structure is still a matter of pure conjecture. It is to be hoped that the authors will investigate this aspect of the research, difficult though it will probably prove to be.

The authors entitled their paper "A Note on the Microstructure of Commercially Pure Iron between Ar3 and Ar2." Strictly speaking, this is not the case. Mr. P. Tucker, who took cooling and heating curves for them, found Ac3 at 888° C. and Ar3 at 874° C., and makes the significant statement that it was "practically impossible so far to determine the Ar2 point of this material even on the most delicate instruments." Now the new structural constituent is shown in the photographs at 899° C., *while the material was still in the γ range*—above Ar3. It does not appear, therefore, that the upper limit of brittleness coincides with the Ar3 change. Ar2 is normally found at about 765° C. in commercially pure irons. This is about 35° lower than the temperature at which the eutectoid structure disappeared. No iron has ever been found to give Ar2 at so high a temperature as 800° C., which is actually below that at which the new constituent vanishes. Neither, therefore, does the lower limit of brittleness coincide with the Ar2 change, assuming that it does exist, according to the evidence at present available.

H. C. H. CARPENTER.

RECENT RESEARCHES AT VESUVIUS.

PROF. ALESSANDRO MALLADRA, the successor of Mercalli at the Royal Vesuvian observatory, has published a number of papers, from 1912 onwards, on the volcanic manifestations and progressive changes in the great crater formed in 1906. It has been possible in recent years to descend, by hazardous paths, to the edge of the central funnel, 250 metres below the crater-edge, and valuable observations have been made on the gases emitted from the fumaroles. Prof. Malladra furnishes a well-illustrated summary of the conditions in 1914 in "Nel cratere del Vesuvio" (*Boll. reale Soc. Geografica*, 1914, p. 753). The gradual widening of the crater by the falling in of its cliffs is shown in plan in a paper, "Sulle modificazioni del Vesuvio dopo il 1906" (*ibid.*, p. 1237). The small aperture of 1900 is also here indicated, almost immediately over the pit that is now active. The volcano remained quiet, in a solfataric stage, for seven years after the enormous outburst of 1906; but a glowing funnel opened in the floor of the crater of explosion on July 5, 1913. Prof. Malladra was engaged in a hypsometrical survey on the cone a few hours after this outbreak ("Sui fenomeni consecutivi all' apertura della bocca 5 Luglio, 1913," *Rend. R. Accad. Sci. Fis. e Mat. di Napoli*, fasc. 11 and 12, 1914), and has recorded a true incandescence, accompanied by the emission of fresh scoriæ, specimens of which were collected on one of many later visits. The "yellow fumarole" in the crater gave a temperature-reading of 128° C. in 1911. In September, 1913, this had risen to 330°, and in October to 347°. During the collection of gases from this fumarole for analysis, water condensed, containing hydrochloric acid in the proportion of 9·21 grams per 100 c.c., and smelling strongly of sulphuretted hydrogen. The author points out that, following the arguments of Brun as to the possibility of the permeation of water into a heated mass from without, this water must be truly magmatic. He thus provides further evidence, in addition to that of Day and Shepherd, against Brun's main contention.

Prof. Malladra illustrates ("I Gas vulcanici e la Vegetazione," *Boll. Soc. Sismologica Ital.*, vol. xviii.) the acid gases of Vesuvius rolling in a dense cloud down the mountain slope. They deposit on the leaves and branches of the trees a white dust consisting of chlorides and sulphates of iron and the alkalies; and these anhydrous or slightly hydrated gases are easily recognisable to the experienced eye from the ordinary masses of water vapour. Like the descending clouds that brought death to Saint-Pierre and Morne Rouge, they consist of very finely divided solid matter and gas, and resemble the smoke of a conflagration. The caustic effect produces brown spots and decay in leaves, and experiments are in progress in the planting of bare parts of the Vesuvian slopes with Euonymus and with a bamboo, appropriately known as *Arundo Plinii*, which flourishes fairly upon Stromboli. Both these, it is hoped, will resist the acid emanations.

An investigation of the rainfall on Vesuvius, and of the distribution of snow on the variously heated areas near the vent ("La pioggia sul Vesuvio, 1863–1913," *ibid.*, vol. xviii.), contains an interesting passage on the snow-accumulations formed by the freezing of the vapour of the fumaroles. G. A. J. C.

FUEL RESEARCH.[1]

IN its first report[2] the Board stated that it had in view two main lines of research: first, a survey and classification of the coal seams in the various mining districts by means of chemical and physical tests in the laboratory, and, secondly, an investigation of the practical problems which must be solved if any large proportion of the raw coal at present burned in its natural state is to be replaced by the various forms of fuel obtainable from coal by carbonisation and gasification processes.

When the previous report was written it was believed that the survey and classification of coal seams might be proceeded with in advance of the second line of inquiry; but further consideration has shown that from the practical point of view the two lines are so thoroughly interdependent that they can be most satisfactorily dealt with side by side. This view will be further developed after the position and prospects with regard to the second line of inquiry have been more fully explained.

In preparation for the organisation of the first line, however, an experimental study of standard methods for the examination of samples of coal in the laboratory has been made. Hitherto in the systematic examination of coals in the laboratory there has been no generally accepted low-temperature carbonisation test. In the survey and classification of coals for the purposes of the present inquiries a test of this kind is practically indispensable. Certain existing tests are designed to ascertain the suitability of coal for gas- or coke-making, but as both these methods of carbonisation are carried out at temperatures above 900° C. they give little or no direct information as to the behaviour of the coal when carbonised at 500° to 600° C.

As a result of experimental work carried out for the Board in the fuel laboratory of the Imperial College of Science and Technology, a test has now been elaborated which by direct weighing and measurement gives the yields of gas, oil, water, and carbonaceous residue which result from carbonisation at any definite temperature. The apparatus is simple and is so arranged that the progress of the distillation can be watched from start to finish. The products can be weighed or measured with reasonable accuracy, and any or all of them can, if desired, be submitted to further examination.

[1] Report (slightly abridged) of the Fuel Research Board on its Scheme of Research and on the Establishment of a Fuel Research Station. (Published for the Department of Scientific and Industrial Research by H.M Stationery Office.) Price 2*d.* net.

[2] This report was not published.