

Industrial & Technological Museum  
Melbourne.

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# The Manufacture of Spelter



The Broken Hill Associated Smelters  
Proprietary Limited

A.N.A. EXHIBITION  
OF AUSTRALIAN PRIMARY  
PRODUCTS & MANUFACTURES

Melbourne . . . . . 1917



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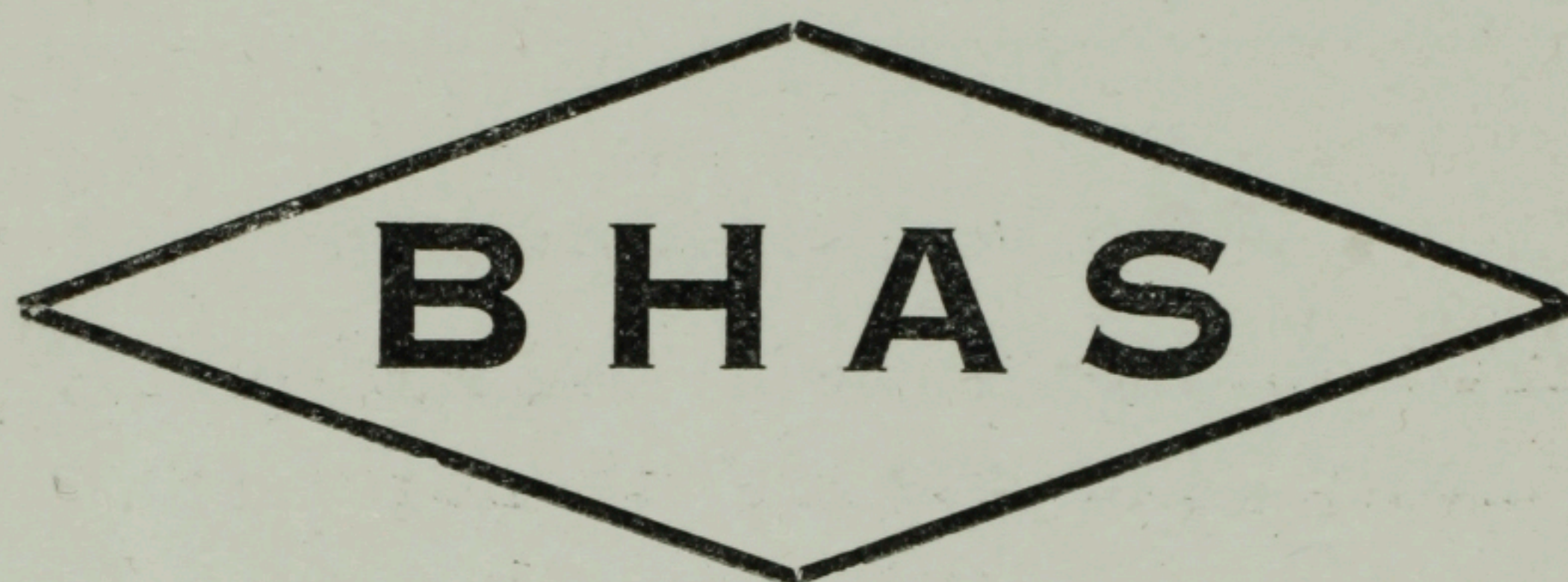
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With the Compliments of  
THE BROKEN HILL ASSOCIATED  
SMELTERS PROPRIETARY LTD.  
COLLINS HOUSE,  
..... MELBOURNE.

NOTE ....

This booklet is intended to be read in  
connection with the Smelter Exhibit  
on the left-hand side of the Booth.



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# The Manufacture of Spelter

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Spelter is the name given to metallic zinc in the form of slabs or bars, as it is found on the market.

The metallurgy of zinc differs from that of all other important metals, in that the temperature required to reduce the metal from its ore is higher than the boiling point of the metal itself. Under these circumstances the zinc is driven off from the ore in the form of vapor, and the condensation of the metallic vapor to liquid metal is an essential part of the process, and, in many respects, the most difficult to accomplish in a satisfactory way.

The ores of zinc employed at the Port Pirie plant consist of zinc blende or sulphide of zinc ( $\text{ZnS}$ ). This arrives at the plant in the form of concentrates, and is stored under covered sheds until required.





Zinc smelting comprises two processes—namely, Roasting and Distillation.

### ROASTING PROCESS.

The object of roasting is to eliminate the sulphur from the ore as completely as possible, and convert the zinc sulphide into zinc oxide. So far, no commercially feasible process of reducing zinc directly from the sulphide has been found, and a preliminary conversion into oxide of zinc is essential.

The roasting is accomplished by exposing the ore at a red heat to a stream of air. The sulphur in the zinc blende burns with a blue flame, giving off sulphur dioxide gas, and the oxygen in the air combines with the zinc, forming zinc oxide. The sulphides of other metals present are also converted to oxides by this treatment. The furnace used is known as "The Mathiessen and Hegeler" Roaster, and consists of a series of super-posed hearths 80 feet long and 6 feet wide. The ore is drawn along these hearths by means of rakes, which themselves are dragged through the furnace by means of long rods, and is exposed to the action of air at a high temperature during the process.

After roasting, the ore is removed in trucks to storage bins until wanted for the distillation process.





## DISTILLATION PROCESS.

The object of this is to separate the zinc from its combination with oxygen, and liberate it as a metallic vapor, this vapor being condensed to liquid metal.

The roasted ore is mixed with fine coal or coke and charged into retorts. The object of the coke is to combine with the oxygen of the zinc oxide, forming carbon monoxide and liberating the zinc. The retorts are 5 feet long, 6 inches wide, and 10 inches high, and are arranged in rows in a furnace, which is heated by gas. The retorts are made of fireclay, and must be airtight, except at the open end, which projects outside the furnace. Attached to the open end of the retort is another fireclay vessel known as a Condenser. The charge in the retort is strongly heated by the action of the gas flames in the furnace, the heat being conducted through the retort walls, and, under the combined action of the high temperature and the carbon of the coke with which the ore is mixed, the zinc is liberated as vapor and passed over into the condenser. The condenser being outside the furnace, is cool, and the zinc vapor condenses there just as steam condenses when passed through a cooled



pipe. The condensed zinc vapor runs down into the bottom of the condenser as liquid zinc, and is drawn off from time to time and cast in moulds.

An essential adjunct to every distillation plant is a Pottery in which retorts are manufactured. In the early days of the art, these retorts were made by hand and were porous and weak. To-day they are made in presses by hydraulic power, the retort being actually forced through a die under pressure of from 2,000 to 3,000 lbs. per square inch. The treatment makes them much more compact and strong than the old hand-made retorts.

A by-product of the distillation process is the so-called Blue Powder or Zinc Dust. This material bears the same relation to the bar metal that hailstones bear to ice. It consists of minute globules of metal which have been frozen while still suspended in the atmosphere of the condenser, and these particles form an exceedingly soft and fine powder, which is used in such diverse industries as the Cyanide treatment of gold ores and Indigo Dyeing.





## APPLICATIONS OF SPELTER.

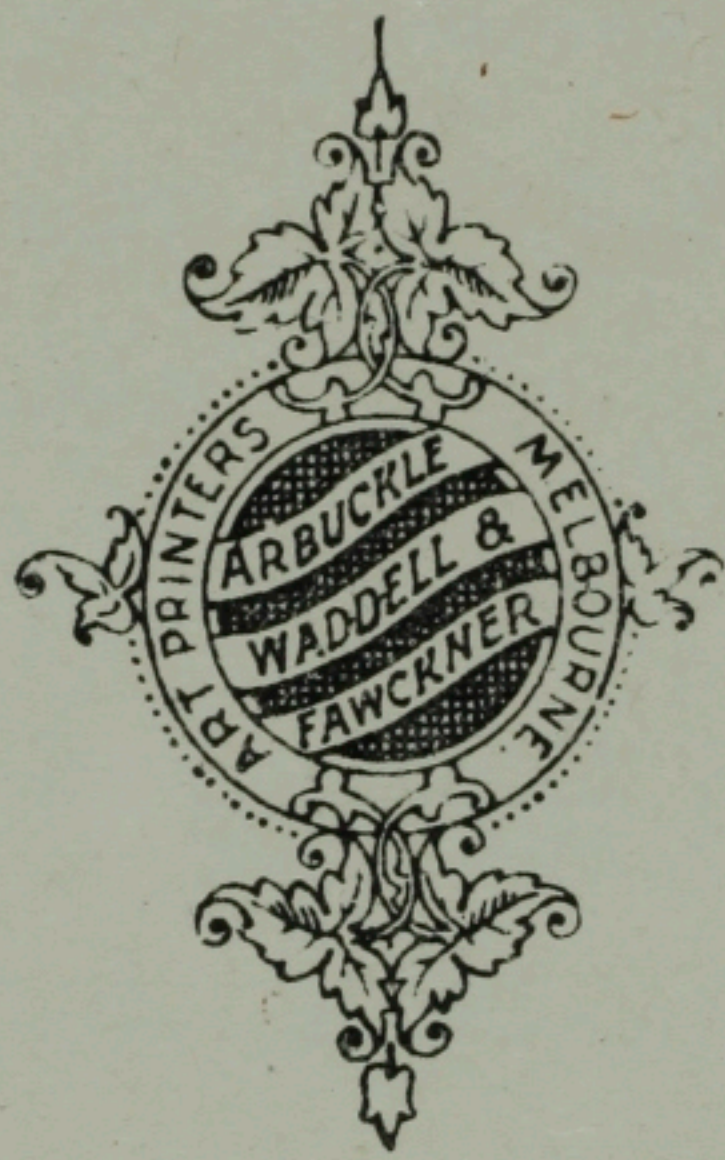
Spelter finds its way on to the market in the form of slabs or bars, usually branded with the name of the maker. The purest and best grades of the metal are made use of in the manufacture of cartridge brass, in which alloy 30 parts of spelter and 70 parts of copper are present. The less pure grades are made use of in galvanising; that is, in coating iron or steel objects with a thin layer of zinc, which protects them against rusting. In the process of galvanising, the iron or steel, after careful cleaning, is passed through a bath of molten zinc, and a thin layer of the latter metal attaches itself firmly to the surface.

In some parts of the world, especially in France, sheet zinc is very largely used for roofing purposes. Sheet zinc is simply spelter which has been rolled out between heavy rollers to the desired thickness. While expensive as a roofing material, it is, at the same time, remarkably enduring, and for that reason has been adopted where true economy is closely studied.

Specimens of the ore in various stages of treatment and of the various products, are included in the Exhibit.







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