

that some are pure diamond, others are diamond plus a small amount of impurity, and only one is not diamond at all. One of the specimens has been photographed using the powerful 5 kW. X-ray tube at the Davy Faraday Laboratory, and it has been conclusively proved that this diamond, at least, is of the rare (type II) variety, which gives only primary diffuse spots and none of the more detailed secondary effects³. Not only this crystal, but also several of the other diamonds which were not submitted to such a rigorous X-ray examination, show the highly laminated condition which has been mentioned by Robertson, Fox and Martin as especially typical of type II diamonds. Careful inquiry has convinced us that J. B. Hannay did in fact succeed in synthesizing diamond, although in very small quantity, and we feel that he should receive the long overdue credit for his patience and perseverance in this research. We think also that it is a noteworthy fact that the method he used is capable of producing the rare type of diamond, which only occurs to the extent of perhaps 1 per cent or less among natural diamond single crystals. An account of our investigation is being published elsewhere⁴.

It would also, of course, have been most interesting to take X-ray photographs of the crystals which resulted from other attempts to synthesize diamond, particularly those of the late Sir Charles Parsons⁵, but we have not been able to trace any of his specimens, in spite of the help given to us by his family and by the firm associated with his name. We would be grateful for any information that might lead to the recovery of these crystals; it would be most unfortunate if they should prove to have disappeared as completely as did the crystals prepared by Prof. Moisson during an earlier investigation of the same kind.

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¹ NATURE, 121, 799 (1928).

² Hannay, J. B., NATURE, 22, 255 (1880); *Proc. Roy. Soc., A*, 30, 188, 450 (1880); *A*, 32, 407 (1882); *Chem. News*, 41, 106 (1880); 98, 173 (1902). N. Story-Maskelyne, *The Times*, Feb. 20 (1880); *Chem. News*, 41, 97 (1880).

³ Robertson, R., Fox, J. J., and Martin, A. E., *Phil. Trans. Roy. Soc., A*, 232, 463 (1934). Lonsdale, K., and Smith, H., NATURE, 143, 112, 257 (1941). Lonsdale, K., *Proc. Roy. Soc., A*, 179, 315 (1942).

⁴ Bannister, F. A., and Lonsdale, K., *Mineralog. Mag.* (in the Press).

⁵ Parsons, C. A., *Phil. Trans. Roy. Soc., A*, 220, 67 (1920).

Hydro-Electric Development in Great Britain

THE two articles on this subject in NATURE of February 13 are welcome for directing attention to the proposals in the Bill presented to Parliament, but the subject requires much more critical attention from the scientific, technological and economic side than it has so far received.

It is surely incorrect to assert that "it is considered beyond controversy that there is only one possible zone . . . and that is in northern Scotland" for siting the electro-chemical and electro-metallurgical industries. We have no vested interest whatever in this question, but have been concerned with it closely, and jointly we have reported rather fully upon it in

a series of articles in *Engineering*, May-June 1939. Cheap and abundant electric energy is undoubtedly one of the important factors, but perhaps even more important are favourable location for the transport of raw materials and finished products, and a good supply of labour of the right types.

The inquiry upon which these new proposals are brought forward appears to have been far too limited to weigh up and balance all the important factors involved, and all we now urge is that the scheme should be subjected to more thorough consideration by economists, metallurgists, chemists and both water- and steam-power engineers.

On the face of it, the economics of even the hydro-electric side of the question look to us doubtful (in comparison with steam-power). It is noted that the estimates require the harnessing of seventy individual schemes for developing the relatively small supply of 450,000 kW. and that this demands a national subsidy of £30 million. By comparison, the capital cost of the new Canadian hydro-electric aluminium plant on the Saquenay River, the war-time development of which has just been exposed, is said to amount to only £26½ million for 1,125,000 kW.

We are keenly desirous of fostering the rapid development of the electro-chemical and electro-metallurgical industries in Great Britain, but it is vitally important that they should be established on a sound foundation and not be supported or opposed for reasons which do not concern them.

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Nature of Entropy

THE engineer has no difficulty in understanding entropy. The boilerman says: "I give you steam with so much heat energy and entropy, and you want to know how much work your engine will get out of it. I can't tell you as I don't know your condenser temperature, or how bad your engine is. Multiply your condenser temperature by my entropy and you know how much of the energy is not available in my steam. Your engine will increase entropy by heat conduction, or by wasteful expansion, if a turbine; but that is your look out."

The physics student can get the idea by taking a bottle of highly compressed air. By working a small engine slowly, all at room temperature, he can get a certain amount of work. If he first expands his air into a big vessel, his engine will give much less work. The air in both cases has the same heat content, but the expansion measures its increase of entropy. The increase of entropy means that the heat energy, which remains constant, was made less available by the wasteful expansion.

Forty years ago, I offered the Physical Society a paper on the factors of heat. The factors in the case of a perfect gas, for example, are speed of the nice molecules we had in those days, and their momentum. The paper was refused.

Entropy is inconvenient in being infinite in any quantity of matter (or radiation); so that in integrating you must add a fiducial constant, or be vague.