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.