

and in doing so he minimises the value of Faraday and Harcourt's work. Of Harcourt he says: "The result at that time (between 1834 and 1844) was scarcely of any practical importance."

Now what does Dr. Zschimmer, who until the Revolution was chemist to Messrs. Schott, of Jena, say? I shall translate from his book, "Die Glasindustrie in Jena" (p. 22), and throughout I shall limit myself to quotations from German sources: "With Harcourt's experiments there began in the year 1834 the systematic 'scientific melting' of glass in the laboratory. He was the discoverer of the first research furnace for fusion at high temperatures, the first who was able to complete numerous small experimental melts, and thence to determine by spectrometer measurement the optical properties—refraction and dispersion—of various extreme glass substances."

On p. 23 he continues: "Harcourt . . . discovered the power of molten phosphoric acid and boric acid to form glass with almost all the elements, and on account of their fluidity he substituted them for the more viscous silica. Already in 1844 he was able to communicate to the British Association the happy success of his first experimental melts, the further object of which was to compare the chemical constitution with the optical properties of different glasses. . . ."

Dr. Zschimmer is generous, but not unduly so. A genuine man of science himself, he has recognised the great, far-reaching practical results of Harcourt's work, but Dr. Zschimmer has embarrassed us. In accepting his opinion we must doubt that of Messrs. Zeiss's representative, whose declared object it is to "furnish some trustworthy historical data."

Messrs. Zeiss's spokesman questions to-day the statement in NATURE that: "If the British optical industry is to be maintained and to develop so as to turn out products equal at least to the best products of other nations, it must not be dependent on foreign sources for the supply of optical glass, but must have an adequate home supply, equal, again, at least to the best available anywhere." "History," he says, "does not point to the existence of such a very close relation between the welfare of the glass-founder and of the optical instrument-maker in the same country."

Does it not? Is Messrs. Zeiss's publicity manager so unfamiliar with the history of the Jena establishments? If in the above statement from NATURE the word "German" be substituted for "British," we have the essence of the original appeals for a subsidy made to the Prussian Government. In this connection I shall translate part of a vigorous statement made by Rudolf Virchow: "It concerns itself, indeed, with a national undertaking, the object of which is to produce in Germany in an independent way the glass necessary for all scientific purposes, and also to provide for the population what is necessary for the production of spectacle glasses, opera glasses, and the like. Nevertheless the latter is not the principal object. It concerns itself, moreover, to the highest degree with the production of glass for telescopes, microscopes, and such like scientific instruments. This question is of very special importance as regards the construction of instruments for military and naval purposes, in which connection we have hitherto been entirely dependent upon foreign countries. In the previous year it was proven to the Budget Commission that only by a particular accident was it possible to obtain the necessary quantity of glass for the construction of optical instruments essential for the army."

"The close relationship between the welfare of the

glass-founder and of the optical instrument-maker in the same country," thus forcibly advocated, was already recognised by the Prussian Government, which "granted to the Jena undertaking for two years a sum of 60,000 marks."

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Anniesland, Glasgow, October 24.

THE letter published in NATURE of October 20 from the Carl Zeiss organisation in Jena through Messrs. J. W. Atha and Co. is interesting, but not very convincing, for Messrs. Zeiss seem to wish to convey a totally different impression from that of thirty-five years ago. Their present attitude is that although they did receive a small subsidy, a mere 3000*l.*, from the Prussian Government, it was an isolated instance and really quite unnecessary. In view of this the following extract from the preface to the catalogue of optical glasses issued by Schott and Gen in 1886 is interesting:—"We have to express our sincere thanks to the Prussian Bureau of Education and to the Diet of the kingdom for the *very liberal and repeated subsidies* by which we were enabled to carry out the costly experiments on a manufacturing scale." The italics in the quotation are mine.

An analysis of the various optical glasses offered in this 1886 catalogue gives food for thought. Forty-four glasses were offered, of which it was claimed that nineteen were essentially new, and so were printed in heavier type. Fourteen of these were entirely withdrawn from the market within a year or two, as they were absolutely unstable, and were never replaced. Of the remaining glasses five had the following significant remark printed against them, presumably as a recommendation: "Exactly corresponds to the hard crown (soft crown, dense flint, etc.) of Chance Bros." Of the remaining glasses it may be said that they were merely slight modifications of the ordinary old-fashioned crowns and flints, having slightly lower or higher refractive indices than ordinary hard crown, light flint, or dense flint, and a correspondingly lower or higher dispersion, many of which had been produced by Chance years before.

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October 25.

IN their letter to NATURE of October 20 (p. 238), Messrs. Zeiss suggest, by implication, that British optical instruments are inferior to those of German manufacture. The following may be of interest:

I possess three photographic lenses. One a pre-war Goerz, double-anastigmat, 7-in. focal length, working at  $f/6.8$ , and two post-war Cooke lenses, one of 8½-in. focal length, working at  $f/4.5$ , and the other of 15-in. focal length, working at  $f/5.8$ .

All three lenses have recently been tested at the National Physical Laboratory. The full reports are too lengthy for publication, but it suffices to quote that the Goerz lens had to be stopped down to  $f/16$  to give "satisfactory definition over the entire plate," whereas the Cooke lenses did this at *full aperture*.

The Goerz lens, I was informed, was specially selected for me by Messrs. Goerz's agency in London, whereas both Cooke lenses were bought from stock at the Army and Navy Stores.

Possibly one important factor in the success of the German optical industry is the skilled way in which their products are advertised. The delusion that they are unequalled is widespread.

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