NOTES.

BORAX AS DESTRUCTIVE OF VEGETATION.

IN the course of an important law case in which we were concerned, and in which it was alleged that damage had been done to a sewage farm through the turning on to it of waste liquor from borax works, some points in the chemical evidence were brought out which may be of interest to readers of the ANALYST. It was admitted that, for a number of years, an effluent containing, in varying strength, borax, sulphate of soda, and carbonate of soda, had been sent at varying intervals on to the land of the sewage farm, the soil being one of light character, of fair average fertility, and well adapted to filtration purposes. Though the effluent had been going on the land for a considerable number of years, it was not until 1908 that any injury was noticed, since which time a watch had been kept and the facts alleged established as far as possible.

While it was admitted by both sides that a sufficiently strong solution of borax going on to land where plants were growing would kill them, the defendants maintained that there must be immediate killing of the crop established if the effluent were to be held responsible. The chemical evidence, therefore, turned largely upon the possibility of boron compounds in some form being retained in the soil, and accumulating there to such an extent as to make the latter thereby toxic.

Analyses of the soils made by Mr. Alfred Smetham, Chemist to the Royal Lancashire Agricultural Society, and by Mr. W. H. Roberts, Public Analyst for Liverpool, showed that, where crops had suffered damage, the soil contained boron compounds, and that, speaking generally, where there was the more boron there the damage was the more marked. In one case in particular, where the damage had

been very marked, the percentage of borates, reckoned as borax, was exceptionally high, although the analysis showed the soil to be in other respects one of a distinctly fertile nature. Indeed, it was shown by the analyses and evidence that none of the soils were really poor ones agriculturally, and that there was nothing to account for the admitted failure of the crops beyond the presence in the soil of borates.

The actual percentage amounts of borates, calculated as borax, on the damaged soils (dried at 100° C.) were: (a) 0·04, (b) 0·032, (c) 0·036, (d) 0·168; while in samples of soil taken from a part of the farm on which an altogether different effluent flowed there were no borates at all found.

The chemical witnesses for the defence, after suggesting that rainwater containing sulphuric acid in quantity, or that washings from tarred roads might have caused the injury (they produced, however, no evidence on these points, and, indeed, had not even tested for their presence), alleged that the soils were worn out by excessive sewage treatment, and that they were devoid of "humus" and other constituents, objections which were all promptly disposed of by the evidence of Dr. Voelcker. The attempt was next made to establish that it was only the borates that were soluble in water and could be removed at any time by washing with water, that could do any harm to plants, and accordingly the figures for borates in the soils put forward by the defence only took account of the soluble borates, and thus were much below the figures above recorded.

The evidence for the plaintiffs tendered by Mr. Smetham and Mr. Roberts was supplemented by that of Dr. Voelcker, who was able to bring forward the results of experiments conducted by him at the Woburn Experimental Station (*J. Roy. Agric. Soc. Eng.*, 76, 1915) on the influence of boron compounds on plant life, and in which it was shown that 0·043 per cent. of borax, if present in a soil, proved actually destructive of the growth of wheat or barley, while amounts of even one-tenth that quantity (0·0043 per cent. of borax) showed a retarding influence.

These witnesses combated the methods employed by the chemists for the defence in estimating the amounts of possibly injurious boron compounds, and their statements that the borax would be washed out of the soil and could not be retained by it, nor were capable, when in the form of compounds insoluble in water, of accumulating to a point where the soil might be considered as toxic to plant life. The evidence supplied by the Woburn experiments of the accumulation of sulphuric acid from the continued use of sulphate of ammonia on a soil deficient in lime, thereby rendering the soil sterile, provided valuable confirmation of the possibility of borates accumulating in the soil and proving injurious.

In the course of the trial numerous references were made to water-culture, pot-culture, and other experiments that had been conducted on the subject, and, in the end, judgment was given to the effect that it had been successfully shown that the presence of borax in the soil was the one and only element concerned in the destruction of the crops.

W. H. ROBERTS.
ALFRED SMETHAM.
J. A. VOELCKER.

DETERMINATION OF CARBON IN STEEL.

The method of dissolving the steel in potassium cupric chloride is still the best. The carbon should be burnt in a silica tube, and the gases passed through copper oxide. In order to protect the tube from the action of the copper oxide a liner of platinum should be used for the copper oxide. Under these conditions the tube may be heated rapidly without danger of fracture or corrosion of the tube, but to guard against the latter the liner is essential.

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CRUCIBLES.

For moderate temperatures gold crucibles are useful and relatively cheap. The modern Bunsen burner, which gives a high temperature, should not be used, as the crucible may melt. Palladium appears to be useless as a crucible material. Porcelain crucibles of the best quality are at present unprocureable. The crucibles made in this country and in neutral countries need much more delicate handling than was formerly necessary with Royal Berlin crucibles. The same remark applies to other porcelain ware.

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ESTIMATION OF ALBUMINOID AMMONIA.

The all-glass apparatus, admirable though it be, has certain disadvantages due to its rigidity. On the whole, the old-fashioned retort and Liebig's condenser are preferable if room is available.

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