

to light a flowing well. The upturned position of the shales, allowing thus the oil to exude and evaporate, may perhaps be responsible for the phenomena as exhibited in the oil districts of this State. The superintendent of the Hayward Company being convinced of the abundance of the oil in the shales and sandstones, was the first to adopt the plan of running into the hills and collecting in the soles of the tunnels the exudations from the oil repositories; and the result has shown the soundness of his method of procedure. The crude oil thus collected must be submitted to a preliminary purification before it can be used for the purposes of illuminating or lubricating. For this purpose refining works have been erected in San Francisco, and in some localities at the wells. Whether the rock oils of this coast be identically similar in chemical composition to the hydrocarbons at the East is a very interesting problem for scientific investigation, but is a subject of very little moment in the popular estimation.

BORAX.*

The borax of commerce, or chemically speaking, the bi-borate of soda, has been, heretofore, chiefly manufactured from a combination of the boracic acid waters of the springs of Tuscany with common soda. This salt is very extensively used for glazing pottery—upwards of 11,000 tons being annually consumed for this purpose in England alone; also, as a flux for assaying, for welding, and for the formation of the finer glasses and enamels.

The presence of this substance in California was first detected by Dr. J. A. Veach, as early as 1856, but it was not until 1864 that systematic efforts for its collection were undertaken. The locality of its occurrence is in Lake County, about sixty miles N. W. of Napa City. There is one other small lake in the county, which contains traces of boracic acid, and likewise the boiling springs on the shores of Clear Lake. The Borax Lake, so called, is on the property of the Borax Company; it is elliptical in form, about one mile long by one half a mile wide.

The United States Survey reports the superficial area of the lake at two hundred and nineteen acres at the latter part of the dry season. The accumulations of the winter's rains, however, enlarge its area to some four hundred acres; of which space some three hundred may be said to be more or less productive of borax. The average depth of the lake is not more than two and a half feet. The waters, surcharged with boracic acid and soda, and becoming concentrated by evaporation, deposit the salt in monoclinic crystals in the mud of the bottom.

The stratum immediately below the water to a depth of some six feet is soft and prolific in fine crystals; below this succeeds a zone of stiff blue mud, wherein are found the large sized crystals. The method of extraction consists in sinking small coffer dams into the muddy bottom, exhausting the water, washing out the finer crystals in a manner similar to the process of panning out placer gold; and picking out the larger masses by hand. As a result of this rude process, the company have been producing an average of two tons per day.

Repeated analyses of air dried samples of mud taken from the bottom at various points, gave eleven and nine-tenths to eighteen and seven-tenths per cent. crystallized borax; and there was obtained by actual lixiviation, fifteen per cent. of borax, twenty eight and a half per cent. of carbonate of soda, and eight and one-fourth per cent. of common salt.

Admonished by this result, the company determined to erect works for extracting the microscopic crystals by lixiviation; these, it is anticipated, will be in active operation by the spring of the ensuing year.

With a view to arrive at the depth of the borax impregnation, an artesian boring was put down a distance of sixty feet; the mud taken from the bottom yielded three and a half per cent. of borax. To the better understanding of the vast amount of borax in the mud of the lake, we may make the following estimates; assuming that the productive ground embraces no more than two hundred acres, with an average

* Compiled from the Report of the Borax Company.

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