Interesting Facts

IN CONNECTION WITH

The Iron & Steel Works

OF

The Broken Hill Proprietary Company Limited

Newcastle,

New South Wales.

JANUARY, 1928.
PLAN
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BROKEN HILL PROPTY COYS
IRON & STEEL WORKS
AT
NEWCASTLE
Interesting Facts

In connection with

Newcastle Steel Works.

Capital:

The amount expended on plant, machinery, etc., in the Iron and Steel Industry, as carried on by The Broken Hill Proprietary Company, at Newcastle, Iron Knob, Whyalla, Devonport, and the various quarries, totals upwards of £7,200,000.

Area:

The area of land held by the Company at the present time approximates 1,225 acres; the Steel Works and adjacent allied industries cover 325 acres; 900 acres are available for future extensions.

Commencement of Construction:

The first test pile was driven for the Blast Furnace foundations on the 24th January, 1913.

The first vessel, carrying plant and machinery, arrived September, 1913.
Materials Used in Construction:

The Works were built on swampy land, which necessitated the placing of all foundations on piles. The piles actually driven in connection with the construction of the various plants totalled 25,000 (9 million cubic feet).

During the first five years 44\(\frac{1}{4}\) million firebricks were used in the building of furnaces, etc., at the Works. If these bricks were laid end to end along the railway track on single rail, you could start at Rockhampton (Queensland), and continue through that State, then through New South Wales, Victoria to South Australia, to Oodnadatta, then across the Transcontinental to Perth (West Australia), and have enough left over to return to Albury.

Thousands of tons of steel, used in the various extensions to the plant, and all the plates and structural steel work required for No. 3 Blast Furnace, have been supplied from the Works themselves.

Commencement of Productive Operations:

The first Blast Furnace was "blown in" on 8th March, 1915, and the first rail was rolled on 24th April of that year, two years and three months from the date of commencement of construction.

Materials Used in Production:

More than 95 per cent. of all the materials used at the Steel Works are produced in Australia.
Railways:

There are 26 miles of standard gauge railway and 3\frac{1}{4} miles of narrow gauge track in use at the Steel Works.

Wharves:

A wharf, 1,800 feet long, has been constructed and well equipped for rapid discharging of inward raw materials (ironstone, limestone, etc.) and outward loading of pig iron, steel products, benzol, etc.

Employees in Industry:

Under normal conditions the number of men employed by The Broken Hill Proprietary Company Limited directly in the Industry are:

<table>
<thead>
<tr>
<th>Location</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newcastle</td>
<td>4,700</td>
</tr>
<tr>
<td>Iron Knob, Whyalla and various Quarries</td>
<td>650</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>5,350</strong></td>
</tr>
</tbody>
</table>

In addition to which it is estimated the following men are afforded indirect employment:

On Company’s and other steamers carrying raw materials and products: 500

In allied industries: Messrs. Rylands and Lysaght’s (at Newcastle and Sydney): 1,200

On the supply of coal and other materials apart from the Company’s employees: 3,500

**Total:** 10,550
Number of Shareholders:

Number of Shareholders . . . . . . . 10,300

Wages Paid:

The weekly wages bill, under normal conditions, amounts to:—

Newcastle Steel Works . . . . . . . £27,000
Iron Knob, Whyalla (S.A.), Devonport (Tas.) and at the various Quarries . . . . . . . . . . . . . 3,000

Total £30,000

Equal to per annum £1,560,000 direct without taking into account any subsidiary companies or allied industries.

Safety Department:

Special steps are taken to reduce risks of accidents at the Works to a minimum. Very thorough measures have been adopted. Safety matters are administered by Plant Committees, consisting of employees, the Superintendent of each Plant being chairman. These Committees report to a General Safety Committee, who are responsible for the administration of general safety matters. The General Committee consists of the Production Superintendent (chairman), the Assistant Production Superintendent, the General Superintendent Rolling Mills, the Master Mechanic, and the Safety Superintendent.

A well equipped Ambulance Station is maintained, with experienced ambulance officers on duty continuously. Stretchers and reserve depots of ambulance requisites are distributed on the various plants. Classes in “First Aid” are also held for men in positions of responsibility and authority.
**Bicycle Shed:**

Upwards of 1,000 bicycles are ridden to the Works each day by employees. In order to safely house these, a large shed, with special storage facilities, has been provided, together with attendants.

**Apprentices:**

In various trades, 152 apprentices are engaged. Special facilities are provided so that each one is properly trained, the whole of their work being under the control of the Apprenticeship Committee, consisting of the Production Superintendent, Chief Mechanical Engineer, Master Mechanic, Electrical Engineer, Works Secretary, Industrial Officer and Master of Apprentices. Special theoretical and practical courses are prescribed for each class of work, and all apprentices are required to attend the Technical College. The Company refunds all fees of apprentices attending College, regularly, and also pays a bonus of 2/- per week to all who have made satisfactory progress in their technical course. A Master of Apprentices is employed, giving the whole of his time following the work and progress of each individual apprentice.

**Officers:**

The Company's policy is to keep its technical officers thoroughly up to date with the world's methods and practice, and to this end its senior officers are periodically given an opportunity of gaining first-hand experience at well equipped plants in England and America.
Miscellaneous:

The products (iron and steel, etc.) despatched from the Steel Works by rail and steamer total 335,000 tons annually.

Approximately one-third of the Kalgoorlie/Port Augusta railway was laid with rails from the Newcastle Steel Works.

10,000 tons of steel plates, for use in the steamers constructed at Walsh Island, Williamstown, etc., for the Federal Government, were produced at Newcastle.

During the war the Industry assisted in the production of munition steel, and rails for war service in France. A very high opinion was expressed by English experts of the munition steel, of which 17,900 tons were rolled and shipped to England. 5,600 tons of rails were also rolled for war purposes.

Coal:

The consumption of coal for all purposes at the Steel Works is approximately 18,000 tons per week.

Water:

The quantity of water consumed amounts to:—

- Fresh Water . . . 11,500,000 galls. per week
- Salt Water . . . 362,500,000
Production to Date:

From the commencement of the various plants, up to the end of November, 1927, the following material was produced:

- Pig Iron: 2,738,600 tons
- Steel Ingots: 2,714,300 tons
- Blooms and Billets: 82,700 tons
- Rails (all sizes): 803,750 tons
- Structural Steel: 218,300 tons
- Steel Plates: 13,700 tons
- Fishplates and Tieplates: 52,500 tons
- Guardplates: 6,700 tons
- Steel Sleepers: 13,000 tons
- Munition Steel: 17,900 tons
- Merchant Bar: 495,200 tons
- Wire Rods: 439,000 tons
- Sulphate of Ammonia: 37,600 tons
- Tar: 28,088,800 gallons
- Benzol: 4,554,800 gallons
- Toluol: 31,500 gallons
- Solvent Naphtha: 333,800 gallons

Coke Ovens:

The coke required for smelting the iron ore in the Blast Furnace is manufactured in the Company's own ovens at the Steel Works. There are 3 batteries, consisting of 224 ovens of the Semet Solvay by-product type. Each oven has a coal capacity of 7½ tons at one charge. The total coal consumed per week is 13,000 tons, producing approximately 8,000 tons of coke. The whole of this coal is drawn from the Newcastle district, Borehole seam coals being in the main used for coking. To deal with the by-products from the coking process, a modern by-products plant is in operation, where sulphate of ammonia for fertilizing purposes, tar and benzol are produced. The weekly production of these materials is as follows:

- Sulphate of Ammonia approx. 100 tons per week
- Tar: 90,000 gallons
- Benzol: 25,000 gallons

In addition, 125 million cubic feet per week of gas are generated during process of coke manufacture, about half of which is burnt in the ovens, the balance being used in the various departments of the Works.
**Blast Furnace:**

The ironstone received by steamer from the Company’s quarries at Iron Knob, in South Australia, is mechanically discharged by means of 2 electric grabs (each with a capacity of 300 tons per hour). The ironstone, together with the fluxes (limestone, silica rock) and fuel (coke), is mechanically charged into the furnace at the top.

The Plant consists of:

3 Blast Furnaces—one with a daily producing capacity of 500 tons, and two with a daily capacity of 450 tons, producing a total of 9,800 tons per week.

In addition to these 3 Blast Furnaces, one small Blast Furnace, with a capacity of 600 tons per week, is held in reserve for the production of ferro manganese, or special grade foundry iron.

The blast for these furnaces is supplied by 3 vertical and 2 horizontal steam engines, of a total capacity of 145,000 cubic feet of air per minute, against a pressure of 25 lbs.; also 1 “Rateau” turbo blower—capacity 30,000 cubic feet of air per minute.

The steam is supplied by 12 Babcock & Wilcox boilers, heated by waste gas from the Blast Furnace.

These furnaces, when all are in blast would consume:

<table>
<thead>
<tr>
<th>Material</th>
<th>Source of Supply</th>
<th>Tons per annum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ironstone</td>
<td>Iron Knob, Spencer's Gulf (S.A.)</td>
<td>800,000</td>
</tr>
<tr>
<td>Coke</td>
<td>Coke Ovens at Works from Newcastle Coal</td>
<td>500,000</td>
</tr>
<tr>
<td>Silica Rock</td>
<td>Gosford (N.S.W.)</td>
<td>26,000</td>
</tr>
<tr>
<td>Limestone</td>
<td>Devonport (Tas.), Taree &amp; Attunga (N.S.W.)</td>
<td>193,000</td>
</tr>
<tr>
<td>Phosphate Rock</td>
<td>Nauru and Ocean Pacific Islands</td>
<td>3,000</td>
</tr>
</tbody>
</table>
Open Hearth:

In the Open Hearth Department the iron is converted into steel. There are 9 Open Hearth Steel Furnaces, each of 60/70 tons capacity in one charge, and capable of producing 9,000 tons of steel per week. The furnaces are gas fired, the gas being produced in 34 large gas producers, mainly from Maitland coal. The flame temperature in the furnace is maintained at 1800°C. The charging of the furnace is done mechanically, all fluxes and scrap being introduced into the furnace with a mechanical charger, and the hot metal is conveyed and introduced into the furnace with a 75-ton crane. The furnaces are lined with magnesite bricks, the walls, roof and other portions of the furnace being built of silica brick. The molten steel is tapped into huge ladles holding 70/80 tons, which are picked up by 120-ton cranes and teemed from the ladle into ingot moulds; these ingots are then sent into the Blooming Mill, where they are stripped and heat treated prior to rolling.

The following table shows the materials used in this plant:

<table>
<thead>
<tr>
<th>Material</th>
<th>Source of Supply</th>
<th>Tonnage used per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pig Iron</td>
<td>B.H.P. Blast Furnaces</td>
<td>8,400</td>
</tr>
<tr>
<td>Scrap Steel</td>
<td>Australia</td>
<td>2,800</td>
</tr>
<tr>
<td>Iron Ore</td>
<td>Iron Knob (S.A.)</td>
<td>1,400</td>
</tr>
<tr>
<td>Limestone</td>
<td>Devonport (Tas.) &amp; Taree &amp; Attunga (N.S.W.)</td>
<td>800</td>
</tr>
<tr>
<td>Magnesite</td>
<td>Attunga (N.S.W.)</td>
<td>250</td>
</tr>
<tr>
<td>Chrome Ore</td>
<td>Barraba &amp; Gundagai (N.S.W.)</td>
<td>10</td>
</tr>
<tr>
<td>Fluorspar</td>
<td>Carboona (N.S.W.), Pine Hills (Vic.) &amp; Cairns (Q.)</td>
<td>20</td>
</tr>
<tr>
<td>Dolomite</td>
<td>Havilah (N.S.W.)</td>
<td>300</td>
</tr>
<tr>
<td>Ferro Silicon, Manganese, Phosphorus, Aluminium</td>
<td></td>
<td>60</td>
</tr>
</tbody>
</table>

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page eleven
BLOOMING and RAIL MILLS.

These two (2) mills are housed in one large building, 970 feet long by 175 feet wide.

Blooming Mill:

After the ingot mould has been removed the solid ingot of steel is placed in the soaking pits and heated to a uniform temperature throughout, ready for rolling down in the Blooming Mill into blooms and billets. The ingot, when it first enters the Blooming Mill rolls, is approximately 6 feet long x 23 x 20 inches, and weighs approximately 3½ tons. This ingot is rolled into various size blooms, according to the purpose for which they are required, averaging about 8½ inches square by 29 feet long. Portion of the steel from the front end of the bloom is cropped down to sound steel, and the blooms are sheared into required lengths for rolling at the other mills into finished products. The Blooming Mill has a capacity up to 10,000 tons per week. The mill is driven by a steam engine electrically controlled. The engine has a horse-power of 13,000.

Rail Mill:

The blooms are taken from the Blooming Mill and charged into a re-heating furnace to regain the temperature necessary for rolling in the Rail Mill. This mill consists of 3 sets of rolls, 3 high, through which the bloom is passed and repassed, each pass altering its shape until the required section is produced. The finished rail of approximately 120 feet long is then mechanically passed on a runway table to the hot saw, where it is cut into lengths required, and then passes on to the stamping and cambering machines, and on to cooling beds; from the cooling beds the rails are pushed down to the gag press, where
they are straightened and then on to the drilling and ending machines.

The steel is handled entirely by mechanical means, from the ingot to the finished rail. The Rail Mill is driven by a steam engine of 11,000 horse-power. All the tilting tables, the charging machines and hot saw are electrically operated.

The building is equipped with electric travelling cranes capable of lifting up to 60 tons.

The Rail Mill is capable of producing 3,500 tons of rails per week. In addition to rails, all structural steel above 6-inch beams, or 3-inch angles, are produced in this mill. The largest beam rolled is a 24-inch beam. In addition to these structural shapes, this mill is also used for producing billets of various sizes down to 1½ inch. The capacity of the mill, when on mixed rolling of, say, rails and billets, is 4,000 tons weekly.

**MERCHANT MILLS**

These consist of 3 mills, known as the 18-in., 12-in. and 8-in. Mills, and are for the purpose of producing light rails, small structural shapes, and merchant bar, from billets rolled on the larger mills.

**18-in. Mill:**

The 18-inch Mill is 3 stand of 3 high type and 1 stand of 2 high type, driven by a steam engine of 3,000 horse-power. The blooms are all mechanically handled throughout the mill in a similar manner to that already described in the Rail Mill.

The capacity of the 18-inch Mill is approximately 2,000 tons per week.

**12-in. Mill:**

In this mill, which has 4 stands of the 3 high type and 1 stand of the 2 high type, the steel is handled in the rolls by manual labor, the product being delivered on to mechanically operated run-out table, and thence on to the cooling beds. This mill is driven by a steam engine of 900 horse-power, and has a capacity of 900 tons per week.
8-in. Mill:

This mill consists of 3 stands of continuous rolls 2 high, and 5 stands in line, 3 of which are 3 high.

The mill is driven by a 1,250 h.p. motor connected to the 5 stands in line and by bevelled and straight gearing to the three continuous stands. The run-out table and cooling bed is similar to that of the 12-inch Mill.

This mill has a capacity of 800 tons per week.

Rod Mill:

The Rod Mill, for rolling billets into wire rods for the use of the wire-drawing and nail-making industries, is of the Morgan Continuous Type, and quite distinct from the other mills, there being 16 sets of rolls placed in series, the rods passing automatically from one to the other, until the finished rod emerges from the 16th roll. The billets used for this purpose are 1$\frac{3}{4}$ inches square x 30 feet long, rolled on the 18-inch Mill, and prior to rolling in the Rod Mill are re-heated in a re-heating furnace. When leaving the last pass in the rolls, and while still hot, the rods are delivered on to bobbins, where they are automatically reeled into bundles. These bundles are then automatically discharged on to a system of drag and cooling conveyors, which are long enough to ensure the bundles cooling down sufficiently to be loaded direct from the conveyor into trucks.

The mill is driven at a high rate of speed, the billets entering the rolls at a speed of 30 yards per minute, the finishing speed being at the rate of 1,040 yards per minute; with two strands running this equals 2,080 yards per minute, or approximately 1$\frac{1}{2}$ miles per minute.

The Rod Mill has a capacity of 2,500 tons per week. The rods produced are of the following gauges, from 7/0 to No. 5, the principal size being No. 5 gauge (.212 inches).
Fishplate Mill:

At this mill the various types of fishplates required for all the rails rolled at the Works are produced. The bar is rolled at the larger mills, and at the Fishplate Mill it is cut, punched, notched, oiled and bundled ready for despatch. The capacity of the plant is 350 tons per week.

Foundries:

The Works are equipped with up-to-date Iron and Steel Foundries, capable of producing castings weighing up to 30 tons each.

The Steel Foundry is equipped with an Acid Furnace of 25 tons capacity and a Basic Furnace of 30 tons capacity. These furnaces are capable of producing 300 and 400 tons per week respectively.

Steel castings of a greater weight are made at the Open Hearth Plant—the largest casting produced at this latter plant to date weighed 45 tons, and required 56 tons of metal.

The Direct Metal Foundry is capable of producing, working one shift per day, 200 tons of iron castings per week.

Repair Shop:

The Works are equipped with a large machine shop, in which are installed modern type lathes, planing machinery, etc., sufficient to cope with the repair work of the plant. There are also the necessary blacksmiths, boilermakers, carpenters, pattern-making and tinsmiths' shops, brass foundry, etc.
Electric Power:

The Electric Power Plant consists of:

A.C. Power Plant:

Main D.C. Power House and Sub-station:
3 1,000-K.W. Motor Generator Sets (6,600-volt 25 period Synchronous Motor—250-volt D.C. Generator).

18-inch Mill Power House:
1 Belliss & Morcom-Lancashire 300-K.W. 250-volt D.C. Generator.

Coke Ovens Sub-Station:
1 1,000-K.W. Motor Generator Set (6,600-volt 25 period Synchronous Motor—250-volt D.C. Generator).

Laboratory:

The Laboratory is fully equipped with modern appliances for carrying out all the analytical, chemical and physical research and testing work required in connection with the Industry.

 Ships:

The Company has a fleet of five ships exclusively engaged in the carriage of ironstone, limestone and finished products.
VIEW OF THREE BLAST FURNACES WITH ORE BRIDGES FOR UNLOADING STEAMERS BY MEANS OF GRABS.