

J. S. Plaskett and R. E. De Lury, using the same apparatus. The 1911 and 1912 values are found to be considerably greater than those obtained in 1913. A measurement of the 1913 plates by Mr. J. S. Plaskett results in the same values as those secured by Mr. H. H. Plaskett. The communication suggests the possible origin of the discrepancies, and discusses them individually. The author finally concludes that there is no evidence of systematic difference of velocity for different elements, and that at present it is impossible to settle the question of a variation in the solar rotation or any similar problem until the personal errors of measurement of each observer have been determined. He gives the formula which represents the values of the solar rotation for 1913.

"L'ASTRONOMIE" FOR SEPTEMBER AND OCTOBER, 1914.—It is satisfactory to be able to state that in spite of the difficulties encountered at Paris in August and the following months of last year, the Bulletin of the French Astronomical Society, *L'Astronomie*, has not broken its continuity. The September and October numbers are now to hand, and those of November and December are completed, and will soon be issued. The September number continues the interesting series of articles on visits to the European observatories, that to the Zurich Observatory being here described and illustrated. Under the title "Jupiter" the observations made on that planet during the opposition of 1913 are described in some detail. Interesting curves are included, showing the displacement of the large red spot in longitude for a period of six months, and the variations of the duration of its rotation for the period 1830-1913. The chief contribution to the October number is a series of accounts of observations of the eclipse of the sun in August last, made from and outside of the line of totality. Some of these, notably that by the expedition from the Meudon Observatory, have already been referred to in these columns.

THE CANADIAN ASTRONOMICAL HANDBOOK.—"The Observer's Handbook for 1915," published by the Royal Astronomical Society of Canada, and edited by Dr. C. A. Chant, is in the seventh year of publication. The present issue is conspicuous by the absence of the brief review of astronomical progress, but this is probably more than neutralised by the addition of useful tables of double and variable stars, and an interesting table, compiled by Mr. W. E. Harper, giving some concise information regarding the brighter stars. The last-mentioned deals with 272 stars and five nebulae, and gives the chief known facts concerning their distances, spectral types, proper motions, radial velocities, etc. In the section on the constellations charts are given containing the stars down to the fifth magnitude. Mr. W. F. Denning contributes the section devoted to meteors and shooting stars. The other sections are mainly on the lines of former issues.

#### COPPER SMELTING IN CANADA.

THE Canadian Department of Mines has issued an interesting report of some 184 pages, profusely illustrated, upon the copper smelting industries of Canada, from the pen of Dr. Alfred W. J. Wilson, Chief of the Metal Mines Division. This report forms a valuable record of the position of Canada as a copper producer at the date at which it was written, namely, the close of the year 1912. As the author very truly observes, "the period of time which necessarily elapses between the writing, and the publication and distribution of Government reports is usually too long to make them an important medium for the

distribution of new knowledge in an old and well-established industry," and indeed the present report well exemplifies the correctness of this view, there being nothing in it with which copper smelters throughout the world are not thoroughly familiar, its chief value lying accordingly in the fact that it furnishes a trustworthy "record of the status of the industry at the time it was prepared," which Dr. Wilson puts forward as the chief purpose for which it was written.

The work contains an introductory chapter, separate chapters dealing in detail with the works of the Canadian Copper Company, the Mond Nickel Company, Ltd., the Consolidated Mining and Smelting Company of Canada, Ltd., the Granby Consolidated Mining, Smelting, and Power Company, the British Columbia Copper Company, and the Tye Copper Company, and final chapters of summaries and statistics. From these it appears that at the date mentioned there were in operation in Canada in the seven smelting works of the above six companies twenty-nine large rectangular water-jacket blast furnaces, with a total hearth area of 2580 sq. ft., and a rated capacity of 15,600 tons of charge per twenty-four hours; the largest of these is a 50 in. by 420 in. furnace of the Consolidated Mining and Smelting Company, with a rated capacity of 875 tons of charge per twenty-four hours, but there are no fewer than four of these furnaces with a smelting capacity of 700 tons or more per twenty-four hours, and only two with a capacity below 400 tons. The matte produced in these blast furnaces is blown in converter plants, of which there are five in all, two being operated by the Granby Consolidated Mining, Smelting, and Power Company, at their Grand Forks and Anyox Works respectively, and one each by the Canadian Copper, the Mond Nickel, and the British Columbia Companies. All but the last-named are basic lined, some using the horizontal cylindrical and some the vertical patterns.

The Canadian Copper Company produces a furnace matte with about 28 per cent. of copper-nickel, which is blown in the converters to rich matte, with 80 per cent. of copper-nickel; the Mond Nickel Company runs a furnace matte with 33 per cent. of copper-nickel, which is also blown up to 80 per cent. (38 per cent. copper, 42 per cent. nickel, 15 per cent. iron); these rich mattes are shipped for further treatment and refining. The Granby Consolidated Company was only operating the works at Grand Forks in 1912, the Anyox works not having been started as yet; they were producing furnace matte with 35 per cent. of copper, which was blown up to blister copper of good quality with 99.5 per cent. of copper, containing, in addition, gold and silver; the British Columbia Company smelted a furnace matte with 40 per cent. of copper, which was also blown up to blister copper. Both these companies shipped their blister copper to the United States for refining.

As to the two companies that do not operate converters, namely, the Consolidated Mining and Smelting Company at Trail, and the Tye Company, the former runs a first furnace matte with 10 per cent. of copper, which is twice concentrated in the furnaces, the second matte containing 15 to 20 per cent. of copper, and the final matte 40 to 42 per cent. of copper; the Tye Company runs largely on customs ores, and produces a final matte with 40 to 43 per cent. of copper; both these companies ship their mattes to the United States for further treatment. It thus appears that although Canada produced in the above year nearly 78 million pounds of copper, not one pound of this was converted into merchantable copper within the Dominion. The only reference to this fact to be found in the report before us is an



incidental statement by Dr. Wilson that "there are no copper refineries in Canada." It is difficult to understand why Canadian copper producers should be willing to forgo the very handsome profit realised by the refining of their crude products, and why they should be so ready to ship these products to the United States instead of completing the refining process at home.

Dr. Wilson avows as one of the objects of this report that "it may possibly be found useful to parties who are contemplating investments in the development of similar industries in other sections of the country," but it is surely of far greater importance to Canada that it should be in a position to utilise fully its mineral production, and to put it on the market as material ready for use in the arts, and not in an only partly manufactured condition. Surely one of the many economic lessons enforced by the present war is the need for the Empire to be as nearly as possible self-supporting, so that we may be, as far as practicable, independent of other nations for the supplies that we chiefly need. This is not always possible, because even the vast British Empire does not furnish all the natural products that we use, but in the copper smelting industry of Canada we have an example where we are deliberately giving away our natural advantages. Seeing that this is a case where both patriotic motives and commercial interests point in the same direction, it may fairly be hoped that there will be found in Canada men enterprising enough to finish what they have begun, and that the reproach that the Dominion is unable to refine its own copper production will soon be removed. This is certainly not the conclusion that Dr. Wilson has drawn, nor perhaps the one which he wishes to be drawn from his careful and comprehensive report, but it certainly is the main impression that the reader of his report is likely to carry away from its perusal.

H. L.

#### AGRICULTURAL AND HORTICULTURAL RESEARCH.<sup>1</sup>

THE varied research activities manifest at Woburn are reflected in the contents of the fourteenth report. They include experiments in potato spraying, trenching, the distribution of soil particles, the effect of one crop on another, the control of the black currant mite, and the loss of manure in transit. It is not possible within the limits of a short notice to discuss all these subjects, nor perhaps is it necessary. For as is inevitable with interim reports, final results may not be expected. Thus with respect to the experiments in potato spraying with Bordeaux mixture and with Woburn paste, the report, though it advances our knowledge another stage, does not make final revelation of the secret of the prophylactic virtue of copper sulphate against late blight (*Phytophthora infestans*). Mr. Pickering recognises that the problem is complex, and inclines to the view that the spray fluid acts rather by inducing healthier foliage than by destroying the spores of the fungus (p. 30). Although on the scientific side of the question much remains obscure, Mr. Pickering records notable progress on the commercially practical side. He finds that Woburn paste used at the rate of 15 or 16 lb. is equivalent in its effect to Bordeaux mixture made from 8 lb. copper sulphate, and this although the paste contains five or six times less copper than does the mixture.

<sup>1</sup> (1) Fourteenth Report of the Woburn Experimental Fruit Farm. By the Duke of Bedford and Spencer U. Pickering. (London: Amalgamated Press, Ltd., 1914.) Price 2s. 6d. post free.

(2) University of Bristol. The Annual Report of the Agricultural and Horticultural Research Station. (The National Fruit and Cider Institute), Long Ashton, Bristol, 1913. Pp. 110. (Bath: Herald Press, n. d.)

If we may offer a suggestion it is that Woburn should undertake a series of records spread over a term of years with the view of settling a question which vexes the minds of not a few of our best and biggest growers—whether in the *long run* spraying with Bordeaux mixture is or is not profitable. Those who know only the laboratory side of the subject may scoff at the question, but Mr. Pickering's experience would doubtless confirm the reviewer's, that many hard-headed lowland Scots do not spray, and give as their reason that it does not pay. Evidence from America, where large-scale spraying experiments have been carried out, would appear to put the men in the wrong, but in spite of that and similar evidence in this country, these men maintain their negative position. If, as Mr. Pickering estimates, the benefit of spraying in a year of blight is only about 10–30 per cent., and if, as is well known, spraying to be of much use must be begun before the disease appears, the unconverted grower may have economic justification for his heresy.

Mr. Pickering's experiments in bastard trenching, carried out in conjunction with Dr. E. J. Russell, lead to negative results which are at first sight surprising. For it might be supposed, from what is known of the need of roots for air, that the mere disturbance of the soil would benefit the crop. It has to be borne in mind, however, that the experiment was carried out with fruit trees, and it is at least probable that when the trees were planted the soil in which they were planted was disturbed sufficiently for their needs. Mr. Pickering is right in believing that where a hard pan exists not far below the surface, bastard trenching even without the addition of manure is of value.

When so much is done at Woburn it is almost ungracious to ask for more, but we should like very much to see the effect of the bastard trenching on a crop of vegetables—carrots or beet, for example. It is rash to prophesy in horticulture, but we incline to the belief that the effect, though perhaps not great, would be positive and not negative, as in the case of the fruit trees.

The Annual Report (1913) of the Agricultural and Horticultural Research Station at Long Ashton, Bristol, shows that this comparatively young institution is carrying out a large amount of useful work.

As is natural, much of the report is concerned with problems connected with cider and perry-making. A subject of wider interest is that of the influence of the stock upon vintage quality and other characters of apples. Growers as a class are apt to maintain that the stock exercises a considerable though ill-defined influence on the scion, and there is a good deal of scattered information on the subject. The analyses of fruit juices published in the report indicate that the nature of the stock is without influence on the quality of the juice of the fruit; save that the rates of fermentation of juices obtained from fruit grown on the Paradise stock are in most cases higher than those from fruit grown in the free stock.

For our part we are inclined to believe that light would be thrown on the subject by an investigation of the oxydases of scion and stock; for it is by no means improbable that research will discover that these potent agents may pass along the wood and bast, and thus affect the rate of chemical change in far-distant tissues.

The influence of grass on the growth of orchard trees—a subject brought into prominence by Mr. Spencer Pickering's observations—is discussed by Mr. Barker on the basis of experiments carried out at Long Ashton and in several demonstration orchards in the west of England.

Mr. Barker, beside confirming the view that grass