application to problems other than those for which they have been devised. The results are interesting almost to the degree of being "sensational." In January of 1913–14 the rate of production of plaice eggs over the whole area sampled was 180,000 millions per 3 days, and in February the rate dropped to 157,000 millions per 3 days. That works out at about two million million eggs per month and about five million million per year. To produce these eggs some twenty millions of female plaice at least must have been required. The rate of mortality is very high, and only about 10 to 30 per cent. of the eggs hatch out. The production was far higher in 1914 than in 1911.

No. 3 of vol. 5, written by Mr. J. O. Borley and his collaborators, deals with the plaice fisheries during the war years, and discusses the results of the special investigations made in various parts of the British sea-fishery area. The report and recommendations of the plaice committee of the International Fishery Council are appended.

No. 4 of vol. 5 breaks entirely new ground so far as the British sea fisheries are concerned. It is an account of the various kinds of gear now used in sea fishing in England and Wales, and has been written by Mr. F. M. Davis. The descriptions are clear; the drawings are very well done, and the Report represents a vast amount of very careful local investigation.

J. J.

## The Floor of the Valley of Ten Thousand Smokes.

THE amazing display of fumarole action over an area of some fifty square miles, which arose in association with the volcanic outbreak of Mt. Katmai in Alaska in 1912, was described and illustrated by its discoverer, R. F. Griggs, in NATURE, vol. 101, p. 497 (1918). In 1920 (vol. 104, p. 595), J. W. Shipley, of Winnipeg, chemist to the first Katmai expedition, gave an illustrated account of the "great mud-flow" through which the vapours fume, and he attributed the material to an eruption of Mt. Novarupta, preceding that of Katmai. He concluded that the spreading of the volcanic dust and scoriæ down the valley towards the Bering Sea was assisted by rains, and that heat from below had hardened the surface and produced the cracks that traverse it.

The National Geographic Society, which organised the expedition led by Dr. Griggs, has now begun the publication of a series of scientific memoirs on special features of the district, following on the general description that was noticed in NATURE, vol. 111, p. 269 (1923). No. 1 of the "Katmai Series" of contributed papers is on "The Origin and Mode of Emplacement of the great Tuff Deposit of the Valley of Ten Thousand Smokes," by the well-known petrologist Clarence N. Fenner, of the Geophysical Laboratory of the Carnegie Institution of Washington.

The author finds, from a thorough study of the valley-floor, that the tuff was erupted from a large number of vents that opened along fissures mainly occurring in the lowland, and that these fissures determine the present lines of fumaroles. The fragmental material flowed while hot enough to char all vegetation in its path; no doubt it was still liberating gases, and the phenomena of Mount Pelée of Martinique were repeated. Katmai exploded somewhat later, since its ashes rest upon the volcanic detritus connected with the fumaroles.

Most of this detritus consists of highly siliceous glass, which has caught up basic matter from older igneous rocks; the mixed blocks possibly come from the moraines around Novarupta, the cone of which is formed of a soda-rhyolite that has penetrated and mingled with a dark medium andesite (p. 56 of memoir). But the author regards it as more likely that similar rock underlies the valley generally. Jurassic sandstones and shales have been blown to fragments by the explosions in the valley-floor; but the source of the andesitic admixture has not been traced here or at Novarupta.

Dr. Fenner's conclusion is that a sill of igneous rock penetrated the sedimentary series beneath the valley, burst into explosive activity along the cracks that opened, and deluged the country with fragmental matter that continued to give off gases and to spread as a quasi-liquid towards the coast. The numerous beautiful photographs accompanying his contribution, including several of Novarupta, complete its value as a petrological study carried out mainly in the field. We may now regard the Valley of Ten Thousand Smokes as one of the finest examples of the uprise and emanation of magmatic waters, and as a further reminder that igneous rocks as they reach us in hard specimens are something very different, both chemically and physically, from their representatives in the cauldrons of the crust.

GRENVILLE A. J. COLE.

## Cultivation of Metal Crystals by Separation from the Gaseous State.

F. KOREF describes experiments on the deposition of crystalline tungsten on a wire consisting of a single tungsten crystal, which is heated electrically in a mixture of hydrogen and tungsten hexachloride vapour in an electric oven.[1] When the oven is fairly cool (about 110° C.) and the pressure is kept down to 12 mm. of mercury, the wire being raised to 1000° C., the metal deposits in crystalline form, growing from the unit crystal, so that the dividing line between the two is scarcely visible in a magnified section, which, when etched, shows the characteristic structure of a tungsten crystal. The external form shows more or less distinct crystalline surfaces and edges, though the surfaces are not perfectly plane, being sometimes concave cylindrical, while the edges are not always sharp. It is concluded, however, that the whole mass forms one crystal, which has grown from the original crystal wire. The number of bounding surfaces seems to depend on the direction of the crystal axis in the original wire, the prism being four-, six-, or eight-sided. The diameter can be increased from 0·05 to 0·15 mm., the temperature being kept constant during the deposition by regulating the heating current.

Although the original wire is flexible the crystal grown from it is brittle; but it becomes flexible after being heated for a few minutes to 2500° C.; no difference in the structure can be observed after this annealing, either microscopically or by X-ray examination. Burger has made a similar observation on tin crystals, obtained from molten tin. Apparently the atoms do not alter their positions during the heat treatment; but in some way, possibly by rotations about their centres, come into new relative relations to one another, and link together more perfectly to form a stronger and more flexible whole.

If the attempt is made to cultivate the crystal beyond the dimensions given above, the surfaces become deformed by the growth on them of numerous small pyramids, the molecules (atoms) no longer

[1] *Zeit. Electrochem.*, 28, pp. 511-517, December 1, 1922.

taking their places in regular fashion on the surfaces of the original crystal; but aggregating themselves about certain minute elementary crystals formed on the surface, which act as "buds" about which further growth takes place. When the pressure and temperature of the oven are high, this takes place from the commencement, and there is no regular crystal growth; but a deposit is formed in scaly layers round the original wire, which is either spongy or dendritic in character.

At the correct temperature and pressure the wire will continue to grow as a single crystal in spite of preliminary deformations, such as twisting, winding into a helix, or even drawing through a die. An attempt was made to draw down the annealed cultivated crystal into a fine wire, in the hope that further cultivation would be possible upon it; but this failed owing to the fact that the whole pressure coming on the edges overloaded the structure. The resulting wire no longer formed a single crystal; and when additional tungsten vapour was deposited on it, each of the small crystals of which it was composed grew independently; the resulting wire was brittle, and could not be made flexible by heating. A similar result was obtained with an ordinary tungsten wire, which did not consist of a single crystal; in this case it was found that heating to 2500° C. for fifteen minutes caused a great many of the small crystals formed at first to unite, so as to give a much coarser structure. This welding of small into larger crystals, without mechanical pressure, has not, apparently, been previously observed.

## State Afforestation in 1921–22.[1]

THE Forestry Commissioners, who have just issued their third annual report, were appointed in November 1919, to carry out a definite programme of afforestation, involving the planting of 150,000 acres of new land in the ensuing ten years, the cost to be defrayed from the Forestry Fund, a sum of 3,500,000*l.* voted by Parliament for the whole period. Acquirement of land, planting operations, and other activities, including education and research, were proceeded with according to plan during the first two years; but the unfavourable financial position of the Government necessitated a reduced programme in the third year, so far as expenses were met with out of the Forestry Fund. Fortunately the Commissioners obtained a large grant out of the Unemployment Fund, and their operations have practically not been restricted. During the year ended September 30, 1922, the Commissioners expended 244,414*l.* out of the Forestry Fund, and 154,017*l.* out of the Unemployment Fund, in all 398,431*l.*, a sum in excess of the normal programme.

The new land acquired for State afforestation during 1921–22 amounted to 23,937 acres. The Commissioners now possess 92,426 acres of plantable land. The area planted by the Commissioners in the year was 10,693 acres; and in addition to this, 10,192 acres were planted by private owners and corporations by means of grants, which were given on condition that unemployed labour should be used. These figures are very satisfactory. The usefulness of forestry for relief work is abundantly shown in the report, which is replete with statistics of the areas and species in the various plantations and nurseries.

Grants in aid of higher forestry education, in all 2206*l.*, were given to the University schools at Oxford, Cambridge, Bangor, Armstrong College, and the two Agricultural Colleges at Aberdeen and Glasgow. The Commissioners have now three schools for training woodmen, at Parkend (Forest of Dean), Chopwell (Co. Durham), and Beauly (Inverness-shire), at an annual cost of 10,160*l.* On research and experiment, the expenditure was 6126*l.* Experimental plots of various species of trees are now 120 in number. Investigations are being carried out in regard to Chermes, *Phomopsis Douglasii*, tree growth on peat, larch hybridisation, etc.; and a census of woodlands is in progress.

[1] Third Annual Report of the Forestry Commissioners. Year ending September 30, 1922. (H.M. Stationery Office, 1923.) Price 1*s.* net.

## The British Medical Association.

THE meeting of the British Medical Association at Portsmouth began on July 20, and the address of the president, Mr. C. P. Childe, was given on the evening of July 24 to a large audience, among whom were a number of distinguished visitors largely from the Oversea Dominions. The president in his address made a strong plea for better housing conditions in the industrial centres, and insisted that an enormous amount of the time and money which is at present being spent on the treatment of diseases like rickets and tuberculosis could be saved if adequate care were given to the housing problem, for in his opinion the absence of fresh air and sunlight in many of the crowded industrial centres was in itself largely responsible for the widespread occurrence of these diseases.

The detailed work in the sixteen different Sections went on from July 25 to July 27, during which a very wide field of subject was under discussion.

In the Section of Pathology and Bacteriology there were discussions upon diseases of the stomach and their methods of investigation, by Dr. C. Bolton; the value of serological tests in diagnosis, by Prof. H. R. Dean; and one on the part played by fungi in disease, by Dr. Castellani. Demonstrations were given, in the afternoons, of specimens which had been collected, forming a museum of very great interest.

In the Section of Radiology a discussion was opened by Dr. R. W. Salmond on the X-ray examination of the urinary tract. During the discussion it was evident that different weight was given by radiologists to the value of screen examinations of the region of the kidney.

The second subject for discussion in this Section was that of medical diathermy, opened by Dr. E. P. Cumberbatch, and followed by Dr. C. A. Robinson, who gave a detailed account of the treatment of gonorrhœa by means of diathermic currents; the temperature which can be tolerated by the tissues is sufficiently high to cause the death of the causative micro-organism, and beneficial results ensue.

In the Section of Tuberculosis a discussion was opened by Prof. Reyn, of Copenhagen, on the subject of the artificial light treatment of lupus and other forms of tuberculosis. From the clinical investigations which have been continued during a large number of years at Copenhagen, the conclusion has been reached that the results obtained in the treatment of lupus by means of ultra-violet light, initiated there by Finsen, are much improved if the local intensive treatment is supplemented by a general irradiation of the whole body. Dr. Sequeira reported a similar result from his experiences at the London Hospital; Prof. Russ thought that it was now possible to assign to certain parts of the spectrum their particular function in this form of therapy, and if this were the case selection of the best form