|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Table II.- | | *-Percentage Composition of Rock-Salt from Wcll-known Localities.* | | | | | | | |  |  |  |
|  |  |  |  |  | |  |  |  | France. |  | | England. | |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | Berchtes- | Stassfurt, |  |  |  |  |  |  | Wie- | white | Marston |
| Locality | Schwäbisch-Hall,  Würtemberg. | | gaden, | near  Magde- | Salins, | Vic, Lorraine. | | | Dax. | Hall. | liczka,  Galicia. | Salt from | Mine, |
|  | Bavaria. | Lorraine. |  |  |  |  |  | Rock Salt, | North- |
|  |  |  | burg. |  |  |  |  |  | Cheshire. | wich. |
| Authority |  | | Bischof. | Rammels-  berg. | Mathieu |  | | Cordier. | Maxwell- | Bischof. | Bischof. | Richard­son and Watts. | Crace  Calvert |
|  |  |  | basic. |  |  | Lyte. |
| Sodium chloride | 99·97 | 98·81 | 99·85 | 94 57 | 97·05 | 99·30 | 97·80 | 97·45 | 96·97 | 99·43 | 100·00 | 98·30 | 96·70 |
| Calcium chloride |  | 0·02 | trace |  |  |  |  |  |  | 0·25 |  |  | 0·68 |
| Magnesium chloride... |  | trace | 0·15 | 0·97 | 6·45 |  |  |  | 0·51 | 0·12 |  | 0·05 | trace |
| Potassium chloride.... |  |  |  |  |  |  |  |  | trace |  |  |  | trace |
| Calcium sulphate | 0·02 | 0·11 |  | 0·89 | 1·50 | 0·50 | 0 30 | 0 25 | 0·23 | 0·20 |  | 1·65 | 0·25 |
| Magnesium sulphate.. Magnesium carbonate |  | 0·15 |  |  | trace |  |  | 2·30 |  |  |  |  |  |
| Calcium carbonate.... Ferric chloride |  | 016 |  |  |  |  |  |  | 0·01 |  |  |  |  |
| Clay or insoluble |  |  |  |  |  |  |  |  |  |  |  |  |
| matters | 0·01 | 0·80 |  | 335 |  | 0·20 | 1·90 |  | 2·28 |  |  |  | 1·74 |
| Water or loss |  |  |  | 0·22 | 1·00 |  |  |  |  |  |  |  | 0·63 |
|  |  |  |  |  |  |  |  |  |  |  |  |

the brine becomes rapidly concentrated. Fig. 3 shows one of these “ Gradirhauser.” It consists of a long shed, the floor of which is a shallow cistern kept filled with the brine to be concentrated, the body of the house being occupied by a single or double row of

faggots of blackthorn *t,* and above these a trough or troughs *b,* into which the brine is pumped; escaping from these into the channel c, it is allowed to flow or drip slowly over the faggots, and finds its way back to the basin beneath. The shed has its sides open and exposed to the prevailing winds, and, the brine being thus spread over a large surface, there is much scope for evaporation, and it becomes rapidly concentrated. Several such sheds are often built in series, and the brine, being conveyed from one to the other as it becomes denser, attains at last a specific gravity of about 1·18, when it is stored in large cisterns till required for evaporation. This is done in large iron pans by the method to be hereafter de­scribed when speaking of rock-salt brine. The use, however, of the “ graduation houses ” is dying out, except in particular localities where competition from sea salt or purer rock-salt is difficult, as both their construction and their maintenance are expensive. The purer rock-salt is often simply ground for use, as we have seen to be the case at Wieliczka and elsewhere, but it is more frequently pumped as brine, produced either by artificial solution as at Middlesborough and other places, or by natural means as in Cheshire and Worcestershire. One great drawback to the use of even the purest rock-salt simply ground is its tendency to revert to a hard unwieldy mass, when kept any length of time in sacks. This is partly but not wholly obviated by packing in casks, which, however, are dear and not always obtainable. As usually made, white salt from rock-salt may be classified into two groups:—(1) boiled: known as fine, table, lump, stoved lump, superfine, basket, butter, and cheese salt (Fr. *scl fin-fin, sel a la minute,* &c.); (2) unboiled : common, chemical, fishery, Scotch fishery, extra fishery, double extra fishery, and bay salt (Fr. *scl de 12, 24, 48, 60,* and *72 heures).* All these names are derived from the size and appear­ance of the crystals, their uses, and the modes of their production. The boiled salts, the crystals of which are small, are formed in a medium constantly agitated by boiling. The fine or stoved table salts aro those white masses with which we are all familiar. Basket salt takes its name from the conical baskets from which it is allowed to drain when first it is “ drawn ” from the pan. Butter and cheese salts are not stove-dried, but left in their more or less moist condition, as being thus more easily applied to their respec­tive uses, of the unboiled salts the first two, corresponding to the Fr. *sel de 12 heures* and *sel de 24 heures,* show by their English names the uses to which they are applied, and the others, the applications of which are equally shown by their names, merely depend for their quality on the length of time which elapses between successive “drawings,” and the temperature of the evapora­tion. The time varies for the unboiled salts from twelve hours to three or four weeks, the larger crystals being allowed a longer time to form, and the smaller ones being formed more quickly. The temperature varies from 55° to 180° Fahr.

One striking difference between the manufacture of salt from rock-salt brine as carried on in Britain and on the Continent lies in the almost exclusive use in the latter case of closed or covered pans, except in the making of fine salt, whereas in Britain open ones are employed. With open pans the vapour is free to diffuse itself into the surrounding atmosphere, and the evaporation is perhaps more rapid. When covered pans are used, the loss of heat by radiation is less, and the salt made is also cleaner. In works published in France and Germany the statement is frequently made that it would be impossible to sell there a grain of salt manufactured by English methods, but one is fairly justified in doubting this assertion, seeing the ease with which the public are induced to purchase the *sel gris* of the marais salants. In fact, it is customary in some places to make a special article, which is sold in competition with sea salt, by mixing with the purer one 10 or 12 per cent. of mud or earth. The most advantageous mode of evaporation would evidently be to cause the heated gases from the furnace to pass over the surface of the liquid itself. No wearing- out of the pans need thus be feared, no lowering of the conductive power by incrustation, but the vapour as fast as formed would diffuse itself into heated air in rapid motion, this air being far from its point of saturation and greedy of moisture. The plan, however, which was tried in Britain by otto Pohl and in Germany by Born has hitherto been a failure, the salt being for one thing very much soiled with the soot and other products of combustion. Again, this mode of evaporation hardly consorts with the slow progress and perfect stillness required for the production of the larger-grained salts, and gives only fine salt.

Figs. 4 and 5 represent a French pan, while fig. 6 is a British pan, only differing from the Continental ones in not being covered in, and in usually having three or four fires in place of two or three, and a separate chamber beyond the pan in which the salt is stoved, heated by the flues conveying the furnace gases to the chimney after leaving the pan. The first two represent a pan of 64 feet long by 211/2 feet wide filled with brine, &c., and with circulating flues beneath for economy of heat. This pan, *a,* is supported all round its lower edges on a wall and on the pillars *b, b,* and heated by two fires c, c. The flame and the heated gases of each fire circulate in the flues *p, p, p,* in which are holes at various convenient points for cleaning ; thus then these gases are made to traverse the length of the pan three times before arriving at the chimneys *n, n* or the drying floors *o, o.* The channels *e, e* beneath the flues (fig. 5) serve to warm the air which feeds the fires, and, entering at the further end of the pan, traverses them and issues warm into the ash pit *g,* which is of course otherwise closed by the door *h.* The steam, collecting beneath the cover *m, of* which the upper portion *i* is attached to the timbers of the roof,