

commissioner, remarks that he considers "By far the most important experiments witnessed by the Commission were those made by Keller, Leleux and Company at their works at Livet."

It is a little difficult to realise upon what grounds the above conclusion was arrived at. Putting aside the speculative calculations of M. Keller and descending to experimental facts, it appears that the commission saw smelted several tons of pig-iron, as a rule remarkably high in manganese (1.5 per cent. to 4 per cent.), and hence of limited commercial interest, and as it is evidently not thought by the commission that the electric furnace is to become a serious competitor with the blast furnace, the specified exceptional value of these results from an industrial point of view is not quite clear.

As regards steel, only one not very satisfactory and untested heat was made (see pp. 77-78), yet upon such evidence the report states that this process is capable of producing steel equal to the best products of Sheffield's crucibles. Such premature conclusions based on such scanty data are not calculated to carry conviction to the experienced metallurgical mind.

The commission also describes a series of experiments made by M. Héroult at La Praz works. The analyses of the steels obtained appear quite satisfactory, but this process is hardly capable of competing with the ordinary open-hearth furnace even from the rosy point of view taken by the commissioners based on costs calculated (in all good faith) by the patentee.

From a British point of view Kjellin's induction process deserves the most serious attention in view of (under certain conditions) its probable competition with the crucible steel process.

Analytically, mechanically, and micrographically this steel leaves nothing to be desired, but unfortunately chemical and tensile tests, and the indications of the microscope, have a limited value in determining the working capabilities of tool-steel.

In his "conclusions" on p. 115 of the report, Mr. Harbord states that "Steel, equal in all respects to the best Sheffield crucible steel, can be produced, either by the Kjellin or Héroult or Keller processes, at a cost considerably less than the cost of producing a high-class crucible steel."

The above statement, so sweeping and involving issues of profound industrial import, should have been made only as the result of a series of exhaustive working tests. For such, in the report, the reviewer has sought in vain.

It is true that a series of tests of turning tools made from Kjellin and Héroult steels has been carried out at Woolwich by Mr. H. F. Donaldson, but the results are quite inconclusive, because of the steels employed hardly one was fit for turning tools.

Cold sett steel, carbon 0.8, cold chisel steel, carbon 0.9, tap-steel, carbon 1.1, and drill steel, carbon 1.2, have all been set to do the work of a comparative turning tool steel of carbon 1.38 per cent.

The natural consequence is that in the Woolwich results, where "E" means equal to the ordinary Woolwich turning tool steel of carbon 1.38, and "NE" means not equal to that steel, we find in the report, pp. 87 and 88, five "equals" and no less than fourteen "not equals."

As to whether Kjellin electric steel is or is not equal to crucible steel time alone can show. The conclusion of the commission may be accurate, but it is certainly not based on any scientific evidence worthy of the name.

Such evidence on a commercial scale can be conclusively obtained only by at least two comparative years of shop practice, employing all kinds of tools, and recording the average wear and waste of the steels as evidenced by the ratio between the work turned out and the annual cost of the tool steels purchased.

In the micrographic section of the report the reviewer notes with regret a recrudescence of the use (in this connection) of the meaningless and unscientific term "grain" in describing the allotrimorphic crystals of ferrite.

These crystals, although usually lacking idiomorphic external faces, nevertheless present that internal molecular symmetry associated with individual crystals, and hence should be classed as such.

Prolonged tests on Kjellin steel of all carbons, compared

with similar crucible steels, have been inaugurated at the University College of Sheffield, and the erection of a Kjellin furnace capable of making one ton of steel per day is under consideration.

Without in any way compromising one's industrial attitude as to the exact capabilities of the respective methods devised by Messrs. Héroult, Keller and Kjellin, one can cordially congratulate these gentlemen on the scientific ability displayed in the development of their several methods, all of which, within their legitimate spheres, are undoubtedly of great metallurgical value. It is the more necessary to say this because such value is liable to be discounted by the hasty and ill-digested conclusions drawn by the Canadian commission.

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LONDON FOG INQUIRY, 1901-3.¹

THE Meteorological Council have issued their final report on the above inquiry, which had to be terminated at the end of the winter 1902-3 as the London County Council were unable to make any further contribution to its cost beyond the 250*l.* originally assigned. A short account of the chief results obtained by Captain Carpenter from the observations of the winter 1901-2 has already appeared in these columns (vol. lxxvii. p. 548). During the succeeding winter records of the duration and intensity of fog were continued at forty-six stations in and around London, and in addition to this the scope of the inquiry was extended to include a detailed study of the distribution of air temperature over the London area. With this object thermometer screens and dry bulb thermometers were issued to thirty fire brigade stations, and daily observations of the air temperature were made at fixed hours.

The material so accumulated has been utilised to determine so far as possible the physical causes most active in producing fog in each case. The guiding principles adopted in the classification are those suggested in an article by the secretary to the Meteorological Council which appeared in NATURE (vol. lxxiv. p. 649) at the time when the inquiry was started. The majority of our fogs were found to be due to radiation from the earth's surface during calm nights. Others, among them the most persistent fog of the winter, were caused by the passage of warm air over a previously cooled surface, while a third group were identified as "cloud" fogs. A certain number of fogs could not be included in any of the above categories. They appeared to be mere accumulations of the products of combustion in an almost calm atmosphere, and as such were termed "smoke" fogs. Full particulars of the thirty-nine most serious fogs of the winter are given in an appendix.

Among the chief results of the inquiry must be reckoned the establishment of a workable scale for the estimation of fog intensity by different observers, based on the extent to which traffic is impeded by land, river, and sea.

Comparison of the fog statistics from the various stations confirms Captain Carpenter's results. With a few possible exceptions which need further investigation, there is no evidence to show that, in London, geological formation has any influence on liability to fog. Again, as was to be expected, the fog frequency on the river and in the parks is very high, but the evidence does not support the view that the fog there found drifts far into the neighbouring districts.

With regard to the main purpose of the inquiry, greater precision in fog forecasts, Mr. Lempfert points out that a first step would be the establishment of a night service at the Meteorological Office. As the majority of fogs are caused by nocturnal radiation, and the intensity of this radiation depends largely on the accident whether the sky is free from cloud or not, it is manifest that forecasts issued at the suggested hour of 5 a.m. would have a much greater chance of proving correct than the present ones, which are based on observations taken at 6 p.m. on the previous evening. As most fogs become thick soon after sunrise, several hours' warning could still be given, though the hour would

¹ Report of the Meteorological Council upon an Inquiry into the Occurrence and Distribution of Fogs in the London Area, during the Winters of 1901-2 and 1902-3, with Reference to Forecasts of the Incidence and Duration of Fogs in Special Localities, to which is appended the Report by R. G. K. Lempfert, M.A. on the Observations of the Winter 1902-3.

be too late for the dissemination of the forecasts by the morning papers. Under the existing arrangements it was found that sixteen out of twenty-four "radiation" fogs and four out of eight "smoke" fogs were anticipated. The three "cold surface" fogs and four "cloud" fogs were not forecasted. The present forecasts rarely, if ever, contain any indications of the intensity of the fog expected.

The problem of the issue of fog warnings for individual districts has been approached from two points of view. As was pointed out in the previous report, the observations of drift smoke, during the incidence of fog usually show an indraught of air to some central district of London, but this is rarely symmetrical; a preponderating direction, usually identical with that due to the barometric gradient, can in most cases be identified, and plays a most important part in determining the region of thickest fog. Out of forty-four days of fog twenty-seven showed the thickest fog to leeward, five showed it to windward, while in the remaining twelve cases no particular preference for any one locality could be identified. Captain Carpenter had suggested that a more detailed study of the distribution of temperature might prove useful in this connection, and Mr. Lempfert reproduces diagrams which show conspicuous differences of temperature within the London area, in which the thickest fog is also to be found in the coldest region. Four out of the five apparently exceptional cases in which fog was thickest to windward show the lowest temperatures also on the windward side. It is the more to be regretted that the inquiry has had to be discontinued as the winter proved to be singularly free from fog. Investigation of the thick fogs of the present season from this point of view would probably have yielded interesting results.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

EDINBURGH.—The annual report for 1904 shows that the total annual value of the university fellowships, scholarships, bursaries, and prizes now amounts to about 18,270*l.* In addition, a sum of upwards of 600*l.*, being the income of the Earl of Moray endowment fund, is annually available for the encouragement of original research. As already announced, in response to the appeal for subscriptions to provide for the further development of the university, Sir Donald Currie has made the munificent gift of 25,000*l.* He has expressed a wish that the revenue from his money should be applied to the remuneration of a staff of lecturers such as the authorities of the university may find it advisable from time to time to appoint. The university court, being desirous of permanently associating his name with the fund, has resolved to designate it "The Sir Donald Currie Lectureship Endowment Fund." Other contributions to the extension scheme have also been intimated to the extent of 15,000*l.*, including a sum of 5000*l.* given by Sir John Jackson to the Tait memorial fund, for the encouragement of physical research.

LIVERPOOL.—The committee of the institute of archaeology has been enabled by the munificence of Sir John Brunner to take in hand the publication of a "History of Egypt," to include all the results of modern research, and to be, so far as possible, a complete history of the Egyptian civilisation from the earliest times down to the conquest by Alexander the Great. It is estimated that the work will take two years to complete, and it will be published with full photographic illustrations.

A CONFERENCE on school hygiene has been arranged by the Royal Sanitary Institute, to be held in the University of London, under the presidentship of Sir Arthur W. Rücker, F.R.S., on February 7-10.

A COURSE of ten lectures on "Enzymes" will be given by Dr. W. M. Bayliss, F.R.S., at University College, London, commencing on January 18. The lectures are open to all internal students of the university, and also to medical men on presentation of their cards.

THE sixteenth issue of the "Public School Year Book"—that for 1905—with its select list of preparatory schools, is as useful as ever. The information given respecting

each public school connected with the Headmasters' Conference is of just the kind to help parents to a decision as to where to send their boys to be educated.

PROF. FRITZ HEISE, of the Berlin School of Mines, has been appointed director of the Bochum School of Mines, and Mr. Georg Baum, the author of several works on coal-mining, has been appointed to succeed him in the Berlin chair. Mr. August Schweman, mine manager of Neurode, has been appointed professor of mining at the Aachen Technical High School to fill the vacancy caused by the death of Mr. Lengemann.

IN view of the educational and scientific progress which Japan has made in recent years, the two lectures on "The Japanese Spirit," which will be delivered by Mr. Y. Okakura, of the Imperial University, Tokyo, at the London School of Economics, Clare Market, W.C., on January 17 and January 20, should be of special interest. Tickets of admission may be obtained free from the secretary of the school.

Science reports that Mr. W. A. Riebling, of Newark, N.J., has sent an additional 2000*l.* to the Rensselaer Polytechnic Institute, Troy, N.Y., to be used in replacing the building destroyed by fire. Mr. Riebling gave 2000*l.* last June. A gift of 1000*l.* from Mr. George B. Cluett is also announced. Wellesley College has received 3600*l.*, we also learn, from the Robert Charles Billings fund, the income of which is to be applied to the department of botany.

THE West Riding Education Committee has resolved, says the *British Medical Journal*, subject to certain conditions, to make grants, which will doubtless be renewed annually, to the Universities of Leeds and Sheffield of 4500*l.* and 1500*l.* respectively. In thanking the county council for the grant to Leeds, the Pro-Chancellor, Mr. A. G. Lupton, stated that of the 100,000*l.* for which the university was now asking a sum of 64,000*l.* had already been subscribed.

THE 1905 edition of the "Schoolmaster's Yearbook and Directory" follows on the same excellent lines as the issue of last year. It contains an immense amount of well arranged information, and has become indispensable to all engaged in educational work. If the publication continues to increase in size, as it seems to do annually, the section on the books of the year might be dispensed with, as information of the same kind can be obtained from many educational periodicals. The editor is to be congratulated on the fact that this useful work of reference has become established so securely.

A RESEARCH scholarship or scholarships, founded by Mr. Andrew Carnegie, will be awarded shortly on the recommendation of the council of the Iron and Steel Institute. Candidates, who must be under thirty-five years of age, must apply on a special form before the end of February to the secretary of the institute. The object of this scheme of scholarships is not to facilitate ordinary collegiate studies, but to enable students, who have passed through a college curriculum or have been trained in industrial establishments, to conduct researches in the metallurgy of iron and steel and allied subjects, with the view of aiding its advance or its application to industry. There is no restriction as to the place of research which may be selected, whether university, technical school, or works, provided it be properly equipped for the prosecution of metallurgical investigations.

A CONFERENCE of teachers from elementary and secondary schools and technical institutes was held under the auspices of the London County Council at the Medical Examination Hall, Victoria Embankment, on January 5, 6, and 7. On the first of these days, under the presidency of Sir William Collins, the teaching of arithmetic was discussed. Mr. C. T. Millis, principal of the Borough Polytechnic, said that what is needed in the teaching of arithmetic is that some of the time now spent in teaching special rules in money sums should be devoted to giving a sound knowledge of general principles. Mr. S. O. Andrew, during the course of a paper on the same subject, remarked that whatever part of arithmetic may be given up or postponed, there is a general agreement that it must still include a know-