THE WATER OF DORTON SPA.

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(Read at the Meeting, April 1, 1914.)

EARLY in the nineteenth century, at the close of the war with France, there was a sudden rush of visitors from this country to the spas on the Continent, and many of the old English watering-places were practically abandoned. Simultaneously with this neglect of our spas there began another movement of a largely speculative character, to exploit new spas which should rival in attractiveness those abroad. Among the most spirited of these attempts was the spa which was built about 1830 at Dorton, in Buckinghamshire. The spring thus developed into Dorton Spa had been known to the inhabitants of the district for many generations, and owing to its inky taste was commonly described as the "alum well." The ground for a radius of many feet was stained a deep yellowish-brown from the deposition of iron oxide and sulphate. According to a contemporary account, it was mainly used as a bath for mangey dogs and for "tanning" them for bull-baiting.

In a pamphlet, published in 1833 by the local surgeon, T. Knights, to advertise the spa, an analysis of the water made by Brande in 1830 is quoted. In spite of vigorous advertising the spa never became popular, and before the end of the forties the pump-room was pulled down and the building allowed to fall into ruins.

According to Brande, the water had a sp. gr. of 1.004 at 60° F., and was acid to litmus, this being due to the presence of 0.8 per cent. of free sulphuric acid.

It had the following composition in grains per pint :

Sulphate of lime	...	...	...	11.5
Muriate of soda	...	...	...	1.4
Sulphate of alumina	...	...	...	2.1
Sulphate of iron	...	...	...	10.0
Total solids				25.0

It contained also traces of carbon dioxide, nitrogen, and silica.

Last year I had the opportunity of examining the water of this well, which is undoubtedly of a remarkable character. The water had a sp. gr. of 1.0041 at 15.5° C., and on evaporation at 100° C. left a residue of 433.2 parts per 100,000. This still contained water of hydration, which could be expelled at a higher temperature. Analysis of the salts present gave the following results, and for convenience of comparison I have calculated Brande's results upon the same basis of parts per 100,000 :

	Mitchell (1913).	Brande (1830). <small>WATER ANAL.</small>
Iron	} 45.6	{ 32.00
Aluminium ...		{ 3.52
Calcium	40.0	31.30
Magnesium ...	15.0	—
Sodium	8.5	6.29
Sulphuric acid (SO ₄)	243.0	202.89
Chlorine	10.0	9.71
	362.1	285.71

The difference between the sum of the constituents and that left on evaporation at 100° C. was due, as mentioned above, to water of hydration retained by the iron sulphate.

From a comparison of the analyses, it will be seen that the amounts of sodium, calcium, and chlorine, have remained fairly constant. Magnesium, if present eighty years ago, was overlooked by Brande. The great increase that has taken place in the total solids is due to the iron sulphate. A slight trace of aluminium is present, and this is included in the iron. As in the case of the earlier analysis, the water is acid, the acidity calculated as free sulphuric acid being 0.1 per cent.

DISCUSSION.

Dr. VOELCKER asked whether Mr. Mitchell knew what was the cause of the peculiar properties of this water, and whether there were any other waters of a similar nature in the district. He had had a good deal to do with water-supplies

in Buckinghamshire, but had never met with this spring or any other of a like nature there.

Mr. T. TICKLE asked whether the iron was wholly ferrous or partly ferric.

Dr. LANDER asked whether Mr. Mitchell had made any observations as to whether the water had any radio-active properties.

Mr. P. A. E. RICHARDS said that some years ago he had made an analysis of water from Boston Spa, near Harrogate (see ANALYST, 1901, **26**, 68-71), which was found to contain barium. An analysis of water from the same source had been made in 1784, the results of which were fairly consistent with those of his own analysis, except that the barium was not discovered, but was included as calcium.

Mr. E. HINKS asked whether it was quite certain that the acid present was free sulphuric acid, and whether the water was free from carbonic acid.

The PRESIDENT remarked that presumably the free sulphuric acid would be due to some hydrolysis of the sulphate of iron.

Mr. C. A. MITCHELL, in reply, said that he was not surprised that Dr. Voelcker did not know of the existence of this spring, since it was, as he had said, situated in a wood, and was difficult to find. He knew of nothing that would account for its peculiar properties. He had not ascertained in what state the iron was present, nor had he made any investigation as to the possible radio-activity of the water, though this seemed a not unlikely possibility, and might perhaps account for the striking effects with which the water had been credited. He had not determined whether the acid was actually sulphuric acid. No carbonates were included in the dissolved salts. He believed that in the earlier analysis the dissolved gases were found to include some carbon dioxide, but in his own case the quantity of water available was insufficient to enable this to be investigated. The water as it came from the spring was yellow and fluorescent from the particles of iron in suspension. These, however, soon subsided. After the water had been kept for about three months the deposit amounted to about 3.3 per cent. of the total solids. The deposition was slow, as the acidity tended to keep the iron in solution.