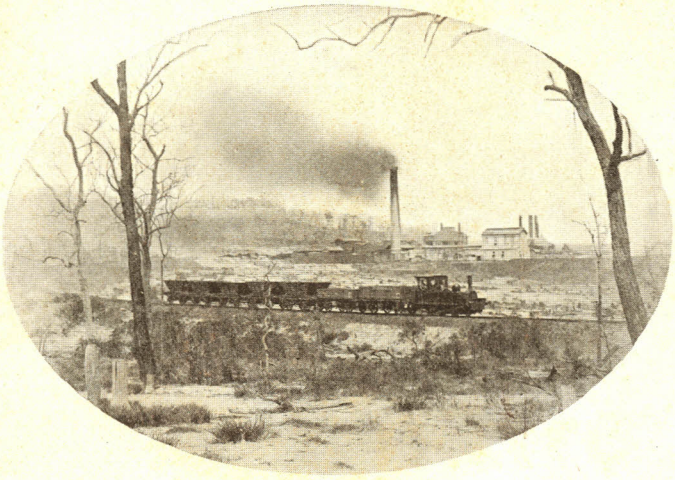
THE... SULPHIDE CORPORATION LIMITED

1909.

A Description of the Cockle Creek Smelting Works.



On the Railway Leading to the Works.

THE
Sulphide Corporation,
LIMITED.

A DESCRIPTION

OF THE

Plant and Processes

AT

COCKLE CREEK, N.S.W.

1909.

THE

SULPHIDE CORPORATION,

LIMITED.

CAPITAL - - £962,500.

Directors.

THE RIGHT HON. THE EARL OF KINTORE, G.C.M.G.
F. L. COX, ESQ.
THE HON. VICARY GIBBS.
F. A. KEATING, ESQ.
G. MACFARLANE REID, ESQ.

Secretary.

H. C. WYNNE.

London Offices.

FINSBURY HOUSE, BLOMFIELD ST., E.C.

IN AUSTRALIA.

General Manager.

C. F. COURTNEY.

COCKLE CREEK SMELTING WORKS,
P. S. MORSE, *Manager*.

CENTRAL MINE, BROKEN HILL.
J. HEBBARD, *Manager*.

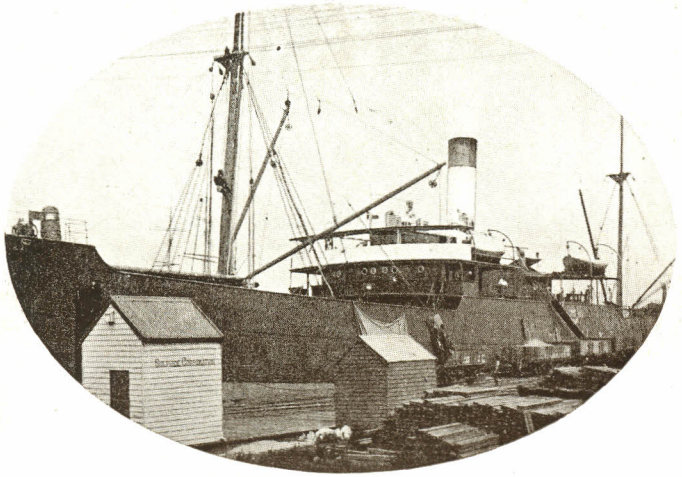
Agents.

MESSRS. GIBBS, BRIGHT & CO.,
Queen Street, Melbourne, Victoria.

Entrance to Cockle Creek Smelting Works.

THE Sulphide Corporation's Works for the smelting of ores containing lead, gold and silver, are situated close to the Cockle Creek Railway Station on the main Northern Railway Line, and are about 95 miles from Sydney and 10 miles from Newcastle. A branch line runs to the works, and siding accommodation and bins are provided for expeditiously handling all ores sent for treatment. The Corporation also possess wharfage facilities at the Port of Newcastle, where consignment of ores arriving by sea can be handled direct into railway trucks for conveyance to the works.

The greater portion of the ore treated at Cockle Creek comes from the Corporation's Mine at Broken Hill, but a large quantity of other ore is also purchased and treated.



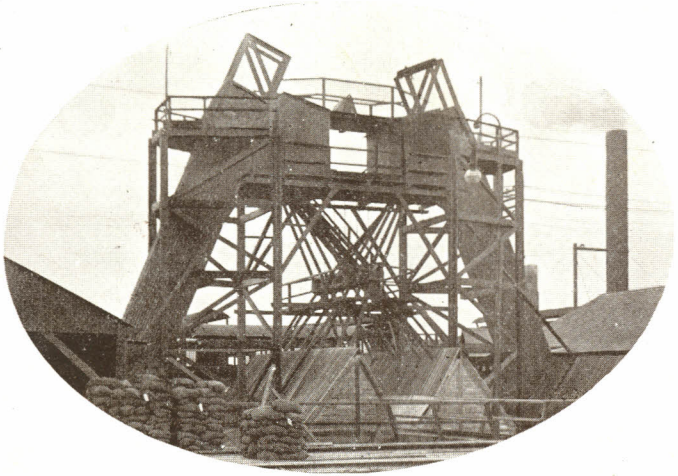
Loading Ore into Railway Trucks at Sulphide Wharf, Newcastle.

The Corporation does not smelt any consignments seperately, but buys all shipments outright, consequently the purchased ore on its arrival at the works is first of all sampled to determine its value.

The sampling is effected by carefully taking a representative portion of all the ore in the consignment. If the ore is in the form of finely crushed concentrates, a core of ore is taken from each bag by means of an instrument like a cheese-taster. If the ore is crude, that is in coarse lump form as it comes from the mine, the method of taking the sample is somewhat different. With ore of ordinary values every fifth bag or every fifth shovelful is sent to the Sampling Mill. If the ore is of high value the whole of the consignment is sent there. In the mill the ore is crushed fine, mixed again and again, and finally, by the Cornish quartering method, reduced to a parcel weighing about 1½lbs., which represents the average value of the whole consignment. This parcel, during the sampling operation, has been ground almost as fine as flour, having passed through a sieve with meshes of 120 holes to the linear inch. It is now divided and made into three packages, each of which is sealed, one package going to the Corporation's Assay Office for analysis, one to the owner of the ore, while the third is held as an umpire sample in case the owner and the Corporation cannot agree on assay values.

At the end of this brochure will be found a diagram of the Sampling Mill, and a specification describing how the sampling operations are performed.

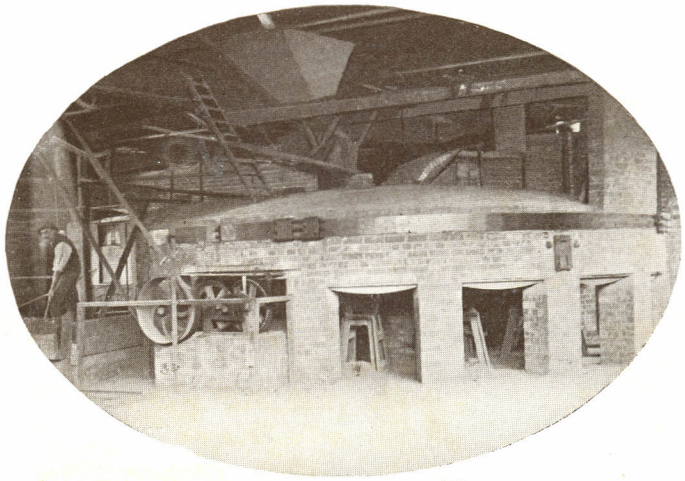
One of the Sampling Floors, showing Cornish Quartering Method of taking samples.



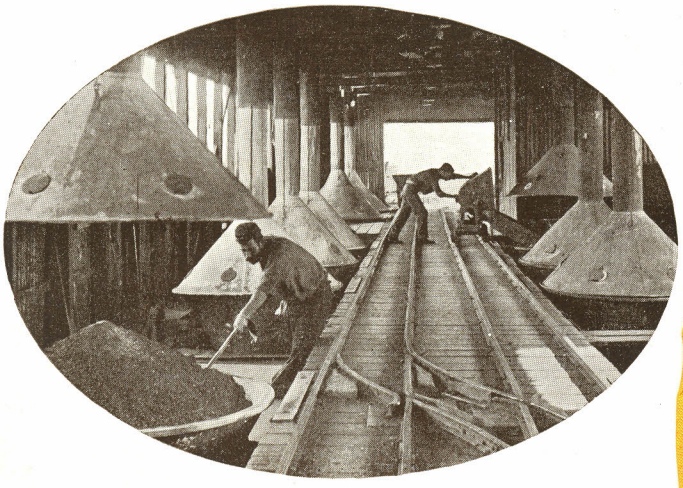
Head of Elevator at Crushing Plant. The Chutes for automatically distributing the Ore into the various Bins can be clearly seen.

All ores, whether purchased or not, on arrival at the works and after having been sampled, are divided roughly into two classes—those carrying sulphur and those free from sulphur.

The ores free from sulphur go direct to the blast furnace bins. Ores carrying sulphur, if in a coarse condition, are first sent to the Crushing Plant, and crushed fine enough to pass through a quarter mesh screen. The sulphide ores—being thus all in a state of fine division—are carefully mixed and, if necessary, fluxes are added to form a suitable roasting mixture. The mixed ore and flux are first treated in large revolving ovens or furnaces. The ores are mechanically fed at the centre of the furnace through a hole in the dome or roof, and are mechanically rabbled or stirred and worked across a horizontal revolving hearth, while over their surfaces flow the hot gases from the fire box. It takes about five hours for the ores to cross the hearth, and during this process the majority of the sulphur contained in the ore is burnt off. The roasted material, while still red hot, is discharged automatically into steel skips, and conveyed to another plant, where it is subjected to a further treatment in large open topped converters. The red hot ore is tipped into these converters and a blast of air admitted at the bottom of the vessel. The small amount of sulphur still remaining in the ore now acts as a fuel, and by means of the heat so produced melts the material into a sinter—a more or less solid lump weighing five or six tons—at the same time the combustion of the



One of the Revolving Mechanical Furnaces.



One end of the Converter House.

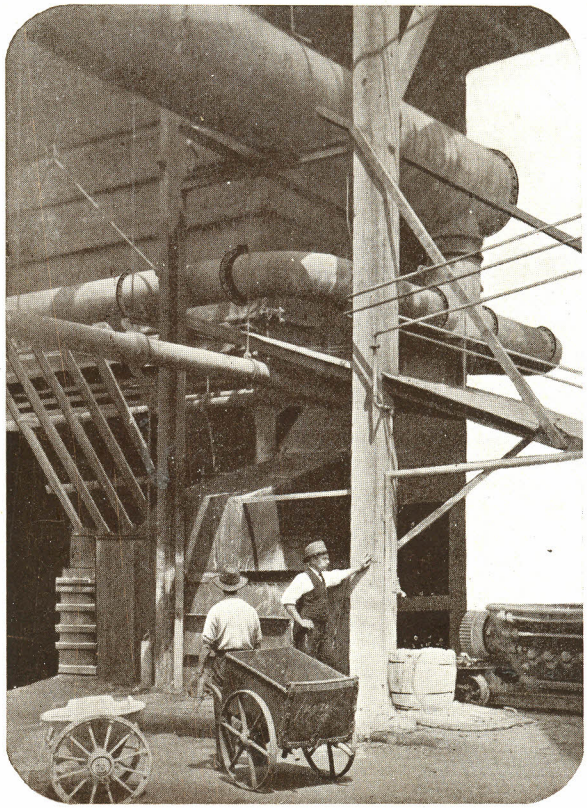
sulphur practically eliminates this element from the ore.

After this process is complete the converter, which is supported on trunions, is tipped over, and the whole five tons in a solid lump falls on to a steel and concrete floor below, where it is broken by hand to pieces about the size of a man's fist.

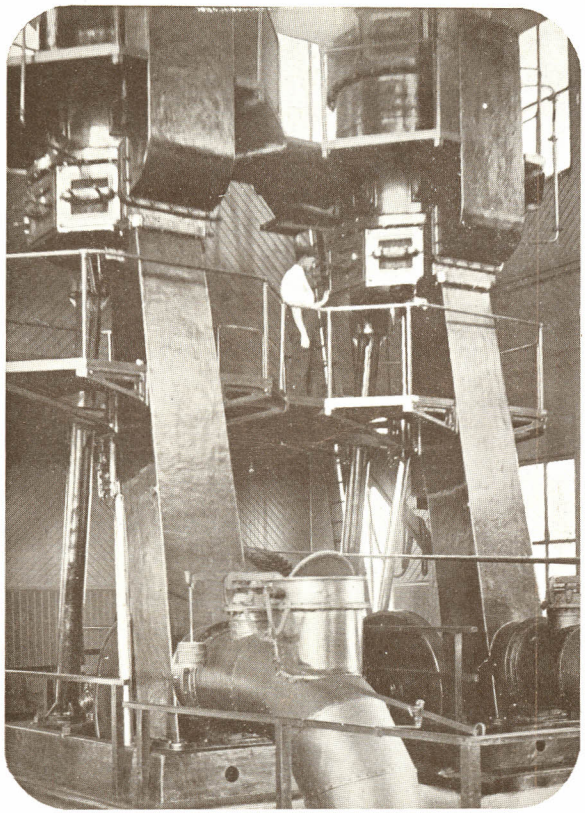
The sulphide ore being now in a condition suitable for smelting is ready for treatment in the blast furnace, together with those ores free from sulphur previously referred to.

Both kinds of ores are then mixed with coke and flux in proper proportions to make a complete smelting mixture, and sent to the blast furnace.

Each blast furnace consists roughly of, at the base, a crucible capable of holding about fifteen tons of molten metal; above and around the upper edge of this are arranged hollow walls of cast iron, through which water is continually flowing, and hence called "water jackets." There are openings in the cast iron walls of the water jackets through which is admitted a powerful blast of air. This air acts on the fuel in the charge, producing vigorous combustion and melting everything fed into the furnace.



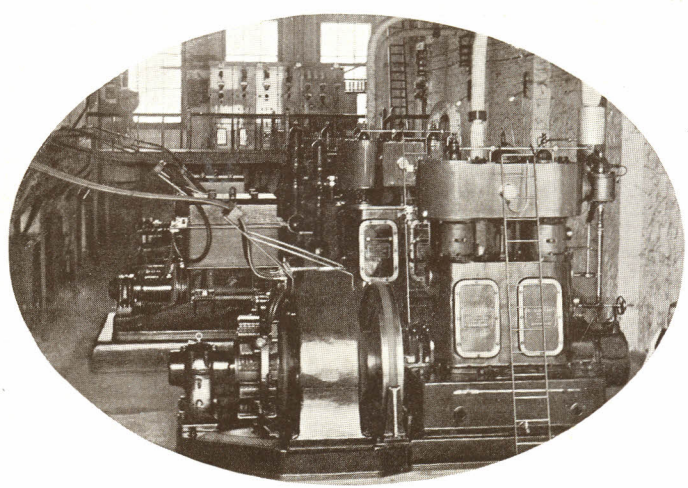
One of the Blast Furnaces.



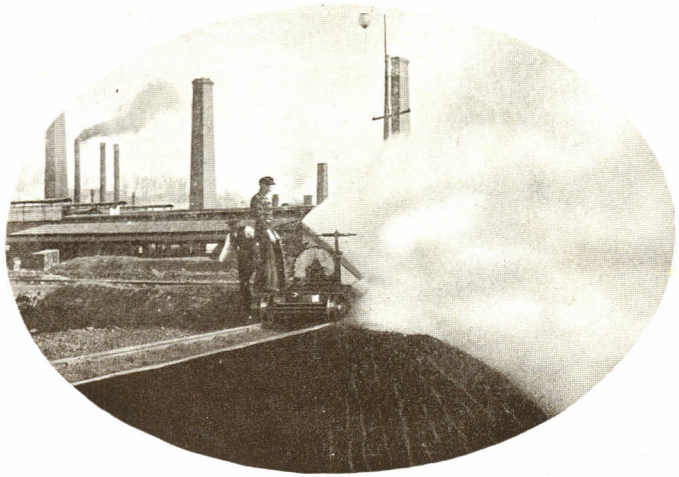
A corner in the Blower House, showing one of the large electrically driven Blowing Engines.

It is inside the space enclosed by these water jackets that the combustion or smelting of the ore takes place, and here the greatest heat of the operation is developed. No bricks could stand this heat. From the top of the cast iron jackets a heavy fire-brick shaft extends up about thirty feet to the feeding floor where the charge is fed into the furnace. A blast furnace when full to the top holds about 150 tons of ore, fuel and flux, and the furnace is kept full all the time. As the charge melts in the smelting zone at the jacket level the ore sinks at the top of the shaft and fresh ore is added to fill up the space. As the mass melts, the metals (being heavier than the waste material or "gangue" which contained them) separate out and sink to the bottom, filling the crucible, and the melted waste matter floats on top. This latter when melted is known as "slag," and is tapped off at intervals into large slag cars, which hold about three tons. The slag cars are on rails, and after being filled are run out to the dump and tipped.

The molten metal or "bullion," as it is called, consists of lead alloyed with the gold and silver contained in the ores; it is also



The Electric Generating Station.



Tipping Slag. This is a very brilliant spectacle at night.

tapped out of the crucible at intervals by means of a syphon tap into pots, and wheeled over to and poured into a small furnace of the reverberatory type. Here it is drossed or cleaned from impurities, preparatory to being cast into moulds for transhipment to the refinery, where the precious metals are separated from the lead. The bullion produced at the Cockle Creek Works contains from 4 to 10 ounces of gold per ton, 75 to 150 ounces of silver, and about 98 per cent of lead.

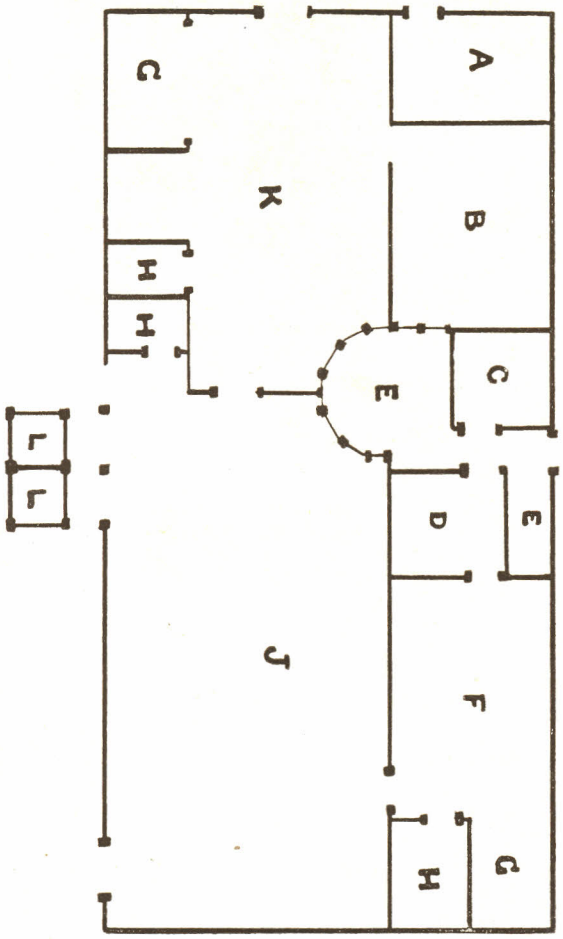
The air blast for the smelting furnace is supplied by large vertical blowing engines which compress the air to the pressure necessary to force it into the furnace in the required quantities. These blowing engines are each driven by 150 H.P. electric motors.

The Corporation has a very complete central Generating Station on the Works, capable of an output of 1000 H.P., and from here electrical current is distributed to drive the motors operating the various plants. In one instance the current is transmitted for a distance of about a mile, where it operates a pumping station on the banks of Cockle Creek. All the water required for cooling the water jackets is pumped from this station.

During the year January to December, 1908, the Corporation produced at Cockle Creek in the treatment of ores from their own mine at Broken Hill, together with purchased ores, 18,263 tons of bullion, containing 86,547 ounces gold, 197,946 ounces silver, and 18,255 tons lead.

PLAN OF SAMPLING MILL.

For Description see opposite page.



1. The Foreman's Office is shown at D, and is fitted with glass windows, thus enabling him to keep complete control on all operations.

2. The room marked E is for the accommodation of customers selling ore to the Corporation. It is situated in the centre of the mill; the floor is raised above the ordinary level, and there are windows all round, thus enabling the seller, if he so wishes, to watch in every detail the sampling of his own ore.

3. Main Sampling Floor, J.—On the steel floor of this room, the bulk sample, consisting of one fifth of the shipment, is, after crushing, quartered down and reduced to a small representative sample.

4. Small Sample Room K.—Here the representative sample taken in the main Sampling Room is further reduced in bulk.

5. F is a Special Sampling Room; this room is reserved entirely for dealing with rich gold ores.

6. Letter B denotes the Bucking Room. Here the sample from the small Sample Room K is reduced to the fineness of flour, and divided into three sealed packets. The location of the Representatives Room (E) enables the seller to closely follow this important work.

7. The percentage of moisture contained in the sample is determined in Room C, where special drying ovens are provided for that purpose.

8. Tool Stores (H H H) are provided, one for each room.

9. Hot Plates for drying the large bulk samples before sampling are provided at G G.

10. The electric motor that drives the mill is situated in Room A. It is of 60 H.P., and operates all the jaw crushers, rolls and grinding mills.

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