Hanover. Fig. 2 represents a section of the Stassfurt beds, and will give an idea of their formation. It appears less than most others to have been subjected to denudation since being formed, and consequently better than many others illustrates the formation of such deposits. Overlying the salt properly so called (*e*) is a thin band of anhydrite, and above this *b, c, d,* beds of variously - col­oured clay, red and grey, containing highly deliquescent salts, forming three distinct layers. The lowest, *d*, called “ polyhalite, ” contains some sodium chlo­ride and with it other deliquescent chlorides. Next to this comes c, the “ kieserite ” region, about 301/2 yards thick—here are chiefly potassium and magnesium sulphates; and lastly we have *b,* the upper layer or “carnallite” region, 23 yards thick, containing almost exclusively the double potassium and magnesium chlorides, together with other deliquescent salts, nodules of boracite, &c. lt has been computed that a sea depth of 121/2 miles would be required

for the production of such a series as this.

The Vosges, which is a very important district, supplied a large part of the east of France with salt, till lost by the war of 1870- 1871, since which time Nancy has gained considerably in importance. Geologically speaking, Nancy is included in this basin.

In Switzerland the chief salt district lies on the right bank of the Rhone, near the Lake of Geneva. The principal centres are Aigle, Roche, and Bex, the last being the most important.

The Pyrenees are rich on both sides in brine springs and rock- salt formations. In the south-west of France we have the rock- salt of Dax and Villefranche, and the brine springs of Salies and Briscous, as well as that of Camarade. In Spain both rock-salt and brine are plentiful, as is indicated by the frequent recurrence of the syllable “ Sal ” in the names of towns (Salinas, Salinillas, Poza de la Sal, &c.).

The Celtiberian or exclusively Spanish district includes various towns scattered over Spain—Salinas de Saelices (Guadalajara), Villafáfila (Zamora), Torreximeno, Cazorla, and Hinojares (Jaen), &c.; but perhaps the most remarkable deposit of salt in Spain is that of Cardona in the province of Barcelona, 45 miles north-west of that city. Here is a veritable mountain composed of a bed of remarkably pure salt 142 to 164 yards thick, and forming two masses, each about a mile in circumference. The salt is as usual stratified, and bears very strong evidence of denudation. It is chiefly pure white, but in parts varies from light-blue to brick-red. It is extracted by an open-air working like stone from a quarry.

There are some brine and rock-salt deposits which can hardly be classified as belonging to any particular district. Such are—in France, at the foot of the Alps, the brine springs of Moutiers and Castellane ; in Italy, Volterra ; in Sicily, Nicosia and Mussomeli; in Croatia, Szambor; in Bosnia, Tusia ; in Russia, Bachmutz on the Donetz, Balachna on the Volga, Staraya-Russa near Lake Ilmen, Eupatoria and other places in the Crimea ; in Prussia, Waltersdorff, Sperenberg, &c.

The chief centres of manufacture in England are at Northwich, Middlewich, Winsford, and Sandbach in Cheshire, Weston-on-Trent in Staffordshire, Stoke Prior and Droitwich in Worcestershire, and Middlesbrough in Yorkshire. @@1 Duncrue near Carrickfergus in Ireland also possesses a large deposit of salt. The Cheshire and Worcestershire salt deposits are up to the present time by far the most important, the Duncrue deposit being only partially worked. Although brine springs have been known to exist in both these counties ever since the Roman occupation, and salt had been made there from time immemorial, it was not till 1670 that rock-salt about 30 yards thick was discovered at Marbury near Northwich by some men exploring for coal, at a depth of 34 yards. In 1779 three beds of rock-salt were discovered at Lawton, separated from one another by layers of indurated clay. The Marston mine, the property of Messrs Rigby and Fletcher of Northwich, is the largest and perhaps the oldest (there are twenty-five in England altogether where rock-salt is raised). It was worked for about a hundred years in only its upper bed, but in 1781 its owners decided on sinking farther, and, after traversing a layer of indurated clay intersected with small veins of salt 101/2 yards thick, they came on another of

rock-salt. This—the bed which has continued to be worked ever since—is 33 to 37 yards thick. Beneath it are others, but they are thin and impure. The total depth of the mine to the bottom of the lower level is 120 yards. At Winsford, where the same formation seems to recur, it is 159 yards from the surface. The Marston mine covers an area of about 40 acres. The salt is first reached at 35-40 yards in the Northwich district, and the upper layer is 25-50 yards in thickness (Marston 23-26 yards); it has above it, apparently lying in the recesses of its surface, a layer of saturated brine. This is the brine which is raised at the various pumping stations in Northwich and elsewhere around, and which serves when evaporated to produce white salt. The beds are reached by sinking through the clays and variegated marls typical of this formation. The salt is blasted out with gunpowder. The Middlesbrough deposit bids fair soon to become of very great importance. It was discovered by Messrs Bolckow and Vaughan in boring for water in 1862 at a depth of 400 yards, but was not utilized, and was again found by Messrs Bell Bros. at Port Clarence at a depth of 376 yards, and is being now worked by them, the heat used for evaporation being the waste gases of their blast furnaces. Encouraged by their success the Newcastle Chemical Company have also bored on the opposite side of the river. They failed at first to find the salt, but ultimately succeeded by a fresh boring. The extent of the bed is not yet ascertained, but evidently by the failure of the Newcastle Chemical Company at first it cannot extend far to the north. Its thickness has been proved in so far as the spot where Messrs Bell Bros, made their boring is concerned. These gentlemen have introduced the method employed at Nancy of raising the salt in the form of brine without the trouble or expense of sinking a shaft. In Cheshire the surface-water trickling through the overlying strata dissolves the salt, which is subse­quently pumped as brine, but here the great depth and imper­meability of the strata precludes this, so another method has been resorted to. A bore is made into the salt, and lined with tubing in the usual manner, and this tube where it traverses the salt is pierced with holes. Within this is hung loosely a second tube of much smaller dimensions so as to leave an annular space between the two. Through this space the fresh surface water finds its way, and dissolving the salt below rises in the inner tube as brine, but only to such a level that the two columns bear to one another the relation of ten to twelve, this being the inverse ratio of the respec­tive weights of saturated brine and fresh water. For the remaining distance the brine is raised by a pump. At first, while the cavity remains small, there is some difficulty in getting a continuous supply of brine of full strength, but this ceases to be the case as the solution chamber (as it is called) becomes enlarged. The fresh water, however, as it descends rises to the surface of the salt, tending rather to dissolve its upper layers and extend superficially, so that after a time the superincumbent soil, being without support, falls in. These interior landslips, besides choking the pipes and breaking the communication, often produce sinkings at the surface, such as occurred some time ago at Dieuze (Lorraine). The same inconvenience is beginning to make itself felt in the environs of Nancy, and a similar one produces on a larger scale the sinking and subsidences at Winsford and Northwich so much complained of. The deposits of salt in the United States are unimportant. The country possesses no really considerable salt industry, but is supplied so far as interior consumption is concerned to a small extent by brine springs. The principal supplies, however, are derived from England and the shores of Spain and Portugal. The same remark applies to Canada. South America possesses several salt deposits and brine springs, but also takes all its supplies from Europe. Asiatic Russia is very abundantly supplied with salt, as likewise is China; and Persia is perhaps one of the countries most abundantly endowed with this natural and useful product. British India cannot be said to be similarly favoured. In the north, it is true, is the great salt range of the Punjab, as well as the Sambhur Lake, and salt is obtained from sea-water at many places along its extensive seaboard ; but India is not well supplied in many parts, and is dependent largely for this article on the Cheshire salt works. In fact this export is one of the most im­portant branches of their trade.

Table II. (see next page) is from Spon’s *Encyclopaedia of the In­dustrial Arts,* &c. The clay and insoluble matters given for the Stassfurt salt seem to be somewhat abnormally large.

Rock-salt is probably the origin of more than half the salt manu­factured in the world. It occurs in all degrees of purity, from that of mere salty clay to that of the most transparent crystals. In the former case it is often difficult to obtain the brine at a density even approaching saturation, and, as at Moutiers in Savoy and in several of the German salt works, chambers and galleries are excavated within the saliferous bed to increase the dissolving surface, and water let down fresh is pumped up as brine. Many brine springs also occur in a more or less saturated condition. In such cases the water is sometimes caused to trickle over faggots arranged under large open sheds called “graduation houses *” (Gradirhäuser),* whereby a more extensive surface of evaporation is obtained, and

@@@1 The termination “wich” in English place-names often points to ancient salt manufacture,—the word “ wich ” (creek, bay; Icel. *vík*) having acquired a special sense in English usage. In Germany the various forms of the non- Teutonic words Hall, Halle occurring in place-names point in the same way to ancient salt-works.