THE BORIC ACID WORKS AT LARDARELO.[1]

By Wm. P. Mason.

SO far as I am aware no recent description of these famous works has been given, and there is certainly wide-spread ignorance as to the best route by which to visit them. The most convenient starting point is Pisa, whence a train may be taken for Cecina at 6.10 A. M.

At Cecina one must change cars for the branch line going to Volterra. At Volterra station (not the town of that name, which lies some five miles away) a comfortable one-horse wagon, holding two besides the driver, may be hired for the round trip for ten francs. The regular post is to be avoided as it does not go far enough. The drive to Lardarelo will take two and a half hours, and the return journey will take about the same time. An evening train leaves Volterra station for Pisa. An attempt to pass the night *en route* would be attended with discomfort and is not recommended.

Unless the visitor be able to speak Italian an interpreter would be absolutely necessary.

The scenery between Volterra and Lardarelo, although hilly, can hardly be termed mountainous; and the soil, though poor in quality, is cultivated, olive plantations being seen in plenty. Altogether, the description of the approaches to the place, as depicted by the older authors, savors of a much more grim locality than the valley seen by the traveler of to-day—its infernal characteristics sink into nothingness when compared with the Yellowstone Park.

The dark color of the masses of friable serpentine on the hillsides, during the last mile of the drive, is the only reminder of the scenery as described by Muspratt, but wherever this rock occurs it does certainly give the surroundings "the appearance of having been burned."

Upon crossing a ridge within half a mile of the end of the journey, the boric acid plant, and its attendant village, suddenly come into view, and, with the numerous jets of native steam

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rising from and among the buildings, the resemblance is very strong to a busy New England factory town.

All of the district now covered by the works was originally owned by the people of the neighboring ancient town of Monte Cerboli, but having been held by them as of little value, it was very cheaply obtained in 1818 by a poor young Frenchman (grandfather of the present Count Lardarel) who detected the presence of boric acid in the steam and who was shrewd enough to appreciate the value of his discovery.

He at first formed a company for the purpose of developing the property, but later acquired entire possession himself.

The boric acid, to the extent of one-tenth of one per cent., is contained in the native steam that issues from the earth through numerous orifices, all of which have been tubed to a greater or less degree.

These tubings are mostly of eight-inch pipe, and extend into the earth varying distances, some a few feet and others over three hundred. Certain of the fumaroles are entirely artificial, having been bored after the manner of artesian wells. The boring tool, when it reaches the steam zone, usually drops suddenly a yard or more, and immediately thereafter steam escapes with much force. The temperature of the issuing steam varies in the different outlets from 98°–140° C., and it rushes from the pipes with great noise and power.

Ordinary spring water is led into a circular brick cistern about thirty feet in diameter, and an eight-inch pipe, conducting natural steam passes through the cistern wall about one foot below the water surface.

The issuing steam, which impregnates the water with boric acid, causes a fountain of several feet in height to play in the cistern.

After an interval of twenty-four hours the contents of this cistern are piped into another similar one on a lower level, and are then subjected to a further injection of steam for an additional twenty-four hours, after which the solution passes to a square settling basin where a grayish mud, of exceedingly fine state of division, separates.

This mud, which contains more or less boric acid, is given

away to the country people who use it as an application for diseases of the hide occurring among sheep and cattle.

From the settling tank the boric acid water passes to evaporating pans (forty in number) made of lead. These pans are six feet wide, 150 feet long, and eight inches deep. They are slightly inclined, and are divided by small ridges two and a half inches high crossing them transversely every two feet. The liquid enters at one end and slowly flows over the step-like divisions to the other, the rate of inflow being made equal to that of evaporation.

When, in the judgment of the attendant, the concentration has been carried far enough, the flow is cut off and the hot, concentrated liquor is brushed out by brooms into crystallizing tanks, ten by thirty feet in size, and allowed to cool.

The deposited crystals of boric acid are removed by wooden scoops, drained in baskets, and the mother liquor is returned to the evaporating pans.

The crystals are spread upon a steam-heated drying floor protected by a shed-like building thirty by fifty feet in area, and when dry are placed in bins for storage. Shipment is made in casks holding about 1,000 pounds each. The heating of the evaporating pans and drying floor, in short heating of every description throughout the establishment, is by native steam.

About 200 hands are employed in the works, and the annual output is approximately 1,700 tons, all of which is shipped to England, *via* Leghorn.

Count Lardarel appears to have a careful eye for the welfare of his employees, as is evinced by the substantial manner in which the village is built, its cleanliness and the attempts made to adorn the streets. He was awarded a medal at the Paris Exposition for his contributions towards the betterment of social conditions, in addition to an award made for his manufactures.

The statement in our standard works of reference that "boric acid is recovered at both Monte Cerboli and at Lardarelo," is confusing, as they are practically one and the same place; and the dimensions given the artificial lagoons, "100 to 200 feet in diameter," is a great exaggeration.

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