

## THE SALT MANUFACTURE IN THE WEAVER

*Authorship of this article is not attributed, but F.G.S. Nicolle, who procured this copy of the article for Edward Baring-Gould, pinned a note on it: "Compare with 'The Cheshire Salt Region' in Good Words (1893) and with Chapter 18, 44 – 45 of The Queen of Love (1894).*

There is a district of Cheshire, the Weaver Valley, that lies above a great basin of salt rock some twelve square miles in extent. The salt was deposited in the Tertiary period, and resulted from the evaporation of some salt lakes which communicated with the sea somewhere about where now stands the town of Liverpool. There are two main strata of rock-salt: the upper one lies one hundred and twenty feet below the surface, and is sixty-three feet thick; below that is a bed of impermeable marl, of an average thickness of thirty feet; and below that, again, another bed of rock of superior purity to that above, and measuring in depth about eighty-eight feet. The lowest rock-salt is alone mined; it is dry; but the peculiarity of the upper deposit is that on its surface are 'brine-runs' — that is to say, the rain and river-water soak through the gravel and gypsum deposits that lie above it, and reaching the salt, take up from it as much as they can hold in solution — that is to say, about twenty-five per cent of salt.

These brine-runs are not all in connection; they lie as underground lakes above the salt rock. There are, however, places where the upper salt rock is dry, and where it was formerly mined. It is not so now. In the upper strata there are thin and inconsiderable salt beds, which were known to the Romans, and perhaps to the Britons; but the salt rock was not discovered till 1670, and the lower deposit not till 1770. In medieval times there were 'wyches' or salt-houses in the Weaver Valley, in which brine brought up in leather buckets on men's shoulders from brine-wells was evaporated over wood-fires in lead pans. Several noblemen had their salt-making houses at Northwich, Middlewich, and Sandbach; but salt does not seem to have been manufactured largely till the present century. At first, much rock-salt was mined where the upper rock was dry; and these old mines when the water got into them were deserted, and have become a source of great danger and mischief; for the water rapidly decomposes the salt rock, and as it is pumped out in the form of brine, fresh water enters and continues the decomposition. By this means the salt bed is being rapidly removed, and the natural consequence is that the country above it is subsiding.

At present, a million tons of salt are carried away down the Weaver Canal alone, and the amount that departs in salt trucks by rail cannot be much less than half that quantity. Consequently, the whole of one stratum that underlies the Weaver Valley and its towns Winsford, Middlewich, Northwich, and Sandbach, is being withdrawn, and the surface of the land is being let down below sea-level. It was given in evidence, in May 1890, before a Select Committee of the House of Lords on the Widnes Brine Supply Bill, that in the Northwich district alone six locks on the river had been rendered useless through the subsidence of the land. A bridge was continually sinking, which had cost seven thousand pounds to build. In 1881 and 1882 it had gone down eighteen inches, and cost a further sum of two thousand one hundred and fifty-seven pounds to raise it. In 1887 it had again sunk.

But we will not consider the sinking of the land, but the method of manufacture of salt from brine.

The sole mines for rock-salt are now in the lowest and purest bed. The rock-salt is exported, much of it to the Netherlands and Australia, and its chief use is for mixing with food for cattle. The upper deposit is worked for table salt, and it is worked by water — that is to say, no mining in it is done by the hand of man; the agent for removing the salt rock is water. Fully-saturated brine contains twenty-seven pounds of salt in one hundred pounds of water. The best Cheshire brine is extraordinarily strong: it contains twenty-six pounds of salt in one hundred; whereas seawater contains only three and a half per cent. The Friedrichshall brine contains twenty per cent., and that of Château-Salines only fourteen per cent. Accordingly, the Cheshire manufacturers have a great advantage in the strength of their brine; and a second in the nearness of the great coal-fields of Yorkshire, Derbyshire, and Durham. They have the most strongly impregnated natural brine known where it is most inexpensive to evaporate the water.

If we visit a salt factory in the Weaver Valley, the first point to be noticed is the boring into the reservoir of brine. A shaft is driven down through the red marl and gravel, through beds of gypsum like masses of alum, till the reservoir is tapped; whereupon the brine rushes up the shaft. Then a pump is let down and hung in the boring. The iron pipe has nothing to rest upon below; it depends from its collar at the top. In the present autumn (1892), one such pump broke from its bearings and sank, never to be recovered. The brine pumped up is discharged into a large bricked tank, from which pipes of communication lead to the several pans in which the solution is to be boiled or scalded.

There are pans of two sorts, according to whether the salt is to be fine or coarse grained. In the former case, it is boiled; in the latter, scalded. Moreover, the size of the pans

differs: those in which fine crystallised salt is to be made are not over thirty feet long by twenty-four feet wide; whereas the others are often double the length. The pans are eighteen inches deep. Under a pan for fine salt at one end is the furnace, and the fire and smoke from it are conveyed the whole length of the pan, and also under a chamber beyond in which the salt has to be 'stoved.' When the brine is in ebullition at the end immediately over the fire, it sends ripples to the farther end, and of course parts with its water by degrees in steam. As the steam forms above the pans, so do salt crystals form on the surface of the brine, as a sort of scum, at the end away from the fire. If this be not removed, in a short while it sinks; accordingly, men, locally termed 'wallers,' are engaged with paddles raking the salt as it forms to the sides, where it is put into 'tubs' — that is to say, wooden forms of various sizes—80, 120, and 160 to the ton. The wallers are paid 2s. 1½d. to 2s. 3½d. per ton for making this salt. As soon as each tub is filled, it is left to drain; then, when drained, the salt block is turned out; with a wooden paddle it is shaped where bruised, and is then carried into the hot room to be 'stoved' — that is, thoroughly dried. Though in the pan-room it becomes sufficiently consistent to be handled, yet such is the amount of vapour in the air there that it still holds a considerable portion of water. Round the pans are hollow troughs eighteen inches deep, in which the men stand to till the tubs. Each tub when filled is put on the 'hurdle' — the platform that acts as a terrace round the entire chamber and the pan.

It is in this part of the salt factory that accidents occur. The air is so full of steam that one cannot see where one is going. A small rib, two inches high, divides the hurdle from the 'stand inside,' and a trip on this rib may precipitate into the boiling brine. But sometimes a death may ensue through sudden giddiness, caused by the density of the vapour or the heat. Shortly before the visit of the writer of this article to one of the factories, a boy was sitting on the edge talking, when suddenly, from no explicable reason, he lost his balance, and fell over into the brine, and was scalded to death. Another case that had recently happened was that of a man. He had been a very bad character, going to night-work — the boiling is carried on night and day — and possibly with a drop too much in his head, he staggered and fell into the pan. He picked himself up, and, confused by pain or steam, he struggled forward into the middle of the pan instead of seeking the edge, and stood there in the boiling brine too stupefied to understand where he had got. He had to be drawn to the side with rakes. He lived for a couple of hours. When the surgeon told him to prepare for death — 'Oh,' said he, while there is breath there is hope;' and these were his last words.

A question which has often arisen in the writer's mind has been relative to the agony of death by burning or scalding. Is it continuous to the last? He believes not. In one or two

cases that have come under his notice, he has convinced himself that after the first spasm of anguish the pain is not felt in the same intensity. He asked this question of the foreman, who had witnessed several deaths by scalding, and he was of the same opinion.

Every ton of salt takes about thirteen hundred-weight of 'burgey' or good slack to make, and costs, all included, from 8s. 6d. to 9s. per ton. The tub salt formed as described is that which is seen in shapes in shops. When sufficiently dried in the stove, this is ascertained by a ringing sound they give out when struck.

Fine salt that is unstoved is called 'butter salt.' This is not put in moulds at all, but is tossed out to drain on the hurdles. The butter salt is sent away in vans or by boat, and shipped largely to the East Indies. The thoroughly dry salt would settle as hard as rock were that taken a long voyage. In the hot houses for drying the squares, the spaces between the flues, that run under the floor like a Roman hypocaust, are left uncovered, and are called 'ditches'. The Men who throw the blocks out of these hot-houses and stack them in the rooms above are called 'ditchers.'

Owing to the intense heat of the works, the men go almost completely naked, wearing breeches or trousers only. They stream with perspiration, and will run out the barrows with butter salt to lade a van on the rails in this condition, and stand talking to each other in a freezing east wind. One would suppose that pulmonary complaints were frequent. This is not the case; the men enjoy excellent health, and almost entire exemption from influenza, cholera, and all fevers.

The next process is to make the fine table salt. For this purpose the conical blocks are run on barrows to the mill to be ground. A man with a pick tosses each moulded block on to a revolving band or elevator with catches on it to receive the blocks, which are carried up and thrown into the mill, where the salt is passed between smooth revolving plates of iron, crushed to the fineness required, then passed through sieves. Much of the table salt produced is as fine in the grain as the finest wheat flour. It is never touched by the hand. As soon as reduced to salt-dust, it is placed in jars, or waterproof bags, or parchment receptacles.

Ordinary common salt is not boiled at all, and is formed at a temperature of one hundred and seventy to one hundred and eighty degrees Fahrenheit. It remains about two days in the pan. It is the rule, the slower the evaporation the larger the crystals formed. This salt is never put into tubs, but is drained on the hurdles.

Fishing salt is made at a temperature of one hundred to one hundred and twenty degrees Fahrenheit, and remains about five days in the pans, sometimes as long as three weeks.

It is a much coarser-grained salt, and is employed for pickling. Bay salt is coarser still, and is allowed some six weeks to form. It is made at a temperature of ninety degrees Fahrenheit; owing to the time it takes making, it is the most expensive of all. After the crystals have been drained, they are washed again in hot brine and then stoved.

Brine as it comes from the shafts is never pure; there is with the salt (chloride of sodium) as well some gypsum (chloride of lime), and this settles at the bottom of the pans. In order to purify the brine, there is always a little soft soap or gelatine introduced. A piece of soft soap the size of a walnut, or a piece of butter of the same size, will suffice to purify twenty tons of salt.

On account of the settling of the gypsum to the bottom of the pans, these pans have to be picked every three weeks; very generally, they are picked weekly. The scale is beautifully white, like snow, and hard as marble. It forms to the thickness of from two to three inches over the bottom, except immediately above the fires. Every salt-boiler has to pick his own pan without extra wages. A pan is spoken of as being 'fresh on pick' or old on pick, according to the length of time since the scale was removed. The salt is conveyed from the factories by canal in 'flats' or in trucks by line, covered and uncovered. The trucks are costly articles, those covered being £102, 10s. each, and hold from six to seven tons. They are built at Chorley.

Table salt in bags is worth forty shillings a ton. There has been great fluctuation in the price of salt. Between 1845 and 1860, common salt fetched 7s. 6d. a ton. In 1865 it dropped to 6s.; but in 1872 went up to 20s. In 1873 it fluctuated between 15s. and 12s. During the American War it reached its lowest price, 3s. 9d. In 1881 it was 4s. 9d.; in 1891 it was 11s. 6d.; in March 1892 it had fallen to 9s.

The price of table salt is, of course, higher than that of common salt. In March 1891, 'handed squares,' eighty to the ton, were at 27s. 6d. and 23s. 6d. In March 1892 the price had fallen to 15s., and then to 13s.

In the reign of William III. a duty of five shillings a bushel, or about a penny a pound, was for the first time imposed on the salt in this country; in 1795 it was increased to 10s.; and in 1805 it was further increased to 15s. which gave rise to a good deal of smuggling. The mischievous effects of the high duty having been strongly represented to the House of Commons, the duty was in 1823 reduced to 2s.; and on the 5th January 1825 it was wholly repealed.

In 1852 in Cheshire there were 29 salt mines and 97 salt works, employing 8000 persons. And 200,000 tons were disposed of for manure, 300,000 tons for consumption

in the United Kingdom, and 500,000 tons were exported. In 1858 the total produce had risen to 1,000,000 tons annually, of which about one-half was exported; and in 1881 the production was further increased to 1,854,000 tons. In 1890 the salt rock mined in Cheshire amounted to 159,000 tons, whilst the salt obtained from brine was as much as 1,958,000 tons.

The great bulk of brine-pumping stations of Cheshire, and indeed of the whole country, have been bought up, and are invested in the Salt Union Company, making enormous profits. Salt which in 1881 was selling at 5s. per ton ran up to 15s. The price has declined since, happily for the public. When the ring was formed, borings were made at Middlesborough, in Durham, and salt was found at 2000 feet below the surface. Two shafts were sunk; into one, sweet water was pumped, and it was drawn forth as brine from the other. This station has since been acquired by the company.

Brine is employed not only for the formation of salt as a condiment, but it is likewise largely employed in chemical works for the production of alkali by the ammonia-soda process. Messrs Brunner, Mond, & Co. have large works of this description at Northwich.

Brine is also employed in the manufacture of bleaching-powder, chloride of potash, and muriatic acid, of which there is a factory at Widnes. This company purchased a piece of land in the salt district, and endeavoured to carry a Bill to enable it to lay pipes from the shaft they bored on their estate to Widnes, so as to convey thence the brine to their works. The Bill was strongly opposed, and was defeated in 1890, as it was contended that the exhaustion of the salt rock would cause serious subsidences without benefit to the inhabitants of the district.

The main Cheshire salt district is in the neighbourhood of Northwich, Winsford, and Lawton. At Middlewich and Nantwich, although brine springs are present and salt has been manufactured for centuries, yet hitherto no salt rock has been reached in borings carried to the depth of four hundred feet.

As already said, the upper salt rock was discovered in 1670; but in Domesday Book there is mention of the wyches or salt-houses in Northwich. With the discovery of the rock, the importance of the district grew and the -Weaver, an insignificant river, within the basin of the salt district, was taken in hand, and in 1721 an Act of Parliament was obtained to deepen the river so as to make it navigable. Before the discovery of the rock, when the brine was got up out of wells, Michael Drayton, in his *Polyolbion*, written well nigh three centuries ago, commemorated in verse the connection of salt with the Weaver. He says:

*To Weaver let us go,  
His fountain and his fall, both Chester's rightly born,  
The county in his course, that clean through cloth divide,  
Cut into equal shares upon his either side.  
And what the famous flood far more than that enriches,  
The bracky fountains are these two renowned Wyches,  
The Nantwich and the North, whose either briny well  
For store and sorts of salts made Weaver to excel.*

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