

EXTRACTION OF METALS BY THE BATTERY.—Bunsen has been investigating the circumstances most favorable to the separation of metals from their compounds. These are the density of the current, and the greater or less concentration of the liquid to be decomposed. The greatest effect is obtained with the most dense current and the most concentrated solutions. Density denotes the concentration of electric action upon a single point, analogous to the concentration of heat and light in the focus of a concave mirror. Thus, we connect a charcoal crucible with the positive pole of the battery, and place in it a small capsule of glazed porcelain containing the liquid to be decomposed. The space between the capsule and crucible is then filled with hydrochloric acid, and the liquid in the small capsule is put in communication with the battery by means of a thin platinum wire, which must be exactly in the centre. The current is then established between a large surface, the charcoal crucible, and a fine platinum wire in which it is concentrated, and the current becomes capable of overcoming affinities which have resisted powerful batteries. The whole apparatus is then set in a large porcelain crucible, and kept warm in the sand-bath. Chrome and manganese are thus readily separated from the solution of their chlorides, provided the negative pole is small and the solution very concentrated. In this state the chrome is quite pure; it presents the appearance of iron, but is less affected by moist air. Heated in the air, it is converted into sesqui-oxide. It resists nitric acid even when boiling, but is acted on by hydrochloric and dilute sulphuric acids, forming proto salts. Its density coincides with the density calculated from the atomic volume. Bunsen obtained sheets of chromium of more than 50 square millimetres surface; they were brittle, and showed a perfect polish on the side which had been in contact with the platinum. Manganese was obtained in the same manner in very little plates of more than 100 square millimetres surface, which oxidised in damp air almost as rapidly as potassium. To induce barium and calcium, a denser current was required. Concentrated solutions of the chlorides are acidulated with hydrochloric acid, and poured boiling into the glazed porcelain capsule. Amalgamated platinum wire in connection with the battery is then introduced, upon which calcium is deposited in a grey layer, easily detached, and containing a little mercury. If water or moist air be present, this amalgam is rapidly oxidised with evolution of hydrogen; when heated it burns with brilliancy. Barium is more easily extracted. The chloride is powdered and made into a paste with water acidulated with hydrochloric acid, heated to 200° Fah. in the water-bath, and the current established. The amalgam of barium thus obtained is silvery white, and very crystalline. In contact with moist air, it is converted into hydrate of baryta. If heated in a current of hydrogen upon a charcoal support, the mercury is carried off, and a residue of porous barium appears, containing brilliant metallic particles.

CONSUMPTION OF COAL IN THE UNITED STATES.—The Consumption of coal does not increase so rapidly as was supposed. In 1852 the increase was less than 13 per cent., and left a surplus in the market. In 1853 the increased supply was less than 9 per cent. from all sources. To this, of course, is to be attributed the high price of coal during the latter part of the year. But taking the average over 12 per cent. it will reach it. We see no good reason to believe that this average per centage in the demand is likely to be exceeded in the present year, which would require an increase in the supply of about 623,000 tons in 1854, from all sources, to keep the market healthy. The increased supply can easily be furnished by the different regions, provided dealers and customers will come forward and take coal early in the spring. The following is a summary of operations in Schuylkill county:—

Total number of collieries.....	113	Number of operators.....	82
Red ash collieries.....	58	Employed at collieries.....	9792
White ash collieries.....	55	Miner's houses out of towns	2756
Whole capital invested in the collieries.....			\$3,162,000
By individual operators, about.....			2,600,000
Thickest vein worked at Hecksherville.....			80 ft.
Smallest.....			2 ft.

All the coal lands now worked in Schuylkill county are owned by six corporations, and about 60 individuals. About 25 of the owners reside in Schuylkill county, and the balance abroad. The coal rent will average 30 c. a ton. The product of 1853 in Schuylkill county was 2,551,000 tons. This would give an income of \$765,480 to the landholders in the shape of rents for the year.—*Postville Mining Journal*.

ON THE PERMANENT EXPANSION OF CAST IRON BY SUCCESSIVE HEATINGS.—In the Memoirs of the Industrial Society of Hanover for last year, there are some interesting remarks on this question. The re-

markable phenomenon that cast-iron presents on being heated, of not returning back to its original volume, but of continually showing an increase of the volume, and of permanently acquiring an enlarged volume by successive heatings and coolings, had been first observed by Rinsep, in 1829. That chemist found that a cast-iron retort, whose capacity was exactly measured by the quantity of mercury which it could contain, held at first, 9.13 cubic inches; after the first heating and cooling, 9.61 inches; and after three heatings, up to the melting point of silver, 10.16 cubic inches. The cubical expansion ought, therefore, to be 11.28 per cent., which gives 3.76 per cent. nearly of linear expansion.

At subsequent periods different phenomena were observed, more or less confirmatory of this law. The cast-iron bars of grates, where powerful fires were made, were frequently observed to elongate, so as to become jammed tight in their frames; and when these obstructed all further enlargements, the bars become curved or twisted. Mr. Brix, in his work on the calorific power of the fuels of Prussia, has detailed a few experiments on this subject. By the aid of several measurements, he has shown that the entire permanent elongation increases after each successive heating, but that the amount produced by each heating diminishes the more frequently the bar is heated, until it finally becomes insensible. Thus, a furnace bar $3\frac{1}{2}$ feet long, after being three days exposed to a moderate fire, had already acquired a permanent elongation of 3-16ths of an inch, or .446 per cent.; at the end of seventeen days, 1.042 per cent.; and after thirty days, 2 per cent., but had not yet reached its maximum. Another bar of the same kind, after a long service, had a permanent elongation of 3 per cent.

If it be remembered that bars while exposed to the fire undergo another temporary elongation, we must agree with M. Brix, that an allowance should be made in a bar which has not as yet been used, amounting to 1 per cent. of its length, for this cause of elongation. The bars must, of course, be sufficiently long to stand between their supports when cool; but it seems that hitherto sufficient room has not been given for this permanent expansion in laying down new bars.

ROBINSON'S PATENT FOR THE NOVEL APPLICATION OF THE SLAGS OR REFUSE MATTERS OBTAINED DURING THE MANUFACTURE OF METALS.—Dr. George Robinson, of Newcastle-on-Tyne, has taken out a patent for the formation of sheets or plates from the slags produced in the various processes of manufacturing and refining iron and other metals. He proposes to convert the molten slag into sheets by pouring it upon an iron or other table previously heated, and then rolling or pressing it to any requisite thickness, according to the purpose for which it is intended to be used. The plates thus formed are afterwards to be annealed, by being allowed to cool gradually in any suitable furnace. While in a plastic state, the sheets may be ornamented by means of suitable elevations and depressions on the rollers by which they are formed. When cold the thin sheets of slag may be used for roofing instead of slates, the thicker plates for flooring, and those having patterns on their surface for covering walls. The Newcastle papers, in alluding to the invention, state that in that district alone there are materials for a very extensive manufacture, and in the other great seats of metallurgic operations the supply of suitable slags is practically unlimited.

THE PRECIOUS METALS IN ENGLAND.—At a time when the extraction of gold in England occupies so much attention, the following account of the presence of silver in England may prove interesting. An immense silver mine was worked in the vicinity of Aberystwith, in the reign of Elizabeth, by which a Company of Germans enriched themselves; after whom Sir Hugh Middleton accumulated £2,000 a month out of one silver mine at Bwlch-yr-Eskir, by which produce he was enabled to defray the expense of bringing the New River to London. After him, Mr. Bushell, a servant of Sir Francis Bacon, gained from the same mine such immense profits, as to be able to present Charles I., with a regiment of horse, and to provide clothes for his whole army. Besides this he advanced, as a loan to his Majesty, no less a sum than £10,000, equal to at least four times the amount of the present currency, and he also raised a regiment amongst his miners at his own charge.

ROSIN OIL FOR LUBRICATING MACHINERY.—Payen and Buran recommend the oil obtained by the distillation of common rosin with from 5 to 10 per cent of quicklime, as a good material for greasing machinery. As it is generally slightly acid, even when distilled with lime, it is recommended to add from 2 to 5 per cent. of lime or magnesia to the cold oil, which unites with the free acid, and gives the whole mass the consistence of butter.—*Polytechnisches Centralblatt*, No. 12. 1853.