

## Literature and Science.

### ALUMINIUM.

LAVOISIER, Sir Humphrey Davy, Berzelius and Doersted, successively labored in vain to reduce this metal from its ores, but to no purpose, though confident of its existence as the metallic base of the micas, feldspars and clays. Wohler, after twenty years of close laboratory work, produced the aluminium lead in 1846, and later, Deville, simultaneously with Gerhard in England, produced the metal in some quantities.

So soon as its manifold qualities had been learned from experiment it was soon elevated to the rank of the most useful of the metals, but with one defect, its cost of production. Deville's product sold at \$32 per pound and the present market price is \$1.30. Could aluminium be reduced from its ores at a cheap price it would insinuate itself into almost every art, and replace iron to a large extent. And it is because we are told that the COWLES process of producing this metal and its alloys, chiefly by the aid of electricity, is to reduce its price per pound to 45 cents, and so bring it within the possibility of being used for the innumerable purposes for which it is easily adaptable, that we enumerate some of its qualities and characteristics.

The present process is a very lengthy and laborious one. The COWLES process is explained to be electrical, the apparatus used in the manufacture consisting of several very powerful dynamos, the largest of which weighs 7,000 pounds, and produces a current of 1,575 ampères. A metallic circuit, broken by the interposition of carbon electrodes, and a mass of pulverized charcoal, hereafter described, conducts the current of this large dynamo to the furnace and back. Inserted into this circuit also is an ampèremeter which indicates the total strength of the current being used. Between the ampèremeter and the furnace, and forming part of the circuit, is a large resistance coil of German silver immersed in water. The unique differentiating feature, however, of the apparatus, is the incandescent electrical furnace for smelting refractory ores, metals and compounds. This is a rectangular oblong box of fire-brick walls, bottom and ends of which are nine inches thick, the interior space being five feet long, one foot wide and one deep. This is closed by a cast-iron cover, in which are two holes for the escape of gases. At each end of the furnace is a hole large enough to admit an electric light carbon, three inches in diameter and thirty inches long. Each of these is connected at the end, projecting outside the furnace, with the positive or negative conductor, as the case may be. Before claying the furnace, it is first lined, to prevent its destruction by heat, with finely pulverized charcoal soaked

in a solution of lime, and then thoroughly dried, and so much of this is introduced that a space of only nine inches inside, three feet long and six inches deep is left in the centre, into which the electrodes project. When charged, the iron top is put on, the seams luted, the current turned on and properly regulated. In about an hour, and after cooling, an oblong crystalline mass of white metal will be found in the charcoal bed.

Bauxite or hydroxide of iron and aluminium is the richest ore of the metal found, containing fifty per cent. of aluminium and twenty-five per cent. of iron. But aluminium is everywhere to be found. It is the metallic base of mica, feldspar, slate, and clay, and forms 9.9 per cent. of the whole of the composition of the earth's crust, being the third most widely diffused and largely abundant element known. It is largely contained in all fertile soils.

The metal is white, like silver, very light, being only two and one half times heavier than water, or the same weight as chalk, and only one-third the weight of iron. It is malleable, and can be drawn into fine wire, and hammered into thin leaf. It can be best worked at a temperature of 100° to 150° cent. The hammered metal has the hardness of soft iron. It fuses at 700° or 600° lower than iron; does not oxidise in either air or water; conducts electricity eight times better than iron, and heat somewhat better than zinc.

It was said by Mr. J. A. Price, president of the Scranton board of trade, in his annual address of this year, that it was eminently fitted for all household and cooking utensils. This is, however, not the case, for the metal is easily attacked by the weakest organic acids in the presence of a chloride—such as common salt.

The alloys of aluminium are numerous, that with copper (ninety per cent.), forming a gold-like substance, largely used for cheap jewellery and statues, and capable of a high degree of polish. Rifle-barrels and even rifle-cannon have been made from this alloy, and have answered admirably. The metal itself is chiefly used for physical apparatus, opera glasses, and other articles where lightness and durability are both desired. Its tensile strength is something wonderful, being 100,000 pounds to the square inch.

If aluminium can be prepared on a cheap scale, we can have bridges lighter than wood, ocean-going vessels of double the present tonnage and much fleet, furniture, railway sleepers, telegraph wires, and thousands of other things that the mind can easily conjure up, made of it, and ponderous iron which at present holds the artificial world in its grasp will have to release its hold in favor of its lighter and less corrodible, though quite as tenacious, brother element.

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### A VISIT TO WALT WHITMAN.

REV. R. E. HAWKIN.

I HAD always intended to visit Walt Whitman should I ever get the chance. The chance came to me a month ago (December) at Philadelphia. He lives at Camden, a town just across the ferry. I had never shared in the general vituperation which greeted "Leaves of Grass" when it appeared in an English dress, under the auspices of Dante Gabriel Rossetti, much as there was repulsive even in that expurgated edition. There seemed to me flashes of genius and clear insight which no age, least of all our own, can afford to despise. The man who wrote "Whispers of Heavenly Death" could not be a mere licentious charlatan. The revolt of Whitman against rhyme is like the revolt of Wagner against stereotyped melody, and in his way he seemed to me to be in search of a freer and more adequate method for conveying the intimate and rapid interior changes of the soul. Over and above this Whitman's wild stanzas, with their lists of carpenters' tools and "barbaric yawps," their delight in the smoke and roar of cities, as well as the solitudes of woods and the silence of mountains and seas of prairies—seemed to me to breathe something distinctive, national, American—with all his confusion of mind. I could hardly read his superb prose description of the Federal battlefields—and those matchless pages on the assassination of President Lincoln (of which he was an eye-witness), without feeling that Whitman was no figure-head—one more monkey, in fact—but a large and living soul, with a certain width of aboriginal sympathy, too rare in these days of jejune thought and palsied heart.

In Camden the old man lives quietly and inoffensively. The people like him—he has survived calumny and abuse. The gentleness and ease of his disposition has endeared him to all who come habitually in contact with him; but he seeks no one, is in failing health, and lives poorly, but not uncomfortably. His friends and admirers have lately presented him with a horse and carriage, and what is better, the wherewithal to keep it. Before that, almost the only exercise and amusement of his failing years consisted in going to and fro on the crowded boats over the wide ferry between Camden and Philadelphia, looking at the people, and chatting, especially with the common men and little children. On the whole, he seems to think Nature less spoiled and sophisticated there than elsewhere. We found him, late in the afternoon, just come in from his drive—a rather infirm but fine-looking old man, with a long, venerable white beard, a high, thoughtful forehead, and a great simplicity of manner and a total absence of posing. He received us with ease and even grace, and one almost forgot that he was