England and Scotland, as stated, but by twenty-eight county councils in Scotland alone, and this also has been the case for more than ten years.

WM. EAGLE CLARKE.

The Royal Scottish Museum, Edinburgh.
August 26.

### A Mistaken Butterfly.

THE following observation will be of interest in connection with those related in NATURE, vol. xcv., 1915.

At Pennant Hills, near Sydney, on March 24 last, I noticed an interesting case of colour-attraction for a butterfly. A lady was standing talking to two other persons on the footpath opposite my house. She was wearing a plain brown straw hat, fixed with a hat-pin having a light blue porcelain knob about half an inch in diameter. A butterfly (*Papilio sarpedon*) kept flying about the knob as if fascinated, and followed the lady closely when she went up the footpath to the house, flying away only when the lady entered the house.

I watched it for quite five minutes, during which time the butterfly never went more than a few inches from the lady's head, and always returned to the blue knob, apparently trying to alight thereon. The lady several times brushed at the insect with her hand to drive it away.

THOS. STEEL.

Sydney, New South Wales.

## *FERTILISERS AFTER THE WAR.*

IN view of the great increase in the facilities for making sulphuric acid, attempts have naturally been made to find an outlet for the new production after the war, and a Departmental Committee appointed to go into the subject has recently examined the possibility of an additional production of fertilisers, which before the war absorbed some 60 per cent. of the acid made. The report of the Committee (Cd. 8994, 1918) has already been discussed in these columns from the point of view of sulphuric acid production: it remains now to consider the effect on fertilisers. The report is very short and does not include the statistical data necessary for a full discussion of the problem: fortunately these can be collected from other sources.

Prior to the war the total consumption of artificial fertilisers in this country was something above 1,000,000 tons per annum, made up approximately as follows:—

| | Estimated pre-war consumption in United Kingdom. Tons per annum | Estimated annual value. Pre-war prices £ |
|---|---|---|
| Farmyard manure ... ... | 37,000,000 | 11,000,000 |
| Nitrate of soda ... ... ... | 80,000 | 920,000 |
| Sulphate of ammonia ... ... | 60,000 | 750,000 |
| Cyanamide (nitrolim) and nitrate of lime ... ... ... ... | 10,000 | 110,000 |
| Superphosphate ... ... ... | 600,000 | 1,650,000 |
| Basic slag ... ... ... ... | 280,000 | 560,000 |
| Guano ... ... ... | Say [1] 25,000 | 250,000 |
| Bones ... ... ... | ,, 40,000 | 200,000 |
| Others ... ... ... | ,, 10,000 | 100,000 |
| Total ... ... ... | 1,105,000 | 4,540,000 |

[1] No good estimate can be made of the amount of guano, bones, and other materials used as fertilisers.

At the same time the areas under the various crops in the United Kingdom were as follows:—

| | Million acres in the United Kingdom |
|---|---|
| Wheat, barley, oats ... ... ... ... | 7·67 |
| Potatoes ... ... ... ... ... ... | 1·21 |
| Swedes, turnips, mangolds ... ... ... | 2·28 |
| Other arable crops ... ... ... ... | 1·55 |
| Temporary grass ... ... ... ... | 6·61 |
| Permanent grass... ... ... ... ... | 27·35 |
| Total ... ... ... ... | 46·67 |

This distribution of land and consumption of fertilisers gave the following amounts of food:—

| | Quantity obtained: millions of tons | | | How utilised: millions of tons | |
|---|---|---|---|---|---|
| | Home-grown | Imported | Total | Eaten by human beings | Eaten by animals |
| Cereals ... ... ... | 6·5 | 10·4 | 16·9 | 5·2 | 9·2 |
| Potatoes ... ... ... | 4·8 | 0·7 | 5·5 | 5·5 | — |
| Other roots (estimated) ... | 44·5 | — | 44·5 | — | 44·5 |
| Grass (estimated as hay) ... | 60 | — | 60 | — | 60 |
| Other foods:— | | | | | |
| Sugar, fish, etc. ... ... | — | — | 3·4 | 3·4 | — |
| Cake, straw, etc. ... ... | — | — | 6·3 | — | 6·3 |
| Animal food:— | | | | | |
| Dairy produce (mainly milk) ... ... ... | 4·7 | 0·5 | 5·2 | 5·2 | — |
| Meat ... ... ... | 1·8 | 1·2 | 3·0 | 3·0 | — |
| Total ... | 122·3 | 12·8 | 144·8 | 22·3 | 120 |

The experience of the war has shown that this type of production is not really the most satisfactory to the nation as a whole, as it leaves us far too dependent on foreign countries for supplies of wheat. On the other hand, a system of husbandry that produces much wheat is unsatisfactory to the farmer because of the possibility that heavy crops in the Argentine or North America or elsewhere might pull down prices to unremunerative levels. The risk may, in fact, never materialise, but it has been burned into the farmers' minds by the low prices of the nineties of the last century. In consequence, before the war wheat-growing was diminishing in this country, and grass was increasing.

Under the double stimulus of high prices and Government action farmers have during the war broken up more than 3,000,000 acres of grass land and thus added considerably to the area under cereals, particularly wheat and oats. The breaking up of the grass land has led to the production of much more food in the country and necessitated the use of more fertilisers. It is officially stated that we now produce breadstuffs sufficient for forty weeks per annum, whereas before the war we produced only enough for ten weeks. This does not, of course, mean that we produce four times as much food as formerly; the breadstuffs are not quite the same as they were; but it does show that we go a long way towards feeding ourselves.

The scientific problems involved are more

straightforward and less controversial than the political and economic problems. If food production is wanted it can be done so far as scientific problems are concerned. The political and economic problems lie outside our present scope; they have been fully discussed in Lord Selborne's report on rural reconstruction. During the war these problems have, in fact, been largely solved, and in the view of Lord Selborne's Committee the increased production could be permanently maintained.

Assuming this were done, then, it would be necessary to put on a permanent basis the present rearrangement of areas under crops. Various schemes have been submitted. Broadly speaking, they involve the maintenance in arable cultivation of the three and a half or four million acres now taken off permanent grass and adding it to corn, thus extending the rotation from four courses to five, or from five to six. The interposition of a corn crop in this manner is quite possible in practice on two conditions—the land must be kept clean and fertilisers must be used. A reasonable dressing to use for cereals in these circumstances would be 1 cwt. of sulphate of ammonia or nitrate of soda and 2 cwt. of superphosphate per acre. This would not give a measure of the total consumption of fertiliser necessary, because the taking out of 4,000,000 acres of permanent grass would necessitate the improvement of the remainder in order that the same quantity of grass might be grown; an average dressing per acre of 1 cwt. of basic slag would be a reasonable application here. Two estimates are given in the report:—

*Estimated Post-war Consumption.*

| | Pre-war consumption: | Sir T. H. Middleton's estimate: | Sir Charles Fielding's estimate: |
|---|---|---|---|
| | tons per annum | tons per annum | tons per annum |
| Sulphate of ammonia... | 60,000 | — | 360,000 |
| Superphosphate .. ... | 743,000 | 1,367,000 | 1,643,000 |
| Basic slag ... ... ... | 263,000 | 892,000 | 1,463,000 |

It is improbable that the production of basic slag would ever attain the high figures quoted here, while, on the other hand, much greater quantities of superphosphate can be made even than the 1·6 millions required on Sir Charles Fielding's estimate. Some of the slag would therefore in practice be replaced by superphosphate.

Of the two sets of figures Sir T. H. Middleton's is the more likely to be realised. Estimates for sulphate of ammonia are difficult to make because to a large extent, and yet not altogether, sulphate of ammonia is replaceable by, and can itself replace, nitrolim or calcium cyanamide and nitrate of soda. It would not be difficult to make a reasonable guess at the total amount of combined nitrogen the farmers of the United Kingdom might be expected to use, but it is impossible to forecast the way in which they will take it. Thus we might assume the following distribution of crops and consumption of fertilisers:—

| | Area | | Fertilisers used: tons | |
|---|---|---|---|---|
| | Total, million acres | Manured, million acres | Superphosphate and basic slag | Nitrogen expressed as sulphate of ammonia |
| Wheat, barley, oats .. ... | 11·2 | 3·0 | 300,000 | 150,000 |
| Potatoes ... ... ... ... | 1·5 | 1·5 | 150,000 | 75,000 |
| Swedes, turnips, mangolds | 2·6 | 2·6 | 390,000 | 130,000 |
| Other arable crops ... ... | 1 6 | 0·9 | 90,000 | 45,000 |
| Temporary grass ... ... | 6·0 | 2·0 | 200,000 | 50,000 |
| Permanent grass ... ... | 23·8 | 12 0 | 600,000 | 20,000 |
| Total ... ... ... | 46·7 | 22·0 | 1,730,000 | 470,000 |

Here all the combined nitrogen is expressed for convenience in the form of sulphate of ammonia, but it must be understood that other compounds can be used also. This leads to the conclusion that 470,000 tons of sulphate of ammonia (or the equivalent of nitrolim and nitrate of soda) and 1,730,000 tons of phosphates (superphosphate and basic slag) could be utilised annually in the United Kingdom—figures, however, which are below those of Sir Thomas Middleton in so far as phosphates are concerned.

However, all these estimates are necessarily hypothetical; no one knows what will happen after the war. Unless the great political and economic problems involved are satisfactorily dealt with we may yet see the land going back to grass in spite of all our endeavours.

E. J. RUSSELL.

## *THE VALUE OF THE HERRING AS FOOD.*

THE report for 1917 of the Lancashire Sea-fisheries Laboratory is chiefly devoted to a paper by Dr. J. Johnstone on the dietetic value of the herring. It is not necessary to emphasise the present importance of this subject, for the fact is now well known that in the days before the war a small proportion only of the herrings landed in this country was consumed by our own population, a proportion which Dr. Johnstone estimates at as low as 20 per cent. The Government Departments responsible for fishery questions are fully alive to the possibilities which will occur after the war for utilising the fish which were previously exported, and so adding substantially to the national food supply. Already steps are being taken with the view of placing these fish on the market in a more attractive and palatable form than the salted or pickled herrings which constituted the bulk of the exported article, and if the public once realises the food value of the fish the whole supply might well be retained at home.

Dr. Johnstone's analyses of the flesh of the herring have been made chiefly on fish from the Irish Sea, and as the most novel feature of his results is the clear and definite way in which he shows that the composition of the flesh varies very greatly in samples of fish taken at different seasons and in different states of development, it becomes important that analyses of a similar kind should be carried out in other fishery regions, especially in connection with the