storing of the crop. The department is desirous of testing the suitability of various parts of the Colony, and notably the New England District for its cultivation, and will be grateful for the observations of those who will conduct experiments as to the relative value of each variety on their respective soils, and under their peculiar climate.

Representative samples, well matured, of each variety grown, will also be gladly received, with a view to testing the density of the juice of each sort, and in some cases making a determination of their sugar and mineral contents, so as to test their industrial value. The dates of sowing and of pulling should also be furnished as well as some indication as to the general treatment applied, the character of the soil, the distribution of rainfall and any other detail which might help in promoting what bids fair to be an important industry, suitable for a promising district of this Colony.

Hair-Worm.

(*Gordius, sp.*)

By N. A. COBB.

During the month of March a number of specimens of hair-worm were brought to the Pathologist. Among others was a milk-white specimen, captured in a creek by Mr. M. J. St. Clair, Stock Inspector at Glen Innes. These worms are so remarkable, and have given rise to such extraordinary opinions, that they deserve notice here, especially as they often cause considerable excitement in families whose water supply they happen to inhabit, and among sheep-owners on whose stations they may be found.

The hair-worms of Australia have not yet received the attention of a competent specialist, so that it is not possible to say whether the worms brought to the Pathologist are native Australian species, or species that have been introduced, though the probability is in favour of the former supposition. Adult hair-worms vary from five or six to twelve inches in length; they are very slender, varying from twice to four or five times as stout as a horse-hair. Towards the head they are narrower, and at the tail-end they are usually a trifle swollen, thus ending in a knob. A person seeing one of these worms for the first time usually mistakes the tail-end for the head. The colour varies according to circumstances, from white through various shades of brown to black. Outwardly the worms are quite smooth, but if examined with a magnifying-glass, two rather inconspicuous longitudinal lines or stripes may be found running the entire length of the animal. Strange to say, those best qualified to judge assert that these worms have no proper mouth and gut, and that they take no food in the usual way. It appears as if the food were absorbed through the skin. Certain it is that the mouth is rudimentary, and also the œsophagus; the gut also is very small, and is with difficulty found, even with the best microscope. The worms are of two sexes, the males being in some species forked at the tail-end. After copulation the females lay an enormous number of eggs. Many years ago it was known to several acute zoologists that the egg-masses were almost as large as the female worm itself; but, for all that, the ovaries were assigned a place at the posterior end of the worm entirely inadequate to hold such a mass of eggs, and much was made of a curious "parenchymatous tissue" filling the greater part of the body. Through the researches of Prof. Vejdovsky, this "parenchymatous tissue" is now known to be none other than the ovaries proper, which are two in number, segmented, and extending to within a short distance of the head. When the eggs are laid in water they give rise in the course of about six weeks to small worms or larvæ of a peculiar form. Whereas the adult worm is without any outside appendages, the young larva has a beak, and around the beak six sharp claws. These larvæ lie motionless

at the bottom of brooks and pools, and it has been found that they may continue to do so for a long time, perhaps many months. Each larva lies perfectly motionless, taking no food, but waiting for its opportunity. If any aquatic insect-larva or a water-flea happens along that way, woe is he! The instant any part of a water-flea or larva of a may-fly comes into contact with the quiet little worm,—*presto!*—he becomes the most active little thing imaginable. With beak and claws he seizes on, and then proceeds to bore his way through the skin into the interior of the flea or may-fly. Here he begins to grow, taking food now for the first time. He sucks in or absorbs the fluids of his host, but does not thus destroy him. Sooner or later the water-flea or may-fly larvæ may be snatched up by some rapacious insect of larger size; and now our worm makes its way through the wall of the intestine of the rapacious insect, and thus finds his way into a wider sphere of action. Lodged in the body of this large insect, which may be a beetle, or even a spider, the worm grows apace, and soon reaches its full size and makes it way out, thereby causing the death of the host. It is surprising how large a worm an insect of the size of a grasshopper can carry and yet live. From a beetle an inch long, a Gordius ten inches long may issue.

The mature worms sometimes collect into great masses several inches through, and in this case, if the worms are black, the resemblance to a tangled mass of horse-hair is very striking. This resemblance has led to the fable that horse-hairs will turn into worms. This superstition is so widespread that there is probably hardly a person in the civilised world who has had a country experience who has not heard it. I have heard very clever people assert warmly that they had tried the experiment and succeeded; that it was only necessary to put hairs from a horse's tail or mane into water, when they would transform themselves into worms in the course of a few weeks. I well remember how this appealed to my imagination when a boy, and how many times I tried the experiment; but somehow I could never make it go, and I was reluctantly driven to the conclusion that my informants were mistaken.

These worms are harmless to man and to domestic animals. Heads of families finding worms answering to the above description in their water supply, and sheep-owners who find them in pools and creeks on their runs, need have no fear of them. They can in no way harm stock, and the only cause for dread, when they are found in the family water-supply, is that they indicate that some way exists by which animals of such size as large insects, &c., can gain access.

Pathological Notes.

By N. A. COBB.

Maize Rust.

During a visit to the Northern District an officer of the Department, in forwarding some specimens of maize affected with blight, gave the following description of the manner in which the disease develops :—

At first the lower leaves are attacked, and gradually the disease works upwards. It begins with the flags becoming stippled with yellow spots, and gradually the whole of the leafy part dries up, and from the outside to the mid-rib breaks away in strips (probably when the wind splits them up), and gives a raggy and dried appearance to the whole plant. If the cobs are not already formed when the blight attacks the plant, it is probable that nothing will come of them, and if the grain is formed it will get more or less pinched. The early crops are not so likely to suffer as the late ones. Dry seasons have acted more detrimentally than wet. That only little damage is done so far this season is here generally attributed to the wet weather that prevailed this summer. Early planting here means from the middle of August to the end of September, and late planting from the middle of December to the middle of January. The months of October and November are avoided for planting, as the corn planted in these months is said to be liable to get fingery, *i.e.*, forming several cobs from the same eye like fingers, and which come to nothing. The disease generally appears first towards the middle of December, or when the maize "tassels" (gets the male flowers). I noticed at Dunoon that this is the time when the aphis is most abundant upon the plants. I saw some of the male flowers covered all over with them when yet partly covered with the sheath.

After a careful examination, the Pathologist made the following report :— I have never before seen maize so seriously affected with rust. I am at present uncertain whether the rust is *Puccinia maydis, Carr*, or not, though it probably is. The uredospores appear to possess three to six germ pores instead of the number usually assigned to *P. maydis*. Again the uredospore sori contain occasionally black bodies resembling spermogonia, and this is not usually recorded of *P. maydis*.

The matter will be fully investigated in order to find out whether this is the species of rust attacking maize in other countries, or one indigenous to this country. In any case it is a very serious disease appearing on a crop which is commonly very hardy. I particularly desire that further specimens of this disease be forwarded at intervals of two weeks, inasmuch as the disease is not at present in just the right condition for investigation. If the crop is soon to be harvested, I would like it much if a few plants could be spared for this purpose.

For the present rotation of crops is recommended, and the destruction of rusty plants by fire. Also that the seed for new crops should be saved from non-rusty plants.

Apple Scab (*Fusicladium dendriticum*)

A number of diseased apples, forwarded to the Department by the *Town and Country Journal*, were ascertained to be affected by the attack of a fungus known as "Apple Scab," a disease of unfortunately too frequent occurrence. It may be almost entirely prevented, at a slight cost, by spraying the affected trees once in every two or three weeks during the spring and summer, with the mixture known as eau celeste (modified), which is prepared as follows:—

(*a*) Dissolve 2lb. copper sulphate (bluestone) in hot water.
(*b*) Dissolve 2½lb. sodium carbonate in another vessel of water.

Mix (*a*) and (*b*), and before using add 1½ pints of ammonia, and then dilute to 30 gallons with water.

Land Drainage.

By the DIRECTOR OF AGRICULTURE.

(ARTICLE No. 1.)

AMONG the many methods at our disposal for improving the mechanical condition of our soils, none perhaps is more important than draining. It shows its beneficent action alike in dry and in wet weather. By its aid heavy clay lands may be made of great agricultural value; without it all other means of improvement are useless. The past wet season has brought home to the minds of many fruit growers on the stiff soils of the county of Cumberland, and many farmers in our wheat growing districts, the need of drainage. But to the thoughtful student the year of drought presents no less potent arguments in its favour. Thousands of lemon, orange, apricot, peach, and other trees have been killed by the stagnant water of the past winter, and the whole subject is therefore exciting interest.

The fundamental principles and chief objects of draining are often misunderstood. Let us first glance at the latter, which are as follows:—

1. To get rid of stagnant water, both from the surface and from under the surface, and thus prevent its injurious effects.
2. To ensure an alternation of condition from wet to dry, and *vice versâ*, and hence a disintegration of the soil above the sub-drain by the kindly influence of the air which must follow the water.
3. To enable the water with its fertilizing constituents from the air to go right through the soil, and not run off the surface.
4. To check evaporation, and thus raise the average temperature.
5. To change the mechanical condition of the soil, and thus give not only better crops, but a larger choice; it being possible to grow not only wheat and beans on clay land, but roots, barley, oats, rape, and clover.
6. To enable the farmer to get on to his land as soon as possible after wet weather, and thus save, perhaps, weeks of time for men and horses.
7. To improve the health of the fruit trees in the orchard, of the live stock in the pastures, and of the human population of the entire district.
8. To deepen the soil, and thus make it possible to use deeper cultivation, subsoil and trench ploughing on the heavy soils.
9. To equalise the temperature of the soil during the season of growth, to raise the average temperature of the soil in winter and early Spring, and thus hasten the maturity of early crops.
10. To lengthen seasons.
11. To prevent injury from drought.
12. To improve quality and quantity of crops.
13. To increase the effect of manures.
14. To diminish liability to rust and other fungus diseases, the rot in potatoes and roots, lichens on fruit trees, and other diseases following bad drainage.

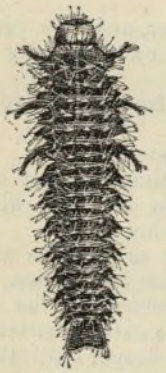
These may be designated the theoretical scientific objects of drainage, which moreover, are found to be realised by practical farmers, and each of them will be discussed in detail in future issues of the *Gazette*.

Insect Pests.

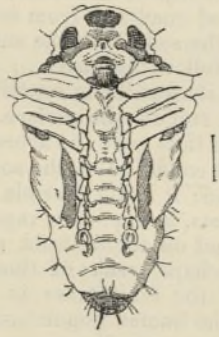
By A. SIDNEY OLLIFF,
Government Entomologist, New South Wales.

The Fig-Leaf Beetle. (*Galerucella semipullata*, Clark.)

The insect here described* is one of the commonest of our native Phytophaga or plant-eating beetles, occurring in some seasons in great numbers on wild and cultivated figs, the young shoots and foliage of which form their food, not only in the young or larval condition, but also in the subsequent or adult stage. The perfect insect, I have observed, chiefly confines its attention to the bark, and the larvæ, which are by far the most destructive, to the leaves and buds. During the early part of the summer I had an opportunity of obtaining a large number of the larvæ in a garden on the Parramatta River, from whence I had previously received the adult beetle,† and these specimens have furnished material for the accompanying figures, illustrating the life-history of the insect.



No. 1.—Larva of Fig-Leaf Beetle (*Galerucella semipullata*, Clark.)



No. 2.—Pupa of Fig-Leaf Beetle (*Galerucella semipullata*, Clark.)

No. 3.—The Fig-Leaf, Beetle (*Galerucella semipullata*, Clark.)

The eggs of this species are laid in small patches, varying in number from fifty to a hundred and twenty, on the stems and leaves of the food-plant, and it was evident, from experiments which I was able to make, that the parent beetle prefers to deposit the eggs on a young plant. The eggs are elongate, fusiform, pale yellow bodies, and are attached side by

* An account of this well-known fig pest was published by Mr. Henry Tryon in his "Insect and Fungus Pests" (p. 148), in 1889, under the name *Galeruca* sp., giving a full life-history of the insect, and some time later Mr. W. W. Froggatt printed a brief notice of the species, accompanied by rough wood-cuts, in the columns of the *Sydney Mail*. I am in a position to state that Mr. Tryon's insect is identical with the species here referred to, as I have had an opportunity of comparing specimens.

† Agricultural Gazette, vol. I., p. 289, 1890.

side to the stem or leaf by their broad extremity. The larvæ, immediately they are hatched, begin their work of destruction, feeding gregariously on the buds and leaves. When young they are pale brownish testaceous in colour, but as they grow larger they become much darker, eventually assuming a deep brownish black. The full grown larva is elongate, somewhat narrowed towards the anal extremity, and more or less cylindrical. Head dark chestnut brown, rather strongly convex, rounded in front, and strongly pubescent; first thoracic segment decidedly longer than the second and third; all the segments, both thoracic and abdominal, strongly pubescent, and provided with conspicuous tubercular elevations, bearing setigerous hairs. These elevations form regular series, running from head to tail, and there are eight on each segment (except the first, or that immediately following the head) disposed in two rows, four in front and four behind. Of these the discal series, or rather the series on either side of the middle, are subconfluent; the lateral series not so strongly elevated; each segment provided at the sides with long fleshy protuberances, which, like the dorsal elevations, are ornamented with strong brownish yellow setigerous hairs; terminal or anal segment shield-like, narrowed in front, truncate and rather strongly emarginate behind; legs robust, chestnut brown in colour; length, 12 mm. (nearly half an inch). It is evident, from the fact that larvæ, certainly not more than one-third grown, which I bred, were found to have pupated in less than a fortnight, that the fig-leaf beetle undergoes its transformations, and attains maturity, in an unusually short time. Probably there are several broods in a season, but at present we have no difinite information on this point. When full grown the larva leaves its food-plant, descends to the earth, and buries itself beneath the surface of the ground, generally at a depth of an inch or two only, or amongst rubbish and dead leaves on the surface. It then changes to the pupa stage. The pupa measures 7 mm. (about a quarter of an inch) in length, is pale yellow in colour, and, like all its tribe, has the limbs separately encased. The perfect insect or beetle is tolerably robust, dull reddish brown in colour, and densely clothed with fine silky gray pubescence; head broad, with a rather large dark brown spot in the middle, and a deeply impressed median line; antennæ robust, rather long, shining black; prothorax broadly transverse, depressed in the middle throughout its width, with a round, dull, dark brown spot in the middle, and sometimes another near each anterior angle, finely punctured on the disk, strongly and moderately closely punctured near the anterior angles, the sides sinuate; scutellum dark brown; elytra nearly parallel, a little widened behind, finely, closely, and irregularly punctured, internal apical angles distinctly produced. Legs dark brown, finely pubescent; length, 7-10 mm.

Fortunately, the attacks of this particular pest can be subdued with comparative ease, and with little outlay. The larvæ and adult insects are readily killed by means of arsenical poisons. London purple or Paris green, mixed with water, and applied to the fig-trees, in the form of spray, as recommended in the case of the Codling moth (see vol. I, pp. 9 and 283), will be found to kill the insects in these stages; and the pupæ may be exposed to the attacks of birds and poultry by turning the ground to the depth of a few inches. The application of lime to the soil beneath the trees, especially if raked into the ground, would also be useful in destroying them in this latter stage.

I have to thank Messrs. Crisford (Richmond), C. Tunks (Parramatta), and A. H. Duncan (Riverstone), for specimens of the fig-leaf beetle in various phases of its development.

Analyses of Commercial Fertilisers, &c.

Bone Dust.

The following analysis, which was made by Dr. Helms, on behalf of the Department, shows the contents of a sample of the bone dust manure manufactured by the Sydney Soap and Candle Company:—

Phosphoric acid (P_2O_5)	15·88 per cent.
Lime	18·42 „
Magnesia	0·30 „
Combustible matter (containing 2·94 per cent. of nitrogen, equal to 3·57 per cent. ammonia) ...	39·42 „
Insoluble substances (chiefly silica)	4·99 „
Moisture	5·57 „

In forwarding this analysis to the Company, the Director of Agriculture pointed out that the manure, though a valuable one for general use, was not of the highest quality as a bone dust, as it contained too much useless matter. The percentage of combustible matter was far above the average, while the content of nitrogen, which should be 4 per cent. by the English standard, was not proportionately high. The insoluble substances were too high, and the amount of phosphoric acid (15·88 per cent.), equivalent to 34·7 per cent. of phosphate of lime, is not equal to the percentage—45 per cent.—insisted on by the highest agricultural authorities in England. It was suggested that by improved methods of manufacture the manure could probably be much improved in value. Everything of little value should be removed if possible, and nothing should be added unless of distinct value as a manure, and the Director also recommended experiments with sulphate of iron, instead of lime, to keep down the smell of the manure. Its value, at present Sydney prices, was estimated at 105s. to 109s. per ton.

Sugar Company, No. 5.

The following letter has been received by the Director from Mr. T. B. Linley, of 573, George-street, Sydney, and St. John's Park, Canley Vale, giving his experiences with the use of Sugar Company's No. 5 manure:—"As a fruit grower, I have to thank you for the trouble you have taken to make known the value of Sugar Company's manures. I think it highly probable that you would like to know what some of us think about them after making experiments. I tried for three years to grow potatoes on my ground at Canley Vale without success. I could get the proper quantity, but they were so very small, the largest about 1⅛ in. in diameter. The varieties were Early Rose and Circular Head. I have this season dug as fine a crop of Early Rose as you would wish to see. I used the Sugar Company's No. 5

sparingly. I tried Circular Heads with same manure and treatment with very unsatisfactory results. I have tried Nos. 2, 3, and 4 in different parts of the ground, and for different plants, but No. 5 suits my ground best. Amongst my fruit trees there were thirty lemon and orange trees that were all but dead; they were the best I could get at planting time. They were small and shrivelled, and for three seasons they lingered between life and death. I applied No. 5 manure, 2 oz. to a pail of water, and they are now full of life and vigour. My plum trees grew in the spring very well, but made no growth after. I experimented with No. 5, half a pail to each tree, about three weeks ago; they are now full of nice shoots. I have tried it on capsicum plants. Those I gave 2 quarts of the liquid manure to are now 3 feet high, and those I purposely left unmanured are just 1 foot high. It acts like magic on passion-fruit. I planted a year-old vine last spring. It now covers 69 square feet of trellis, and it is full of blossoms, those passion vines I left to themselves just occupying 4 superficial feet. I tried it on some China date plums. It caused some of the leaves to thicken and curl. I only used 2 quarts to each small tree, and that only once. I should be glad if you could tell me whether the pea-nut plant can fix nitrogen from the air like the pea and bean tribe. From some experiments I have tried, I suspect such is the case. If you can place your hand on an analysis of the ashes of the pea-nut it would be very acceptable."

In addition to those interesting particulars, the Director has received from Mr. F. R. Pockley, of Gordon, highly satisfactory accounts of the wonderful effect of Sugar Co's. No. 5 manure on his peach trees. Mr. Pockley dressed his trees with this manure at the rate of 3 or 4 lb. per tree. A sample of the fruit gathered from the trees and shown to the Director measured 11½ inches round, and weighed 11¼ ounces, while others were of nearly equal excellence.

Analyses of Soils.

Table of Soils analysed by the Analytical Chemist of the Department.

(*Continued from vol. 2, page 59.*)

By A. Helms, M.A., Ph.D.

Locality and Geological Formation of surrounding country.	Nature of Soil.	Mechanical Analysis.				Analysis of Fine Soil.				Determination of Substances in hot hydrochloric acid of 1·10 specific gravity.										
		Stones of more than ¼ in. diameter.	Coarse sand of more than ½ in. diameter.	Root fibres.	Fine soil.	Moisture.	Sand.	Impalpable matter, chiefly clay.	Organic substances, and water of combination.	Lime.	Equivalent to, in an acre of soil 6 inches deep.	Potash.	Equivalent to, in an acre of soil 6 inches deep.	Phosphoric acid.	Equivalent to, in an acre of soil 6 inches deep.	Nitrogen.	Equivalent to, in an acre of soil 6 inches deep.	Equal to ammonia.	Magnesia.	Ferric oxide.
Rolland's Plains—Silurian	Heavy c ay	6·25	29·00	0·06	64·69	4·15	8. 8	67·91	19·14	0·3952	7,904	0·1558	3,116	0·0696	1,392	0·3660	7,320	0·408	0·3255	..
Tenterfield	Sandy loam	0·07	18·76	..	81·47	2·0	63·45	28·77	5·78	0·4976	9,952	0·5012	10,024	0·0197	394	0·2800	5,600	0· 34	1·0680	..
Parish, Tuggerah, Newcastle	Sandy loam	..	10·26	..	89·74	8·1	57· 6	22·55	14·75	0·1360	2,720	0·0557	1,114	0·0037	74	0·2800	5,600	0· 34	0·1799	..
Windsor, No. 1	Light sandy loam	0·9	1·49	0·13	97·48	2·25	71·57	20·84	5·34	0·0608	1,216	0·0985	1,970	0·0348	696	0·1400	2,800	0·1700	0·0340	..
„ No. 2	Light sandy loam	6·16	1·38	0·06	92·40	1·05	79·62	16·42	2·91	0·0416	832	0·0730	1,460	0·0187	374	0·1280	2,560	0·1547	traces	0·9042
„ No. 3	Heavy clay	..	0·12	0·05	99·83	10·1	11· 5	68·42	9·98	0·1336	2,672	0·1616	3,232	0·0828	1,656	0·2700	5,400	0·3218	0·3857	5·2608
Gungamba, Glen Innes	Heavy clay	0·06	0·07	0·03	99·84	6·53	2·37	76·30	14·80	0·2040	4,080	0·0574	1,148	0·1585	3,170	0·1540	3,080	0·187	0·2863	13·0424
Sutton Forest	Clay loam	0·26	0·85	0·15	98·74	5·30	18·55	64·56	11·59	0·1128	2,256	0·0555	1,110	0·0092	184	0·1470	2,940	0·1785	0·3007	6·2472
Picton Lakes	Sandy loam	13·24	1·50	2·23	83·03	1·45	67·80	25·16	5·59	0 0624	1,248	0·0233	466	0·0192	384	0·0364	728	0·0442	traces	1·0412
Burradoo	Heavy clay	6·12	4·64	0·15	89·09	2·45	22·40	69·07	6·08	0·3448	6,896	0·0599	1,198	0·0844	1,688	0·0900	1,800	0·1103	0·0565	3·9730
Arncliffe—Hawkesbury, sandstone	Loam	6·81	26·28	0·09	66·82	2·45	52·50	38·30	6·75	0·1040	2,080	0·0612	1,224	0·0215	430	0·1414	2,828	0·1717	0·0966	4·9320
Cootamundra	Red clay loam	0·03	3·93	0·88	95·16	6·7	13·79	69·62	9·89	0·8824	17,648	0·4202	8,404	0·1284	2,568	0·1940	3,880	0·2363	0·3930	4·9868
„	Red clay loam	0·19	8·12	0·51	91·18	2·05	23·83	67·60	6·52	0·8136	16,272	0·2716	5,432	0·1213	2,426	0·1280	2,560	0·1547	0·3165	3·3976

General Notes.

Gum-leaf Extract for destroying Insects.

The following particulars of the mode of preparing a decoction of gum-leaves for the destruction of insect pests has been forwarded to the Department by Mr. John M'Coig, of the State Forest Nursery, Gosford:—"The decoction I tried was made by filling a kerosene tin with fresh succulent gum leaves of any species, but preferably *E. globulus* or *E. piperita*, then fill up with water, and boil down until about 1½ or 2 gallons remains. Of this, take 1 pint to 2 gallons of water, and apply to the infected plants with a large syringe. I used it cold, but intend to try the effect of it when warm. I found it effectual this year with a new pest, a beetle which perforates the leaves of vines. In fact, it is omnivorous, as I found it denuded cabbages, potatoes, and pumpkins, of all leaves in a neighbour's place. As the beetle is very lively it is best to syringe early in the morning. Mr. Olliff kindly named the beetle for me. He calls it *Arsipoda Macleayi*. It did not attack the vines after one good syringing; and I also found that the decoction greatly prevented the attacks of the red-cedar moth, as the young plants I syringed kept nearly free, whilst those left without syringing were badly infested. Mr. Olliff kindly named this pest for me, also. It is called *Epicrocis terebrans*, and its larvæ bore into the points of young shoots. It, however, only attacks cedar, and is not at all likely to attack fruit trees, although it caused me to try the decoction as a remedy. I found, on putting the grubs into a phial, which had contained eucalyptus extract, for the purpose of forwarding them to Mr. Olliff, that although the phial had been washed, the slight trace left in the bottle was sufficient to kill them at once. This, with other things I had noticed, induced me to try the remedy. I have tried the decoction, on a small scale, for American blight, but, although effective, I have not yet sufficiently proved its efficiency. I find it very effective for the green fly (*Aphis mali*) on roses, and I expect it would be equally effective with the aphis, which is now so bad on the young shoots of peaches. Being cheap and plentiful, it should be easily tried, and if found by others as useful as I have found it, doubtless it will come into general use."

Pest-proof Tree Stocks.

A number of experiments have been commenced by Mr. John M'Coig, of the State Forest Nursery, Gosford, with a view to selecting stocks which will resist the attacks of various pests and diseases, with a view to using them for the purpose of grafting with fruit trees.

The native grape has been selected for a vine stock, it being, in Mr. M'Coig's opinion, likely to resist phylloxera. It will certainly be a strong hardy, stock, and as it has existed so long in the Colony, is free from blight, has been able to fight its way amongst our timber trees and scrub, in untrenched ground, it will, he thinks, in tilled ground, respond to kind cultivation.

The native lime is expected to prove a valuable stock on which to graft lemons and oranges, as it attains a great size, is long lived, grows naturally in wet, swampy ground, and is always healthy. Mr. M'Coig expects it will prevent "yellows" and such troubles.

The loquat is well known as a hardy tree, and Mr. M'Coig has never seen blight upon it. He recommends its use as an easily-reared and procured stock, and one that is likely to be blight-proof for apples.

Grafting Reputed Blight-Proof Apples on Blighty Stocks.

Mr. John M'Coig, of the State Forest Nursery, Gosford, grafted several reputed blight-proof apples on some very blighty stocks. This was done more than two years ago, and the following account of the results obtained has been kindly supplied by Mr. John Taylor, of North Ryde, who owns the orchard where the experiment was carried out:—"The sorts with which Mr. M'Coig was successful are Cox's orange pippin, peach apple, Baxter's pearmain, winter pearmain, and five-crown pippin. These were grafted on to large apple trees which were very much blighted but which are now free from blight and growing well."

Analysis of Water from Hay.

As an instance of the care which it is necessary for a farmer to exercise in the source of his water supply, the following analysis is given of a sample of water from the estate of Mr. T. F. James, of Hay, forwarded to the Department by Mr. A. Lakeman, M.P.:—

Contents—428·5 grs. solids per gallons, of which 315 grs. per gallon are sodium chloride (common salt); 46 grs. are volatile in dull red heat (chiefly organic substances); the remainder (67 grs. per gallon) contain alumina, lime, magnesia, sulphuric acid, and traces of lime and potash.

From this analysis it will be seen that 1 lb. of salt is contained in 22 gal. of water, besides Epsom salts, gypsum, and other minerals. Such a water, if used in large quantities, or continuously in small quuntities, would certainly kill trees or any other crops to which it might be applied. In cases where trees and plants are dying without any apparent cause, an analysis of the water supply may very likely assist in deciding the question.

The Strawsonizer.

In part 3 of this volume a description appeared of the new Strawsonizer spraying machine, together with the announcement that a number of specimens were on their way to this Colony for Messrs. Jas. Martin & Co., of York-street, Sydney. The Department has since been in communication with Mr. Edward Tyrrell, of Pokolbin, Hunter River district, who states that he purchased a Strawsonizer during a recent visit to England for the purpose of sulphuring vines affected with oïdium, as he found that in using bellows the men were not careful to sulphur the whole of the vine, and that the plan was a slow and tedious one. He finds that the machine will distribute sulphur very evenly and quickly, and has promised to send reports of future experiments with this remarkable apparatus.

Fruit from Young.

A nice collection of apples and other fruits has been received by the Department from the orchard of Mr. J. Pike, of Englewood, Young. The object of the presentation was to enable specimens to be selected for the

purpose of being modelled. The fruit reached the Department somewhat too late for many selections to be made, a very large number of specimens having been obtained from that exhibited at the recent Fruit Conference, but endeavour has been made to preserve some good samples for that purpose.

Sugar Beet.

A consignment of sugar-beet from the well known seed firm of Vilmorin, Andrieux, & Co., of Paris, comprising Red Skin, Green Top, Brabant, French Rich, White Red Top, Improved Vilmorin, and Klein Wanzleben, having been obtained by the Department of Agriculture, the Minister (the Hon. Sydney Smith) has approved of the same being distributed free to farmers in suitable districts for experimental purposes; in addition to which an exhaustive experiment will, next spring, be conducted by the Principal of the Hawkesbury Agricultural College at Ham Common. The question of sugar-beet cultivation has been fully dealt with in articles which have appeared in several parts of the *Agricultural Gazette*. Applications for seed are now invited.

Hawkesbury Agricultural College.

The following is a list of the officials appointed by the Minister for Mines and Agriculture, to different positions in connection with the Hawkesbury Agricultural College:—

Principal	John Low Thompson.
Science Master ...	E. Clarence Wood, M.A., B.Sc., B.E.
Registrar	Charles T. Musson, F.L.S., London.
Orchard Manager ...	William Stieme.
Farm Overseer ...	Bruce Ferguson.
Foreman Carpenter ...	Adam Brooks.
House-keeper ...	Miss P. Jewell-Oliver.
Medical Officer ...	W. M. Helsham, M.R.C.S.E., L.R.C.P. (Lond.).

Saving Cabbage Seed.

A question having been addressed to the Department, inquiring as to the best heads of cabbage to save for seed, the Botanist gave the following information which will doubtless be found of service to many readers of the *Gazette*:—It has been proved by experience that the best seed is obtained from the cabbages with the finest heads. It has been proved by experience also that seed gathered from the middle flower stem produces plants which will be fit for use a fortnight earlier than those from seed of the lateral flower stems. A few of the healthiest and finest cabbage stalks furnished with sprouts will produce good seed, but growers, who make a specialty of growing cabbages, prefers the seed saved from plants that have the hearts left on them.

[Four plates.]

Sydney: George Stephen Chapman, Acting Government Printer.—1891.