

39/85

IN THE PRIVY COUNCIL

NO. 28 of 1985

ON APPEAL  
FROM THE COURT OF THE SUPREME COURT OF WESTERN AUSTRALIA

B E T W E E N :

HAMERSLEY IRON PTY LIMITED

Appellant  
(Respondent)  
(Plaintiff)

- and -

1. THE NATIONAL MUTUAL LIFE ASSOCIATION OF AUSTRALASIA LIMITED,
2. LANGLEY GEORGE HANCOCK,
3. ERNEST ARCHIBALD MAYNARD WRIGHT,
4. HANCOCK PROSPECTING PTY LTD,
5. WRIGHT PROSPECTING PTY LTD AND
6. L.S.P. PTY LTD

Respondents  
(Appellants)  
(Defendants)

RECORD OF PROCEEDINGS

---

PART II  
VOLUME I

---

Ince & Co.  
Knollys House  
11 Byward Street  
LONDON, EC3R 5EN

SOLICITORS FOR THE APPELLANT  
(RESPONDENT) (PLAINTIFF)

WALTONS & MORSE  
PLANTATION HOUSE  
31-35 FENCHURCH STREET  
LONDON, EC3M 3NN

SOLICITORS FOR THE RESPONDENTS  
(APPELLANTS) (DEFENDANTS)

ON APPEAL

FROM THE FULL COURT OF THE SUPREME COURT OF WESTERN AUSTRALIA

B E T W E E N :

HAMERSLEY IRON PTY LIMITED

Appellant  
(Respondent)  
(Plaintiff)

- and -

LANGLEY GEORGE HANCOCK, ERNEST  
ARCHIBALD MAYNARD WRIGHT, HANCOCK  
PROSPECTING PTY LTD, WRIGHT  
PROSPECTING PTY LTD AND L.S.P. PTY LTD AND  
THE NATIONAL MUTUAL LIFE  
ASSOCIATION OF AUSTRALASIA LIMITED

Respondents  
(Appellants)  
(Defendants)

RECORD OF PROCEEDINGS

INDEX OF REFERENCE

---

PART II  
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ON APPEAL

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B E T W E E N :

HAMERSLEY IRON PTY LIMITED

Appellant  
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LANGLEY GEORGE HANCOCK, ERNEST  
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PROSPECTING PTY LTD, WRIGHT

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ASSOCIATION OF AUSTRALASIA LIMITED  
Respondents  
(Appellants)  
(Defendants)

RECORD OF PROCEEDINGS

INDEX OF REFERENCE

| No. | Description of Document | Date | Page |
|-----|-------------------------|------|------|
|-----|-------------------------|------|------|

PART I

VOL I

IN THE SUPREME COURT

|    |                                       |                    |           |
|----|---------------------------------------|--------------------|-----------|
| 1. | Originating Summons                   | 2nd September 1982 | 1 - 2     |
| 2. | <u>Plaintiff's Evidence</u>           |                    |           |
|    | Evidence of Colin Roy Langridge       |                    | 3 - 133   |
|    | Examination in Chief                  | 3-6                |           |
|    | Cross-examination                     | 7-111              |           |
|    | Re-examination                        | 112-120            |           |
|    | Further Examination in Chief          | 121                |           |
|    | Further Cross-examination             | 122-129            |           |
|    | Further Re-examination                | 130-133            |           |
|    | Evidence of Douglas Frederick Tomsitt |                    | 134 - 151 |
|    | Examination in Chief                  | 134-146            |           |
|    | Cross-examination                     | 147-151            |           |

| Description of Document                 | Date | Page       |
|-----------------------------------------|------|------------|
| Evidence of Alban Jude Lynch            |      | 152 - 312  |
| Examination in Chief                    |      | 152-189    |
| Cross-examination                       |      | 190-291    |
| Re-examination                          |      | 292-312    |
| VOL II                                  |      |            |
| Evidence of Arthur Noel Pritchard       |      | 313 - 375  |
| Examination in Chief                    |      | 313-325    |
| Cross-examination                       |      | 326-364    |
| Re-examination                          |      | 365-374    |
| Further Cross-examination               |      | 375        |
| Evidence of Robin John Batterham        |      | 376 - 454a |
| Examination in Chief                    |      | 376-427    |
| Cross-examination                       |      | 428-454    |
| Re-examination                          |      | 454a       |
| Evidence of Desmond Evered Wright       |      | 455 - 532  |
| Examination in Chief                    |      | 455-468    |
| Cross-examination                       |      | 469-524    |
| Re-examination                          |      | 525-532    |
| Evidence of Robert George Horseman      |      | 533 - 553  |
| Examination in Chief                    |      | 533-542    |
| Cross-examination                       |      | 543-552    |
| Re-examination                          |      | 553        |
| VOL III                                 |      |            |
| Evidence of Earl Conrad Herkenhoff      |      | 554 - 625a |
| Examination in Chief                    |      | 554-572    |
| Cross-examination                       |      | 573-613    |
| Re-examination                          |      | 614-625a   |
| 3. <u>Defendants' Evidence</u>          |      |            |
| Evidence of Niles Earl Grosvenor        |      | 626 - 693  |
| Examination in Chief                    |      | 626-635    |
| Cross-examination                       |      | 636-687    |
| Re-examination                          |      | 688-693    |
| Evidence of Peter Forbes Booth          |      | 694 - 779  |
| Examination in Chief                    |      | 694-699    |
| Cross-examination                       |      | 700-775    |
| Re-examination                          |      | 776-779    |
| VOL IV                                  |      |            |
| Evidence of Geoffrey Samuel Baker       |      | 780 - 791  |
| Examination in Chief                    |      | 780-782    |
| Cross-examination                       |      | 782a-790   |
| Re-examination                          |      | 791        |
| Evidence of Christian Frederick Beukema |      | 792 - 867  |
| Examination in Chief                    |      | 792-802    |
| Cross-examination                       |      | 803-867    |
| Evidence of Neville Oliver Boughton     |      | 868 - 914  |
| Examination in Chief                    |      | 868-893    |
| Cross-examination                       |      | 894-912    |
| Re-examination                          |      | 913-914    |

| Description of Document                                                                                                                                             | Date               | Page        |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-------------|
| Evidence of Ernest Archibald Maynard Wright                                                                                                                         |                    | 915 - 973   |
| Examination in Chief                                                                                                                                                |                    | 915-937     |
| Cross-examination                                                                                                                                                   |                    | 938-967     |
| Re-examination                                                                                                                                                      |                    | 968-973     |
| VOL V 4. Reasons for Judgment of the Honourable Mr Justice Olney                                                                                                    | 23rd December 1983 | 974 - 1001  |
| 5. Judgment (excluding Agreement therein referred to)                                                                                                               | 9th January 1984   | 1002 - 1004 |
| <u>IN THE FULL COURT OF THE SUPREME COURT</u>                                                                                                                       |                    |             |
| 6. Notice of Appeal in Appeal No 59 of 1984                                                                                                                         | 13th February 1984 | 1005 - 1042 |
| 7. Notice of Appeal in Appeal No 60 of 1984                                                                                                                         | 13th February 1984 | 1043 - 1054 |
| 8. Notice pursuant to Order 63 Rule 9 in Appeal No 59 of 1984.                                                                                                      | 2nd March 1984     | 1055 - 1058 |
| 9. Notice pursuant to Order 63 Rule 9 in Appeal No 60 of 1984                                                                                                       | 2nd March 1984     | 1059 - 1062 |
| 10. Reasons for Judgment of the Honourable Mr Justice Wallace, the Honourable Mr Justice Kennedy and the Honourable Mr Justice Rowland in Appeals 59 and 60 of 1984 | 27th November 1984 | 1063 - 1135 |
| 11. Judgment of the Full Court in Appeal No 59 of 1984 (excluding Agreement therein referred to)                                                                    | 29th November 1984 | 1136 - 1139 |
| 12. Judgment of the Full Court in Appeal No 60 of 1984 (excluding Agreement therein referred to)                                                                    | 29th November 1984 | 1140 - 1144 |
| 13. Order of the Full Court consolidating Appeals Nos 59 & 60 of 1984 and granting conditional leave to appeal to Her Majesty in Council                            | 6th March 1985     | 1145 - 1147 |
| 14. Order of the Full Court in Appeals No 59 & 60 of 1984 granting final leave to appeal to Her Majesty in Council                                                  | 6th March 1985     | 1148 - 1149 |

PART II

EXHIBITS

| Description of Document                            | Date               | Page        |
|----------------------------------------------------|--------------------|-------------|
| VOL I Exhibit "1" Affidavit of Colin Roy Langridge | 2nd September 1982 | 1150 - 1160 |

| Description of Document | Date                                                                                                         | Page                |                        |
|-------------------------|--------------------------------------------------------------------------------------------------------------|---------------------|------------------------|
| Exhibit "1 CRL1"        | Copy Royalty Agreement between Defendants and Plaintiff                                                      | 12th December 1962  | 1161                   |
| Exhibit "1 CRL2"        | Copy Deed of Authority                                                                                       | 12th November 1967  | 1162 - <del>1168</del> |
| Exhibit "1 CRL3"        | Copy Notice of Assignment from Fifth Defendant to Plaintiff                                                  | 25th October 1979   | 1169 - <del>1171</del> |
| Exhibit "1 CRL4"        | Copy plan Isometric Arrangement of Tom Price Concentrator Plant                                              | 16th July 1980      | 1172                   |
| Exhibit "1 CRL5"        | Copy letter C R Fieldhouse to Plaintiff's Solicitor                                                          | 5th August 1983     | 1173                   |
| Exhibit "1 CRL6"        | Copy letter Plaintiff's Solicitor to C R Fieldhouse                                                          | 11th September 1981 | 1174                   |
| Exhibit "1 CRL7"        | Copy text of letter Plaintiff's Solicitor to C R Fieldhouse                                                  | Undated             | 1175                   |
| Exhibit "2"             | Affidavit of Colin Roy Langridge                                                                             | 24th May 1983       | 1176 - 1178            |
| Exhibit "2 CRL8"        | Copy Agreement between A.V. Barrett - Leonard and others and Rio Tinto Southern Pty Ltd                      | 4th May 1962        | 1179 - 1192            |
| Exhibit "3"             | Paper presented by Messrs Uys & Bradford entitled "The Beneficiation of Iron Ore by Heavy Medium Separation" | 1981                | 1193 - 1216            |
| Exhibit "4"             | Three photographs of Tom Price concentrator control room mimic panel                                         | 1983                | 1217                   |
| Exhibit "5"             | Three photographs of Tom Price concentrator plant lookout display panel                                      | 1983                | 1218 - 1219            |
| Exhibit "6"             | Annual Reports of Hamersley Holdings Limited for the years 1976, 1978, 1981 and 1982                         |                     | 1220 - 1328            |

| Description of Document | Date                                                                                    | Page                           |
|-------------------------|-----------------------------------------------------------------------------------------|--------------------------------|
| Exhibit "7"             | 1976-77 Pit and Quarry Handbook and Buyer's Guide, 69th Edition, pages B170 to 177 only | 1976-77<br>1329 - 1336         |
| Exhibit "8"             | Affidavit of Douglas Frederick Tompsitt                                                 | 24th May 1983<br>1337 - 1338   |
| Exhibit "8 DFT1"        | 26 photographs of feed at various stages of processing in the Tom Price concentrator    | 23rd March 1983<br>1339 - 1352 |
| Exhibit "9"             | Affidavit of Alban Jude Lynch                                                           | 22nd May 1983<br>1353 - 1358   |
| Exhibit "9 AJL1"        | Copy Appendix 'A' to Mineral Processing" by E.J. Pryor, 3rd Ed. - Glossary of Terms     | 1965<br>1359 - 1369            |
| Exhibit "9 AJL2"        | Copy extract from "Principles of Mineral Dressing" by A.M. Gaudin                       | 1370 - 1377                    |
| Exhibit "10"            | "Handbook of Mineral Dressing" by Taggart, pages 2-134 to 2-140 inclusive               | 1976<br>1378 - 1384            |
| OL II Exhibit "11"      | Australian Standard 2418, Part 1 - 1980, Terms Relating to Coal Preparation             | 1980<br>1385 - 1405            |
| Exhibit "12"            | Affidavit of Arthur Noel Pritchard                                                      | 24th May 1983<br>1406 - 1415   |
| Exhibit "13"            | Two brochures by Dorr-Oliver and by Hayl & Patterson                                    | 1416 - 1423                    |
| Exhibit "14"            | Terms and Definitions of the Vibrating Screen Manufacturers Association                 | 1967<br>1424 - 1441            |
| Exhibit "15(1)"         | Affidavit of Robin John Batterham                                                       | 25th May 1983<br>1442 - 1446   |
| Exhibit "15(2)"         | Amended paragraph 5 to the Affidavit of Robin John Batterham                            | 25th May 1983<br>1447          |

| Description of Document | Date                                                                                                                            | Page                            |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| Exhibit "16(1)"         | Diagram showing simulation of scrubbing and screening of Tom Price Concentrator                                                 | 1448                            |
| Exhibit "16(2)"         | Diagram showing simulation of scrubbing and screening of Tom Price Concentrator                                                 | 1449                            |
| Exhibit "16(3)"         | Diagram showing simulation of scrubbing and screening of Tom Price Concentrator                                                 | 1450                            |
| Exhibit "17"            | Copy Chapter 9 from "Mineral Processing" by Pryor                                                                               | 1965<br>1451 - 1504             |
| Exhibit "18"            | Copy Chapter 8 of "Mineral Processing Technology" 2nd Edition by B.A. Willis                                                    | 1981<br>1505 - 1531             |
| Exhibit "19"            | Affidavit of Desmond Evered Wright                                                                                              | 30th May 1983<br>1532 - 1534    |
| Exhibit "20"            | Brochure by Mt Newman Mining Company entitled "Beneficiation Plant"                                                             | 1979<br>1535 - 1546             |
| Exhibit "21"            | Booklet by Mt Newman Mining Company entitled "Mt Newman Operations Guide"                                                       | 1980<br>1547 - 1582             |
| Exhibit "22"            | Affidavit of Robert George Horseman                                                                                             | 29th August 1983<br>1583 - 1586 |
| VOL III Exhibit "23"    | Affidavit of Earl Conrad Herkenhoff                                                                                             | 29th August 1983<br>1587 - 1592 |
| Exhibit "23ECH1"        | Extract from "Handbook of Mineral Dressing" by A.F. Taggart                                                                     | 1593 - 1609                     |
| Exhibit "23ECH2"        | Extract from Bulletin of the University of Minnesota - Mining Directory 1963 Issue                                              | 1963<br>1610 - 1612             |
| Exhibit "23ECH3"        | Extract from "Economic Aspects of Iron Ore Preparation" prepared by the Secretariat of the Economic Commission for Europe, 1966 | 1966<br>1613 - 1630             |



| Description of Document | Date                                                                                                                                         | Page                                  |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|
| Exhibit "24"            | Reprint from Volume 66<br>No. 47 Skillings Mining<br>Review entitled "Hamersley's<br>Low Grade Iron Ore<br>Concentration Project"            | 1977<br><br>1631 - 1635               |
| Exhibit "25"            | Affidavit of John Roberts                                                                                                                    | 1st June 1983<br><br>1636 - 1637      |
| Exhibit "26"            | South Australian Broken<br>Hill Proprietary Company<br>Steel Works Indenture Act,<br>1958                                                    | 1958<br><br>1638 - 1663               |
| Exhibit "27"            | Two pamphlets entitled<br>"Iron Ore" published by<br>the Geological Survey of<br>Western Australia, 1966<br>(copy) and 1983                  | 1966,<br>1983<br><br>1664 - 1705      |
| Exhibit "28"            | Copy pages 7-01, 7-06,<br>7-36 and 7-37 of<br>Taggart's "Handbook of<br>Mineral Dressing"                                                    | 1976<br><br>1706 - 1709               |
| Exhibit "29"            | Affidavit of Niles<br>Earl Grosvenor                                                                                                         | 27th October, 1982<br><br>1710 - 1719 |
| Exhibit "29NEG1"        | Copy letter from<br>Plaintiff's Solicitor<br>to C.R. Fieldhouse                                                                              | 21st October 1982<br><br>1720         |
| Exhibit "29NEG2"        | Drawing P-004-5041<br>General Arrangement<br>Section B, of Tom<br>Price Concentrator<br>Washing and Screening<br>Plant                       | 7th December 1976<br><br>1721         |
| Exhibit "29NEG3"        | Drawing P-004-5033<br>General Arrangement of<br>Tom Price Concentrator<br>Washing and Screening<br>Plant Wet Feeder                          | 18th May 1977<br><br>1722             |
| Exhibit "29NEG4"        | Copy booklet "Vibrating<br>Screen - Theory and<br>Selection" published by<br>Allis-Chalmers                                                  | <br><br>1723 - 1748                   |
| Exhibit "30"            | Copies pages 108, 115,<br>119-120, 127-132 and<br>149 of a compilation<br>of extracts from the<br>American Engineering<br>and Mining Journal | 1930's - 1950's<br><br>1749 - 1760    |
| Exhibit "31"            | Page 270 of the United<br>Nations' Publication,<br>"Economic Aspects of<br>Iron Ore Preparation"                                             | 1966<br><br>1761                      |

| Description of Document | Date                                                                                                                                     | Page                             |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
| Exhibit "32"            | Hamersley Iron "Resources Technology Operations" Booklet, page 16, Plant Layout, Mt Tom Price                                            | January 1981<br>1762             |
| Exhibit "33"            | Affidavit of Peter Forbes Booth (with exception of paragraph 4)                                                                          | 27th October 1982<br>1763 - 1770 |
| Exhibit "34"            | Affidavit of Peter Forbes Booth                                                                                                          | 30th June 1983<br>1771 - 1773    |
| Exhibit "34PFB1"        | Copy Conceptual Drawings of Wet Feeder Designs                                                                                           | 1774 - 1775                      |
| Exhibit "34PFB2"        | Copy Conceptual Drawings of Feed Chutes at Tom Price and Mt. Newman                                                                      | 1776                             |
| Exhibit "35"            | Affidavit of Geoffrey Samuel Baker                                                                                                       | 17th October 1983<br>1777 - 1779 |
| Exhibit "36"            | Affidavit of Christian Frederick Beukema                                                                                                 | 22nd June 1983<br>1780 - 1789    |
| Exhibit "36CFB1"        | Copy United Nations Survey of World Iron Ore Resources, 1955                                                                             | 1955<br>1790 - 1798              |
| Exhibit "37"            | Copy State of Minnesota Iron Ore Mining Lease                                                                                            | 1941<br>1799 - 1808              |
| VOL IV Exhibit "38"     | Copy article entitled "State of Iron Ore Mining Industry" by Christian F. Beukema                                                        | February 1961<br>1809 - 1812     |
| Exhibit "39"            | Affidavit of Neville Oliver Boughton (excluding paragraphs 6, 7 & 8, the last sentence of paragraph 9 and paragraphs 12 to 15 inclusive) | 20th October 1983<br>1813 - 1820 |
| Exhibit "39NOB1"        | Copy article entitled "Iron ore Concentration Plant of Hamersley Iron Pty Ltd, Mt Tom Price W.A. by Colin R. Langridge.                  | 1821 - 1823                      |



| Description of Document | Date                                                                                                          | Page                               |
|-------------------------|---------------------------------------------------------------------------------------------------------------|------------------------------------|
| Exhibit "39NOB2"        | Copy article entitled "Developments in Iron Ore Mining and Treatment in Australia, 1960-1978" by R.T. Madigan | 1824 - 1826                        |
| Exhibit "39NOB3"        | Copy letter Plaintiff to Hancock & Wright and attached statements                                             | 14th June 1979<br>1827 - 1831      |
| Exhibit "39NOB4"        | Copy letter Plaintiff to Hancock & Wright and attached statements                                             | 5th May 1981<br>1832 - 1837        |
| Exhibit "39NOB9"        | Copy letter Plaintiff's Solicitor to Messrs Keall Brinsden & Co.                                              | 30th August 1983<br>1838           |
| Exhibit "39NOB10"       | Copy letter Keall Brinsden & Co to Plaintiff's Solicitor                                                      | 16th September 1983<br>1839 - 1840 |
| Exhibit "39NOB11"       | Letter Plaintiff's Solicitor to Keall Brinsden & Co                                                           | 23rd September 1983<br>1841        |
| Exhibit "39NOB12"       | Copy letter Keall Brinsden & Co to Plaintiff's Solicitor                                                      | 6th October 1983<br>1842 - 1843    |
| Exhibit "40"            | Photograph of Tom Price Concentrator Mimic Panel, with enlargement                                            | 1983<br>1844                       |
| Exhibit "41A"           | Photograph of material on small screens                                                                       | 1983<br>1845                       |
| Exhibit "41B"           | Second print of exhibit "41A"                                                                                 | 1983<br>1846                       |
| Exhibit "42"            | Two photographs of material coming from primary wet screens                                                   | 1983<br>1847                       |
| Exhibit "43"            | Flow Chart of Concentrator Medium Drum Plant                                                                  | 30th July 1976<br>1848             |
| Exhibit "44"            | Chart of Isometric Arrangement of Tom Price Concentrator Plant                                                | 23rd June 1977<br>1849             |
| Exhibit "45"            | Affidavit of Ernest Archibald Maynard Wright                                                                  | 20th October 1983<br>1850 - 1852   |

| Description of Document | Date                                                                 | Page                              |
|-------------------------|----------------------------------------------------------------------|-----------------------------------|
| Exhibit "45EAW1"        | Copy backing Sheet of Agreement                                      | 1853                              |
| Exhibit "45EAW2"        | Bundle of correspondence                                             | Various<br>1854 - 1911            |
| Exhibit "45EAW3"        | Bundle of draft Agreements                                           | Various<br>1912 - 1975            |
| Exhibit "45EAW4"        | Copy letter Second Defendant to John Hohnen                          | 12th June 1962<br>1976 - 1977     |
| Exhibit "46"            | Affidavit of Ernest Archibald Maynard Wright                         | 24th October 1983<br>1978         |
| Exhibit "46EAW5"        | Copy letter F.S. Anderson to Second Defendant                        | 15th November 1962<br>1979 - 1982 |
| Exhibit "47"            | Copy pages 46 to 48 inclusive of "Mining Magazine" Jan. 1978 Edition | January 1978<br>1983 - 1985       |

DOCUMENTS NOT TRANSMITTED TO THE PRIVY COUNCIL

| Description of Document                                                                                                                     | Date                             | Page |
|---------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|------|
| <u>IN THE SUPREME COURT</u>                                                                                                                 |                                  |      |
| Affidavit of Neil Alexander Florence together with exhibit "A" thereto                                                                      | 20th December 1982               |      |
| Summons for Directions and order thereon                                                                                                    | 22nd April 1983<br>2nd June 1983 |      |
| Affidavit of Nicholas Paul Hasluck                                                                                                          | 30th May 1983                    |      |
| Exhibits "8DFT2-11" to the affidavit of Douglas Frederick Tompsitt sworn 24th May 1983 were not documents but were samples of iron ore feed |                                  |      |
| Exhibits "NOB5-8" to the Affidavit of Neville Oliver Boughton sworn 20th October 1983                                                       |                                  |      |
| <u>IN THE FULL COURT OF THE SUPREME COURT</u>                                                                                               |                                  |      |
| Notice of Motion in Appeal No 60 of 1984 for leave to Appeal to the Full Court                                                              | 13th February 1984               |      |

| Description of Document                                                                                     | Date               | Page |
|-------------------------------------------------------------------------------------------------------------|--------------------|------|
| Notice of Objection to Competency in Appeal 59 of 1984                                                      | 2nd March 1984     |      |
| Notice of Objection to Competency in Appeal 60 of 1984                                                      | 2nd March 1984     |      |
| Notice of Motion in Appeal No 59 of 1984 for leave to appeal to the Full Court                              | 13th March 1984    |      |
| Order in Appeal No 59 of 1984 (inter alia) for Appeals to be heard together and for one set of Appeal Books | 20th March 1984    |      |
| Order in Appeal No 60 of 1984 (inter alia) for Appeals to be heard together and for one set of Appeal Books | 20th March 1984    |      |
| Certificate of Correctness of Transcript of Hearing before the Honourable Mr Justice Olney                  | 4th May 1984       |      |
| Notice of Motion in Appeal No 59 of 1984 for leave to Appeal to Her Majesty in Council                      | 20th December 1984 |      |
| Notice of Motion in Appeal No 60 of 1984 for leave to Appeal to Her Majesty in Council                      | 20th December 1984 |      |
| Affidavit of Jack Raymond Wood in Appeal No 59 of 1984                                                      | 20th December 1984 |      |
| Affidavit of Jack Raymond Wood in Appeal No 60 of 1984                                                      | 20th December 1984 |      |
| Affidavit of Colin Roy Langridge in Appeal No 59 of 1984                                                    | 20th December 1984 |      |
| Affidavit of Colin Roy Langridge in Appeal No 60 of 1984                                                    | 20th December 1984 |      |
| Affidavit of Malcolm Roger Joseph Randall in Appeal No 59 of 1984                                           | 20th December 1984 |      |
| Affidavit of Malcolm Roger Joseph Randall in Appeal No 60 of 1984                                           | 20th December 1984 |      |

IN THE SUPREME COURT  
OF WESTERN AUSTRALIA

No. 2313 of 1982

IN THE MATTER of an Agreement between  
LANGLEY GEORGE HANCOCK, ERNEST  
ARCHIBALD MAYNARD WRIGHT, WRIGHT  
PROSPECTING PTY. LTD., HANCOCK  
PROSPECTING PTY. LTD, two other  
companies and HAMERSLEY IRON PTY.  
LIMITED.

B E T W E E N:

10

HAMERSLEY IRON PTY. LIMITED

Plaintiff

AND

LANGLEY GEORGE HANCOCK

First Defendant

ERNEST ARCHIBALD MAYNARD WRIGHT

Second Defendant

HANCOCK PROSPECTING PTY. LTD.

Third Defendant

WRIGHT PROSPECTING PTY. LTD.

Fourth Defendant

L.S.P. PTY. LTD.

Fifth Defendant

THE NATIONAL MUTUAL LIFE ASSOCIATION

OF AUSTRALASIA LIMITED

Sixth Defendant

AFFIDAVIT IN SUPPORT OF ORIGINATING SUMMONS

20

I, COLIN ROY LANGRIDGE of 54 Fitzroy Crescent, Dampier in the State of Western Australia, Manager Production Control and Technical Services, make oath and say as follows:

1. I am and have since 1967 been employed by the Plaintiff, which owns and operates an iron ore mine and concentrator at Tom Price. From

1150

EXHIBIT "1"-Affidavit of Colin Roy  
Langridge dated 2.9.82

"K. Langridge" W. Matthews

November, 1976 until March, 1978 I was Senior Project Engineer for the Plaintiff's concentrator construction project. From March, 1978 until July, 1982 I was General Superintendent, Ore Treatment at Tom Price with responsibility among other things for production at and maintenance of the concentrator. I am duly authorised to make this Affidavit on behalf of the Plaintiff. Except where otherwise indicated, I do so from my own knowledge.

2. Pursuant to an Agreement dated 12th December, 1962 ("the Agreement") between the First, Second, Third and Fourth Defendants ("the Vendors"), two other companies and the Plaintiff, the Vendors sold to the Plaintiff their right title and interest in certain Temporary Reserves of iron ore. Now produced and shown to me marked "Exhibit CRL1" is a true copy of the Agreement. By Clause 9 of the Agreement the Plaintiff undertook, subject to the precise terms of that clause, to pay to the Vendors a royalty on iron ore produced from those Temporary Reserves and sold or otherwise disposed of ("the Royalty").
  
3. I believe that by a Deed dated 22nd October, 1964 between the Vendors and one Lloyd Stanley Perron, the Vendors assigned to him a 15% interest in the Royalty ("the Perron Interest"). Now produced and shown to me marked "Exhibit CRL2" is a true copy of an Authority dated 12th November, 1967 given by the Vendors and others to the Plaintiff, Recital (b) of which refers to that Deed. I further believe that on 11th April, 1979 the Fifth Defendant became legal owner of the Perron Interest by virtue of certain trust arrangements with Mr. Perron and others and that by a Deed dated 25th October,

EXHIBIT "1"-Affidavit of Colin Roy  
Largridge dated 2.9.82

1151

"I believe that on 11th April, 1979 the Fifth Defendant became legal owner of the Perron Interest by virtue of certain trust arrangements with Mr. Perron and others and that by a Deed dated 25th October,

1979 the Fifth Defendant assigned all its right title and interest in the Perron Interest to the Sixth Defendant for a period of seven years and three months. Now produced and shown to me marked "Exhibit CRL3" is a true copy of a Notice of Assignment referring to those arrangements and that assignment.

4. Subject to paragraph 3, the Plaintiff is not aware of any dispositions or dealings by any of the Defendants in respect of the Royalty or any part thereof that are or purport to be of current effect.
  
5. I ask leave to refer to Clause 9 of the Agreement. Subject to the precise terms of that clause, the Royalty is 2.5% of the amount received on sale or other disposal of iron ore produced by the Plaintiff in unrefined and unmanufactured form f.o.b. the first port of shipment thereof. Clause 9(b) provides, in effect, that if iron ore is beneficiated or otherwise treated by the Plaintiff it shall be deemed to have been disposed of at the time beneficiation or other treatment (not being crushing or screening) begins. Clause 9(c) provides, in effect, that such iron ore shall be deemed to be disposed of at "the assumed f.o.b. price" and that expression is defined in Clause 9(e).
  
6. Clause 9(e) draws a distinction between the assumed f.o.b. price where the Plaintiff has during the period of six months immediately preceding the date of deemed disposal sold iron ore of the same grade quality and physical condition for shipment from Western Australia and the assumed f.o.b. price where the Plaintiff has not done so. In

1152

EXHIBIT "1"-Affidavit of Colin Roy  
Langridge dated 2.9.82

*CR Langridge*      *Colin Roy*



the latter case, failing agreement between the parties, the assumed f.o.b. price is such price as is determined by arbitration as representing the then price f.o.b. from such port as that from which the Plaintiff has usually shipped or proposes to ship iron ore. That port is and has always been the Port of Dampier.

7. All references to iron ore in this Affidavit, except the Paraburdoo ore referred to in the last sentence of paragraph 16, are references to iron ore won from the Temporary Reserve land as defined in Recital (g) to the Agreement. All references to dimensions are references to the nominal dimensions at which the material referred to is sized.<sup>10</sup> In this context, the nominal dimension of sizing means the average dimension at which the relevant sizing apparatus is designed to split the oversize material from the undersize material. This is sometimes called the "cut point" of the sizing apparatus.
  
8. The Plaintiff began working its iron ore mine at Tom Price in 1966 and began operating the concentrator in 1979. For the purposes of providing feed for the concentrator certain iron ore is brought by truck from the mine and sized by a grizzly into +200mm and -200mm ore. The +200mm ore then goes through a crushing and screening process, following which it is stockpiled ready for railing to<sup>20</sup> Dampier where it is blended and further screened prior to export. These proceedings are not concerned with that ore. The -200mm ore goes, via a separate stockpile, to "scalping" screens where it is sized into +80mm and -80mm ore. The +80mm ore then goes to secondary crushers which reduce it to -80mm ore.

EXHIBIT "1"-Affidavit of Colin Roy  
Langridge dated 2.9.82

1153

"CR Langridge's Affidavit dated 2.9.82"

9. The two streams of ore rejoin and go to bins. From each bin the ore falls down through a pulping box on to a metal plate from which it slides as a slurry on to a screen. Water is jetted on to it at high pressure in the pulping box and again immediately over the screen. The effect is to clean as well as to separate the ore because the water loosens and detaches the clayey shales and other fragments. The first screen sizes the wet material into +30mm and -30mm fractions. A further screen immediately below it sizes the -30mm material into +6mm and -6mm fractions. More water is jetted on to the material while it is on this screen with the same effect as that 10 described earlier. Three streams therefore emerge : material between 80 and 30mm; material between 30 and 6mm; and material of less than 6mm.

10. The -6mm material descends as a slurry through pipes on to a sieve bend and thence on to another screen, where it is further jetted with water, again with the same effect as that described in paragraph 9. The sieve bend and screen size the material into two fractions, one between 6mm and .5mm and the other below .5mm. That produces four streams :

- A - material between 80 and 30mm;
- B - material between 30 and 6mm;
- C - material between 6 and .5mm; and
- D - material of less than .5mm.



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11. Streams A, B and C each go to their own preparatory screens where the material is cleaned and separated a final time with further jets of

1154

EXHIBIT "1"-Affidavit of Colin Roy  
Langridge dated 2.9.82

*CR Langridge*

water. Any material of less than 6mm in stream A or B which has become detached from the larger pieces since the treatment described in paragraphs 9 and 10 falls through those preparatory screens and joins stream C. Material between 80 and 30mm and material between 30 and 6mm which is retained on those preparatory screens goes to revolving heavy media drums. At the preparatory screen for stream C, material between 6 and .5mm is retained and fed to heavy media cyclones; material of less than .5mm which has become detached from the larger pieces since its earlier treatment falls through the screen and goes to hydrocyclones where it is sized into two 10 fractions, one between .5 and .04mm and one of less than .04mm. (Before May, 1982 the sizing was effected at .063mm rather than .04mm.) The latter is then discarded. Both the drums and the heavy media cyclones make use of an unstable suspension of ferrosilicon in water with a specific gravity which permits the higher density iron ore ("concentrate") to sink and the lighter shaley material ("tailings") to float. The efficiency of the suspension in performing this task is greatly reduced if small particles of clayey shale and other material are not thoroughly removed from the material entering the drums and cyclones because those particles upset the 20 specific gravity and viscosity of the suspension. The ferrosilicon is itself later retrieved from both concentrate and tailings by further jetting with water on recovery screens.

12. Stream D material flows into sumps and is then pumped to hydrocyclones where it is sized into two fractions, one between .5 and .04mm and one of less than .04mm. (Again, before May, 1982, it was .063mm.) The latter is discarded. The former fraction, together

EXHIBIT "1"-Affidavit of Colin Roy  
Langridge dated 2.9.82

1155

*Colin Roy*

with material of the same size derived from the .5mm fraction of stream C goes to a wet high intensity magnetic separator ("WHIMS"). The WHIMS extracts the iron ore concentrate by working on its magnetic properties and gets rid of the non-ferrous tailings.

13. After the ferrosilicon has been washed off, concentrate between 80 and 30mm is reduced in size to -30mm by a further separate crushing and screening process before being put on the lump ore stockpile. Concentrate between 30 and 6mm goes directly to a lump ore stockpile after the ferrosilicon has been washed off. Concentrate between 6 and .5mm is "dewatered" in bunkers after the ferrosilicon has been washed off. It then goes to a fines stockpile. Concentrate between .5 and .04mm goes to horizontal pan filters which extract water from the concentrate by vacuum and thence to a fines stockpile.

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14. The concentrator is designed to run continuously 24 hours per day, 7 days per week. It was designed on a modular basis so that specific parts of the plant can be isolated and taken off line to effect repairs and maintenance and to control product grades and feed volumes. There are larger numbers of both cyclones and hydrocyclones than there are of drums or WHIMS. If it is necessary to close a cyclone, for example, the material that would have gone to it can be distributed amongst the other cyclone modules without significantly interrupting the flow of material through the plant. However, there is only one drum which handles material between 80 and 30mm and only two drums which handle material between 30 and 6mm. There are only two WHIMS which handle the material between .5 and .04mm. Because it

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*Colin Roy*

may not be, and in the case of material between 80 and 30mm is not, possible to distribute all the material which would have gone to these modules to a "spare" module, the plant was designed so that the flow of material for these stages could be diverted elsewhere to avoid a closure of the whole plant. It is therefore possible for stream A to by-pass its preparatory screens and drum and go straight to the separate crushing and screening process for ore between 80 and 30 mm referred to in paragraph 13 and thence to the lump stockpile. It is also possible for stream B to by-pass its preparatory screens and drums and go directly to the lump stockpile, and for the material between .5 and .04mm to by-pass the WHIMS and, after dewatering, go straight to the fines stockpile. These by-passes are used only for short-term maintenance. If lengthier maintenance is required then either an adjacent module is loaded to full capacity and the total plant throughput reduced, or the whole plant is stopped.

15. A further alternative exists by which the ore between 200 and 80mm which is scalped and crushed to below 80mm in the secondary crushers referred to in paragraph 8, need not rejoin the -80mm undersize which falls through the scalper. Instead, if the reach of the conveyor belt which takes it from the secondary crushers is extended, it can be sent direct to the further crushing and screening process referred to in paragraph 13 and thence to the lump ore stockpile. The design of the plant incorporated this alternative as a further means of controlling the grade and size distribution of ore sent through the treatment processes referred to in paragraphs 9 to 14. From the time the concentrator was commissioned until 1st March 1981, this part of

1157

EXHIBIT "1"-Affidavit of Colin Roy  
Langridge dated 2.9.82

"OK Langridge" [Signature]

the plant was run in that alternative mode. Since 1st March 1981, it has been run in the mode described in paragraph 8. Now produced and shown to me marked "Exhibit CRL4" is an isometric drawing illustrating the main processes described in paragraphs 8 to 15.

16. The ore the Plaintiff mines at Tom Price is a mixture of hematite and shale. The shale contains the bulk of certain non-ferrous elements which reduce the purity of the ore and consequently its effectiveness in steel-making. The most important impurities are alumina, silica and phosphorus. Most of the iron ore sold by the Plaintiff which comes from Tom Price is known as "High Grade Ore". Whilst it contains small proportions of impurities, High Grade Ore (also called "Direct Shipping Ore") is of sufficient natural purity to be sold without treating it other than by crushing and screening. Before being railed to Dampier, High Grade Ore is crushed to below 30mm, then sized by screens into lump ore (between 30 and 6mm) and fine ore (below 6mm). No part of it is discarded. No water is used except to control dust. In the course of mining its High Grade Ore the Plaintiff has had to extract other material which is too impure to be sold after merely crushing and screening in the way described above. The better part of this material includes all the "Low Grade Ore" the subject of these proceedings. The concentrator was designed to purify this ore, and was commissioned on 1st April, 1979. As described above, the concentrator increases the purity of the Low Grade Ore by both detaching and removing impurities from the hematite. This purified product is suitable for blending with High

*Colin Roy*

Grade Ore from Tom Price (which includes crushed and screened ore derived from the +200mm grizzly oversize referred to in paragraph 8) and ore from the Plaintiff's mining tenements at Paraburdoo to form a saleable commodity.

17. The Plaintiff has not (whether alone or in association with or by licence to others) since 22nd September, 1973 sold or disposed of any iron ore of a grade quality or physical condition the same as or similar to that fed into the concentrator. That date is more than six months prior to the date low grade ore was first fed into the concentrator except for small quantities which were processed for test purposes before it was commissioned.

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18. The Vendors have claimed that Royalty is due in respect of the Low Grade Ore referred to in paragraphs 16 and 17, but the Vendors and the Plaintiff have not been able to agree whether this is in fact the case or on an assumed f.o.b. price for the purposes of Clause 9(e)(ii). On 3rd June, 1981 they appointed Brian John Shaw, one of Her Majesty's Counsel for the State of Victoria, to be an arbitrator pursuant to that Clause, but no notice to arbitrate has been given by the Plaintiff or any of the Vendors.

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19. During July, 1981, it became apparent that the Vendors and the Plaintiff were also unable to agree on the point at which beneficiation or other treatment begins within the meaning of Clause 9(b). On 5th August, 1981 the Vendors' solicitor wrote to the Plaintiff's solicitor asking among other things whether the Plaintiff agreed with his clients' contention that beneficiation or other treatment begins "immediately after the preparation screens for the

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1159  
EXHIBIT "1"-Affidavit of Colin Roy  
Largrudge dated 2.9.82

feed to the heavy media drum plants and the heavy media cyclone plant and after the sieve bends and screens for the feed to the WHIMS plant". On 11th September, 1981 the Plaintiff's solicitor replied by letter to the effect that the Plaintiff considered that beneficiation or other treatment begins "at the wetting stage in the wetting and screening house". Now produced and shown to me marked "Exhibit CRL5" and "Exhibit CRL6" respectively are true copies of those two letters, and marked "Exhibit CRL7" is a true copy of an intended covering letter from the Plaintiff's solicitor to be delivered to the Vendors' solicitors together with the papers in these proceedings. 10

20. As the Vendors and the Plaintiff are still unable to agree on the true construction of Clause 9(b) I respectfully ask this Honourable Court to determine the question raised in the Originating Summons herein.

SWORN by the said COLIN )  
ROY LANGRIDGE at *B.umpsee*)  
this *2nd* day of )  
*September* 1982 )

*"CR Langridge"*

Before me

*"M. McHale" JP*

A Justice of the Peace

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Filed on behalf of the Plaintiff.

1160

EXHIBIT "1"-Affidavit of Colin Roy  
Langridge dated 2.9.82



EXHIBIT "1 CRL" - Copy Royalty Agreement  
between Defendants and  
Plaintiff dated 12.12.1962

( This exhibit is the Agreement )  
( that is the Schedule to the )  
( Notice of Appeal in Appeal No. )  
( 59 of 1984, being Document )  
( No. 6 herein, and is not reproduced )  
( here. )

1 9 6 7

Langley George Hancock  
Ernest Archibald Maynard Wright  
and  
others  
to  
Hamersley Iron Pty. Ltd.

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A u t h o r i t y

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STONE JAMES & CO.  
SOLICITORS  
PERTH. W.A. 6000



# WESTERN AUSTRALIAN STAMP DUTIES

17-NOV-67 302884 s . . D S/OLST \$\*\*\*1.00

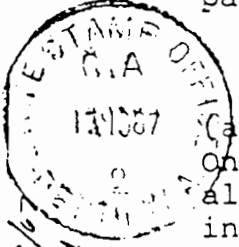
THIS INSTRUMENT UNDER SEAL is made the 17<sup>th</sup> day of November  
 One thousand nine hundred and sixty seven BETWEEN LANGLEY  
 GEORGE HANCOCK ERNEST ARCHIBALD MAYNARD WRIGHT and  
 WRIGHT PROSPECTING PTY. LTD. all formerly of 609 Wellingt  
 on Street Perth in the State of Western Australia and  
 HANCOCK PROSPECTING PTY. LTD. formerly of 150 Victoria .  
 Avenue Dalkeith in the said State but all now of or hav -  
 ing their registered offices situate at 88 Thomas Street 10  
 West Perth in the said State (hereinafter together called  
 "the Vendors") of the first part LLOYD STANLEY PERRON of  
 2 Duncraig Road Applecross in the said State Business .  
 Manager (hereinafter called "Perron") of the second part  
 SENTINEL MINING COMPANY INC. of 181 Saint George's Terra-  
 ce Perth in the said State (hereinafter called "Sentinel")  
 of the third part C.S.R. BUILDING MATERIALS SALES PTY. .  
 LTD. of 37 Saint George's Terrace Perth in the said State  
 formerly called AUSTRALIAN BLUE ASBESTOS PTY. LIMITED .  
 (hereinafter called "C.S.R. Building") of the fourth part  
 THE COMMERCIAL BANK OF AUSTRALIA LIMITED of 335-337-339 .  
 Collins Street in the City of Melbourne in the State of  
 Victoria and which has a branch office at 40 Saint George's  
 Terrace Perth in the said State of Western Australia .  
 (hereinafter called "the Commercial Bank") of the fifth  
 part

WHEREAS :

(a) By an Agreement dated the Twelfth day of December  
 One thousand nine hundred and sixty two between inter .  
 alia the Vendors and HAMERSLEY IRON PTY. LTD. of 95 Coll- 20  
 ins Street Melbourne in the said State of Victoria (here-  
 inafter called "Hamersley") (hereinafter called "the Agr-  
 eement") Hamersley agreed to make to the Vendors in the  
 events in the Agreement mentioned certain payments as  
 more particularly described therein

(b) By a Deed dated the Twenty second day of October  
 One thousand nine hundred and sixty-four between the Vend- 30  
 ors of the one part and Perron of the other part the Vend-  
 ors AGREED AND DECLARED that Perron had acquired a FIFT -  
 EEN (15) per centum interest in the Agreement and in the  
 venture the subject thereof

(c) By absolute assignments in writing dated respectiv-  
 ely the Twenty sixth day of October One thousand nine hun-  
 dred and sixty four and Twenty third day of December One  
 thousand nine hundred and sixty-five the Vendors assigned



Agreement dated 17/11/67  
 Stamped \$ 1166.10.00  
 \$ 11.00

for Commissioner of Stamps.

EXHIBIT "LCRL2" - Copy Deed of  
 Authority dated 12.12.67

to Sentinel by way of security in the case of the firstly mentioned assignment all their right title and interest in the royalties payable to them under the Agreement and in the case of the secondly mentioned assignment all the Vendors right title and interest in the Agreement and the royalties and other moneys payable to the Vendors there - under (other than a fifteen per centum interest acknowledged in the said absolute assignments to have been acquired by Perron in the royalties expressed in the Agreement to be payable to the Vendors) and notice of such assignments was duly given Hamersley by notices in writing to Hamersley dated respectively the Twenty seventh day of September One thousand nine hundred and sixty-five and the Twenty-third day of December One thousand nine hundred and sixty-five and confirmed by a notice dated the Third day of April One thousand nine hundred and sixty - seven

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(d) By an absolute assignment in writing dated the Fifteenth day of March One thousand nine hundred and sixty seven the Vendors assigned to C.S.R. Building by way of security all the Vendors right title and interest in the royalties and other moneys payable to the Vendors under the Agreement (other than a fifteen per cent interest acknowledged in the said absolute assignment to have been acquired by Perron in the royalties expressed in the Agreement to be payable to the Vendors) and C.S.R. Building has given to Hamersley notice in writing of such absolute assignment dated the Fourteenth day of September One thousand nine hundred and sixty seven

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(e) By two Indentures of Assignment dated respectively the Twenty first day of March One thousand nine hundred and sixty-seven and the Fourth day of August One thousand nine hundred and sixty-seven the Vendors made absolute assignments to the Commercial Bank of all the Vendors right title and interest in all moneys whether by way of royalty or otherwise secured or payable under or by virtue of the Agreement and all interest thereon and other moneys to be or become payable under or by virtue of the Agreement (other than a fifteen per cent interest acknowledged in a further Indenture of the 19th April 1967 to have been acquired by Perron in the royalties expressed in the Agreement to be payable to the Vendors) to secure various amounts advanced or to be advanced by the Commercial Bank to the Vendors and interest thereon and notice of such absolute assignments was duly given to Hamersley by notices in writing dated the Second day of May One thousand nine hundred and sixty seven and the Fourth day of September One thousand nine hundred and sixty-seven

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(f) The parties hereto have agreed to give this irrevocable authority to Hamersley to make payments out of the moneys to become payable to the Vendors under the Agreement in respect of the sale or other disposal of iron ore (hereinafter called "the royalties") in manner hereinafter provided

NOW THIS INSTRUMENT UNDER SEAL WITNESSETH as follows:

1. The Vendors, Perron, Sentinel, C.S.R. Building and the Commercial Bank do and each of them DOETH HEREBY IRREVOCABLY . AUTHORISE Hamersley after the repayment of the sum of TWO HUNDRED THOUSAND DOLLARS (\$200,000) to Hamersley in accordance with Clause 8 of the Agreement out of the first TWO HUNDRED THOUSAND DOLLARS (\$200,000) of the royalties to pay the same to Perron until Hamersley has paid to Perron the sum of THIRTY FIVE THOUSAND TWO HUNDRED AND NINETY FOUR DOLLARS . (\$35,294) and thereafter to pay out of any further royalties as they from time to time become payable in each case FIFTEEN (15) per centum thereof to Perron and as to the balance of such royalties in the following priorities:

(a) Provided that Sentinel has not by then given to Hamersley the notice hereinafter referred to in this Paragraph to pay the same to Sentinel until Hamersley has paid to Sentinel the sum of EIGHT HUNDRED AND SEVENTY TWO THOUSAND FIVE HUNDRED AND EIGHTY TWO DOLLARS (\$872,582) or until Sentinel gives to Hamersley notice in writing that Sentinel has reassigned to the Vendors all the right title and interest assigned by the Vendors to Sentinel under the absolute assignments in writing of the Twenty sixth day of October One thousand nine hundred and sixty-four and the Twenty-third day of December One thousand nine hundred and sixty five whichever event shall first occur

(b) After payment of all amounts payable under Paragraph (a) of this Clause and provided that C.S.R. Building has not by then given to Hamersley the notice hereinafter referred to in this Paragraph to pay the same to C.S.R. Building until Hamersley has paid to C.S.R. Building the sum of EIGHT HUNDRED AND NINETY-NINE THOUSAND TWO HUNDRED AND FIFTY DOLLARS (\$899,250) or until C.S.R. Building gives to Hamersley notice in writing that C.S.R. Building has re-assigned to the Vendors all the right title and interest assigned by the Vendors

C.S.R. Building under the absolute assignment in writing of the Fifteenth day of March One thousand nine hundred and sixty-seven whichever event shall first happen

- (c) After payment of all amounts payable under each of paragraphs (a) and (b) of this Clause and provided that the Commercial Bank has not by then given to Hamersley the notice hereinafter referred to in this Paragraph and that the certificate and authority hereinafter in this paragraph referred to have not been delivered to Hamersley to pay the same to the Commercial Bank until the Commercial Bank gives to Hamersley notice in writing that it has re-assigned to the Vendors all the right title and interest assigned by the Vendors to the Commercial Bank by the Indenture of Assignment of the Twenty first day of March One thousand nine hundred and sixty seven and the Fourth day of August One thousand nine hundred and sixty-seven or the Vendors deliver to Hamersley a Certificate from the Commercial Bank to the effect that the Vendors are no longer indebted to it and an authority from the Commercial Bank to Hamersley authorising it henceforth to pay the same to the Vendors in accordance with the provisions of the Agreement whichever event shall first happen

- (d) After payment of all amounts payable under each of Paragraphs (a) (b) and (c) of this clause to pay the same to the Vendors in accordance with the provisions of the Agreement

3. Hamersley may pay all moneys -

- (a) Payable to Perron hereunder to the credit of the account styled "L.S. Perron - Trust Account" with the Bank of New South Wales, Head Office, Perth
- (b) All moneys payable to Sentinel to the credit of the account styled "Sentinel Mining Company Inc." with the National Bank of Australasia Limited of 48 Saint George's Terrace Perth
- (c) All moneys payable to C.S.R. Building to the credit of the account styled "Colonial Sugar Refining Company Limited with the Bank of New South Wales, Commerce Branch, 65 Saint George's Terrace, Perth
- (d) All moneys payable to the Commercial Bank to the Commercial Bank at 40 Saint George's Terrace Perth in the said State of Western Australia

BW  
10/11/67  
B.W.

and the receipt of the said Bank of New South Wales Head Office the said National Bank of Australasia Limited the said Bank of New South Wales Commerce Branch and the said Commercial Bank shall be a full and sufficient discharge to Hamersley for all royalties so paid and as effective for all purposes as a receipt therefor given by Perron Sentinel or C.S.R. Building or the Commercial Bank

10/11/67  
B.W.  
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B.W.

3. This Agreement shall be binding on the personal representatives successors and assigns of the parties hereto as the case may be and any reference to a party herein shall include a reference to his or its personal representatives successors or assigns

IN WITNESS whereof the parties hereto have here unto executed this instrument the day and year hereinbefore written

Signed Sealed and Delivered by the said LANGLEY GEORGE HANCOCK in the presence of:  
B.W. Hancock

L. G. Hancock



Signed Sealed and Delivered by the said ERNEST ARCHIBALD MAYNARD WRIGHT in the presence of:  
B.W. Hancock

E. M. Wright



THE COMMON SEAL of WRIGHT PROSPECTING PTY. LTD. was hereunto affixed by the Governing Director ERNEST ARCHIBALD MAYNARD WRIGHT in accordance with the Articles of Association



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E. M. Wright

5.

THE COMMON SEAL of HANCOCK PROSPECTING PTY. LTD. was hereunto affixed by the Governing Director LANGLEY GEORGE HANCOCK in accordance with the Articles of Association



*L. G. Hancock*

Signed Sealed and Delivered by the said LLOYD STANLEY PERRON in the presence of :

*L. Perron*



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*Joan Blackmore*

Sealed with the Seal of ROBERT ERNEST BLANCKENSEE as Attorney for Sentinel Mining Company Inc. in the presence of:

SENTINEL MINING COMPANY INC  
By its Attorney

*R. Blundstone*



*R. Blundstone*

THE COMMON SEAL of C.S.R. BUILDING MATERIALS SALES PTY. LTD. was hereunto affixed by authority of the Directors and in the presence of:

*Malcolm King*

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*R. [unclear]*

Secretary

*Secy. initial  
in red ink*

*MAF  
MAF  
ed*

SIGNED SEALED AND DELIVERED BY ~~THE COMMON SEAL OF~~ HENRY HALL JACKSON the Attorney for THE COMMERCIAL BANK OF AUSTRALIA LIMITED and signed by ~~him~~ on behalf of the said Bank in the presence of :-

*H. Hall Jackson*



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*a. Linnick Ryan*

*C. D. Peck wa.*

*A. [unclear] [unclear]*



NOTICE OF ASSIGNMENT

L.S.P. PTY. LIMITED

C.R. FIELDHOUSE  
SOLICITOR  
45 MACQUARIE STREET  
SYDNEY N.S.W.

to: Hamersley Iron Pty. Limited.

NOTICE OF ASSIGNMENT

L.S.P. PTY. LIMITED a company incorporated in the State of Western Australia and having its registered office at 46 Terrace Road, Perth in the said State HEREBY NOTIFIES HAMERSLEY IRON PTY. LIMITED that the said L.S.P. Pty. Limited (as successor in title to LLOYD STANLEY PERRON to all the right title and interest of the said Lloyd Stanley Perron in a certain royalty agreement entered into between inter alia Hamersley Iron Pty. Limited and Langley George Hancock and Ernest Archibald Maynard Wright and Wright Prospecting Pty. Limited and Hancock Prospecting Pty. Limited by virtue of a certain deed of change of trustees dated 11 April, 1979 made between Leonard Michael Brennan, Lloyd Stanley Perron, Geoffrey John Gadsdon and the said L.S.P. Pty. Limited whereby L.S.P. Pty. Limited was appointed trustee of a trust duly constituted as The Brennan Trust) has by deed of even date to these presents assigned unto The National Mutual Life Association of Australasia Limited all that the right title and interest of L.S.P. Pty. Limited in the aforesaid royalty agreement for a period of seven (7) years and three (3) months commencing from the date hereof.

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L.S.P. PTY. LIMITED hereby directs Hamersley Iron Pty. Limited to pay all monies otherwise payable by the said Hamersley Iron Pty. Limited to Lloyd Stanley Perron or the said L.S.P. Pty. Limited to The National Mutual Life Association of Australasia Limited or as it may direct for the period of seven (7) years and three (3) months commencing from the date hereof.

Dated the Twenty Fifth day of October 1979



SIGNED for and on behalf of )  
L.S.P. PTY. LIMITED by )  
CARNEGIE RICHMOND HALLETT )  
FIELDHOUSE its duly authorized )  
attorney pursuant to Power of )  
Attorney dated 23 October, )  
1979 who states that he has )  
no notice of revocation of the )  
said power pursuant to which )  
he has now executed this )  
notice in the presence of: )

*[Handwritten signature]*  
.....

L.S.P. PTY. LIMITED  
by its attorney.

*[Handwritten signature]*  
ELIZABETH CHAMBERLAIN  
Solicitor  
*[Handwritten initials]*

I, LLOYD STANLEY PERRON hereby confirm that the abovementioned L.S.P. PTY. LIMITED is entitled pursuant to the aforesaid deed of change of trustees to receipt of all monies otherwise payable by Hamersley Iron Pty. Limited to myself in respect of the right title and interest previously held by me in the aforesaid royalty agreement and hereby confirm the direction by the abovementioned L.S.P. PTY. LIMITED for payment of all such monies to be made to The National Mutual Life Association of Australasia Limited or as it may direct in terms of the above notice.

SIGNED for and on behalf of )  
LLOYD STANLEY PERRON by )  
CARNEGIE RICHMOND HALLETT )  
FIELDHOUSE his duly authorized )  
attorney pursuant to Power of )  
Attorney dated 23 October, )  
1979 who states that he has )  
no notice of revocation of the )  
said power pursuant to which )  
he has now executed these )  
presents in the presence of: )

*Richard*

*[Handwritten Signature]*  
.....

LLOYD STANLEY PERRON  
by his attorney.

*25/10/79*

EXHIBIT "ICRL4" - Copy plan  
 Isometric Arrangement of Tom Price  
 Concentrator Plant dated 16.7.80

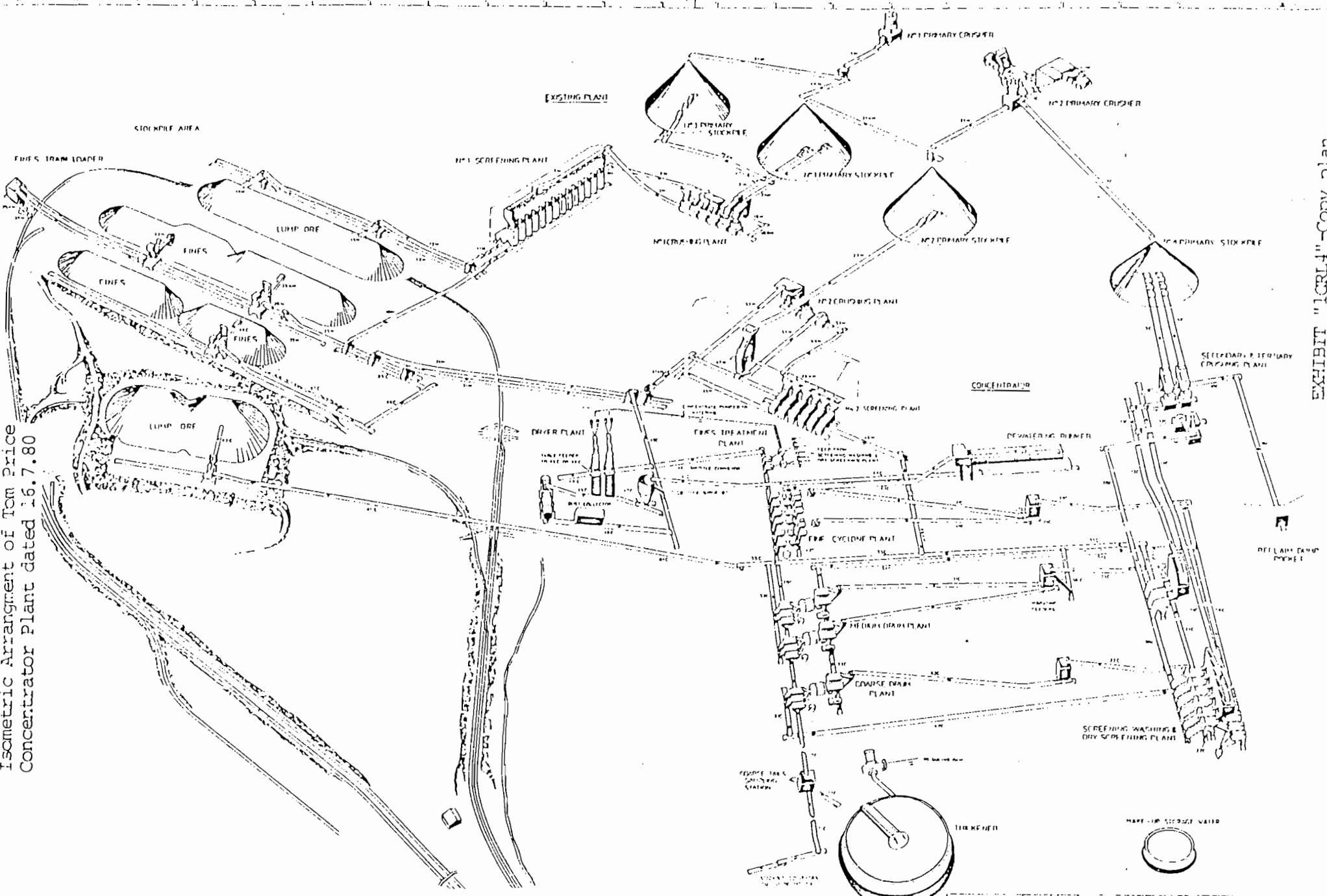


EXHIBIT "ICRL4" - Copy plan  
 Isometric Arrangement of Tom Price  
 Concentrator Plant dated 16.7.80

|                                                           |  |                                                                                                                       |  |                                     |
|-----------------------------------------------------------|--|-----------------------------------------------------------------------------------------------------------------------|--|-------------------------------------|
| PROJECT NO. 1001<br>DRAWING NO. 1001-1001<br>DATE 16.7.80 |  | <b>HAMERSLEY IRON PTY. LIMITED</b><br>TOM PRICE TREATMENT PLANT<br>ISOMETRIC ARRANGEMENT<br>PROPOSED LAYOUT JULY 1980 |  | SHEET NO. 1001-1001<br>OF 1001-1001 |
|-----------------------------------------------------------|--|-----------------------------------------------------------------------------------------------------------------------|--|-------------------------------------|

*C. R. Fieldhouse*  
Solicitor

*13-15 Macquarie St., Sydney, N.S.W. Australia*

TELEPHONE: (02) 231 2377

TELEX: AACC041

5 August 1981

Mr. A.W. Patterson,  
Legal Officer,  
Hamersley Iron Pty Limited,  
55 Collins Street,  
MILBOURNE, VIC. 3000

Dear Sir,

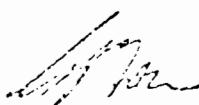
Re: Proposed arbitration between Hancock & Wright  
and Hamersley Iron Pty Limited concerning Royalties

In order to clarify the ambit of the proposed arbitration would you kindly advise your client's attitude to the following matters.

1. Our client contends that the point at which "beneficiation or other treatment begins" within the meaning of clause 9 (b) of the 1962 agreement is immediately after the preparation screens for the feed to the heavy media drum plants and heavy media cyclone plant and after the sieve bends and screens for the feed to the WIMS plant. Does your client agree? If not, where<sup>20</sup> is the point at which your client contends that "beneficiation or other treatment begins".
  2. If no to our client's contention to question 1, does your client agree that the submission to arbitration in clause 9 (e) (ii) empowers the arbitrator to resolve such question in the course of determining "The assumed F.O.B. price"?
  3. Does your client agree that the submission to arbitration in clause 9 (e) (ii) empowers the arbitrator to resolve the questions of:
    - (a) tonnages;
    - (b) characteristics;
- 30
- of ore passing through the point at which "beneficiation or other treatment begins" during the period or periods in respect of which royalties are claimed?
4. If no to any part of questions 2 and 3, does your client agree to extending the submission to arbitration to enable the arbitrator to resolve each of these matters?

To enable appropriate proceedings to be taken should agreement not be reached on these matters this is an open letter, and an open reply is requested. 40

Yours faithfully,



C.R. FIELDHOUSE

EXHIBIT "1CRL5"-Copy letter C R  
Fieldhouse to Plaintiff's  
Solicitor dated 5.8.83



HAMERSLEY IRON PTY. LIMITED

(INCORPORATED IN VICTORIA)

55 COLLINS STREET, MELBOURNE, 3001

Our Ref: 110-5-6

PO BOX 2841AA  
MELBOURNE, AUSTRALIA 3001  
TELEGRAMS: "CONRIO"  
TELEX: AASD108  
TELEPHONE (AREA CODE 03)  
SWITCHBOARDS: 658 1133  
DIRECT LINE: 658

September 11, 1981 10

Mr C.R. Fieldhouse  
Solicitor  
43-45 Macquarie Street  
SYDNEY N.S.W. 2000

Dear Sir,

Re: Hamersley and Hancock & Wright

I refer to your letter of 5th August 1981.

My client does not agree with your client's interpretation of the point at which "beneficiation or other treatment begins" within the meaning of clause 9 (b). In our view, it begins at the wetting stage in the wetting and screening house. 20

We think it is very doubtful indeed whether the arbitrator is authorised to resolve that question or to decide the characteristics of ore passing through the point at which "beneficiation or other treatment begins". We think it clear, with respect, that the arbitrator cannot determine the tonnages of such ore because he is concerned only with a price, which if positive would be expressed in terms of dollars or cents per tonne. 30

As at present advised, my client does not agree to extending the submission to arbitration to enable the arbitrator to resolve any of those questions. I should however be pleased to confer with you as to the best approach to resolving them, or it may be useful to arrange a conference with counsel for both sides.

Yours faithfully,

A.W. Patterson  
Legal Officer

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1174

EXHIBIT "LCRL6"-Copy letter  
Plaintiff's Solicitor to C R  
Fieldhouse dated 11.9.81

TEXT OF LETTER TO MR. FIELDHOUSE

I refer to my letter of 11th September, 1981 concerning the scope of the arbitration and to Mr. Barlow's recent telephone conversation with Mr. Wright.

We have confined the enclosed Originating Summons to the critical issue of when "beneficiation or other treatment begins" within the meaning of clause 9(b). The Arbitrator needs to know that before he can begin his task and it is in the interest of all parties to have an authoritative determination as early as possible. That seems to be common ground.

Subject to agreeing on a precise amendment to the Arbitrator's terms of reference, my client would be prepared to agree that he should ascertain the 10 characteristics of ore passing through the point which the Court determines to be the point where "beneficiation or other treatment begins". That would seem to be a more suitable issue for the Arbitrator than for the Court.

We maintain our position that the Arbitrator cannot determine the tonnages of ore because he is concerned only with a price, but we acknowledge that he would be entitled and may be required to take tonnages into account in determining a price per unit.

I trust that the submission of the first question to the Court and the suggestions in this letter go some way towards resolving the issues raised in your letter of 5th August, 1981. 20

Yours faithfully,

A. W. PATTERSON

CRA Legal Department, Perth

1175

EXHIBIT "1 CRL7"- Copy text of  
letter Plaintiff's Solicitor to  
C R Fieldhouse

IN THE SUPREME COURT  
OF WESTERN AUSTRALIA

IN THE MATTER of an Agreement between  
LANGLEY GEORGE HANCOCK, ERNEST  
ARCHIBALD MAYNARD WRIGHT, WRIGHT  
PROSPECTING PTY. LTD., HANCOCK  
PROSPECTING PTY. LTD., two other  
companies and HAMERSLEY IRON PTY.  
LIMITED

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B E T W E E N:

HAMERSLEY IRON PTY. LIMITED

Plaintiff

AND

LANGLEY GEORGE HANCOCK

First Defendant

ERNEST ARCHIBALD MAYNARD WRIGHT

Second Defendant

HANCOCK PROSPECTING PTY. LTD.

Third Defendant

20

WRIGHT PROSPECTING PTY. LTD.

Fourth Defendant

L.S.P. PTY. LTD.

Fifth Defendant

THE NATIONAL MUTUAL LIFE ASSOCIATION  
OF AUSTRALASIA LIMITED

Sixth Defendant

AFFIDAVIT

I, COLIN ROY LANGRIDGE of 54 Fitzroy Crescent, Dampier in the State of  
Western Australia, Manager Production Control and Technical Services, make  
oath and say as follows:

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1. I ask leave to refer to my Affidavit sworn on 2nd September, 1982 and  
filed with the Originating Summons herein. I am duly authorised to make  
this further Affidavit on behalf of the Plaintiff. Except where  
otherwise indicated, I do so from my own knowledge.
2. The Fourth Schedule to the Agreement which is "Exhibit CRL1" to my first  
Affidavit is an Agreement made on 4th May, 1962 relating to Temporary  
Reserve No. 2436H and the land comprised therein. Now produced and  
shown to me marked "Exhibit CRL8" is a true copy of that Agreement.

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*"C.R. Langridge"*

1176

*"B.J. Allen brought JP"*



3. As mentioned in paragraph 8 of my first Affidavit, the Plaintiff began working its iron ore mine at Tom Price in 1966 and began operating the concentrator in 1979. Crushing and screening processes were used from 1966, but they were all dry processes until the concentrator was built. The only use of water was to control dust. The Plaintiff's High Grade Ore facility at Tom Price is an example of the kind of processes used. Some Low Grade Ore similar to that fed to the concentrator was also crushed and screened from time to time, but always by dry processes, in the period before the concentrator commenced operation. 10
4. I refer to the first sentence of paragraph 11 of my first Affidavit. The Stream C material is repulped in a distributor and then passes over a sieve bend before going to its preparatory screen. The pulp removed at the sieve bend joins the material of less than .5mm referred to in the fourth sentence of paragraph 11.
5. I refer to paragraphs 10, 11 and 12 of my first Affidavit and in particular to the references therein to material of less than .5mm contained in Stream D and in the undersize from Stream C. When that material enters the hydrocyclones it is in slurry form. To the best of my knowledge and belief, the sale or shipment of iron ore in slurry form was unknown and undeveloped anywhere in the world in 1962 and Australian iron ore has never been sold or shipped in slurry form. 20
6. Since I swore my first Affidavit the only significant change that has occurred in the operation of the concentrator is the trial installation of a pool washing deck and facilities for enhanced water injection in one of the six modules. 30
7. I depose to the matters in paragraph 3 hereof from my own knowledge as regards the period from August, 1967 on. I verily believe that those

EXHIBIT "2"-Affidavit of Colin Roy  
Langridge dated 24.5.33

C. R. Langridge "

B. J. Attenborough JP "

matters were also true in the period from June 1966, when crushing and screening of iron ore began, to August 1967.

SWORN by the said COLIN )  
ROY LANGRIDGE at *Jampri* )  
in the State of *Western Australia* )  
this *24<sup>th</sup>* day of )  
*May* 1983. )

" *C.R. Langridge* "

Before me:

*B. J. Attenborough J.P.*  
A Justice of the Peace

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Filed on behalf of the Plaintiff.



EXHIBIT "2"-Affidavit of Colin Roy  
Langridge dated 24.5.83

10-0-0



AN AGREEMENT made the 4<sup>th</sup> day of May 1962 .  
BETWEEN ARTHUR VIVEASH BARRETT-LENNARD FRANK ST. AUBYN .  
BARRETT-LENNARD and EDWARD GUY BARRETT-LENNARD all of .  
Boolaloo Station Via Onslow in the State of Western Austral-  
ia HANCOCK PROSPECTING PTY. LIMITED of 150 Victoria .  
Avenue Dalkeith in the said State and LANGLEY GEORGE HAN-  
COCK ERNEST ARCHIBALD MAYNARD WRIGHT and WRIGHT PROSPECT-  
ING PTY. LIMITED all of 509 Wellington Street Perth in the. 10  
said State (hereinafter called "the Vendors" which express-  
ion shall wherever the context permits include the Vendors .  
and each of them and their and each of their respective .  
personal representatives successors and assigns) of the one.  
part) and RIO TINTO SOUTHERN PTY. LIMITED the registered .  
office of which is at 408 Collins Street Melbourne in the .  
State of Victoria (hereinafter called "the Purchaser" which.  
expression shall wherever the context permits include the .  
successors and assigns of the Purchaser) of the other part .  
WHEREAS the parties hereto other than the said LANGLEY . 20  
GEORGE HANCOCK and ERNEST ARCHIBALD MAYNARD WRIGHT are .  
the applicants under the Mining Act 1904 and its amendments.  
of the State of Western Australia for the Temporary Reserve.  
for iron ore in respect of the area described in the applica-  
-tion therefor dated the 27th day of September 1961 and .  
signed and sealed by the parties hereto (hereinafter called.  
"the Mining Title" which expression wherever herein used .

B. J. Allenborough JK

shall include any leases or other mining tenements herein- .  
after granted to the parties hereto or any of them in respect  
of the whole or any part or parts of the areas comprised in .  
the said Temporary Reserve) AND WHEREAS the parties hereto.  
now desire to define the separate rights of the Vendors and .  
the Purchaser in and to the said Mining Title and to define .  
the terms on which the Purchaser may acquire the whole inter- 10  
est in the said Mining Title

NOW IT IS HEREBY AGREED AS FOLLOWS :-

1.       THE Vendors hereby grant to the Purchaser the sole and.  
exclusive option (hereinafter called "the said Option") to .  
acquire the whole of the legal and beneficial interest in the  
said Mining Title free from encumbrances and all the right . 20  
title and interest of the Vendors in and to the areas of land  
comprised therein
2.       THE coming into operation of this agreement other than.  
Clause 5 hereof is conditional on the granting of the said .  
Temporary Reserve or upon the Purchaser receiving assurance .  
to its satisfaction from the Department of Mines Perth in . 30  
relation to the granting or intended granting thereof and .  
upon fulfilment of this condition the Purchaser shall notify.  
the Vendors in writing accordingly and the said option shall.  
come into operation as from the giving of such notice PROVID-  
ED ALWAYS that the Purchaser may waive the aforesaid condi- .  
tion
3.       THE Purchaser shall pay all expenses of and in connect. 10  
-ion with obtaining a grant of the said Mining Title.

EXHIBIT "2 CRL8" - Copy Agreement  
between A.V. Barrett - Leonard and  
others and Rio Tinto Southern  
Pty Ltd dated 4.5.62

2017

4. \_\_\_\_\_ THE said option shall unless sooner determined as ..  
hereinafter provided continue for a period of two years from  
the date on which the said Temporary Reserve shall be grant-  
ed.

5. \_\_\_\_\_ THE consideration for the said option and the other .  
rights hereby granted shall be the sum of ONE THOUSAND .  
POUNDS (£1,000) which shall be payable to the Vendors on .  
the execution by the Vendors of this Agreement.

6. \_\_\_\_\_ (a) After the expiration of a period of SIX (6) 10  
months from the date of this Agreement the  
Vendors may but subject to Clause 8 hereof  
give notice in writing to the Purchaser of  
their intention to determine the said option  
unless the sum of SIX THOUSAND POUNDS  
(£6,000) shall be paid to the Vendors by  
the Purchaser within FOURTEEN (14) days  
after service of such notice on the Purchaser

(b) After the expiration of a period of EIGHTEEN 20  
(18) months from the date of this Agreement  
the Vendors may but subject to Clause 8  
hereof give notice in writing to the Purch-  
aser of their intention to determine the  
said option unless the sum of TWENTY-THREE  
THOUSAND POUNDS (£23,000) shall be paid to  
the Vendors by the Purchaser within FOURTEEN  
(14) days after service of such notice on  
the Purchaser

EXHIBIT "2 CRL8"-Copy Agreement  
between A.V. Barrett - Leonard and  
others and Rio Tinto Southern  
Pty Ltd dated 4.5.62

"BJA"

(c) In the event of the Purchaser failing to make a payment pursuant to the terms of a notice given pursuant to paragraph (a) or paragraph (b) of this Clause the said option shall cease and determine at the expiration of the period of FOURTEEN (14) days referred to in the notice

7. \_\_\_\_\_ THE Purchaser may exercise the said option from time to time by notice in writing to the Vendors specifying the lease, leases or other tenement or tenements forming part of the said Mining Title over which the said option is then being exercised and the Vendors shall within SEVEN (7) days after receipt of such notice (if they have not already done so pursuant to Clause 14 hereof) execute or cause to be executed all necessary and proper transfers and other documents effectually to vest the same in the Purchaser free from encumbrances and shall deliver or cause to be delivered such transfers and other documents and the relative instrument or instruments of Title to the Purchaser for registration

8. \_\_\_\_\_ AS consideration for the transfer to the Purchaser of the lease leases tenement or tenements forming part of the Mining Title and the rights to mine respectively granted thereby which are acquired by the Purchaser hereunder the Purchaser shall

(a) if the same shall not have already been paid pay to the Vendors the amounts referred to in Clause 6 hereof but without any demand or notice

EXHIBIT "2 CRL3"-Copy Agreement  
between A.V. Barrett - Leonard and  
others and Rio Tinto Southern  
Pty Ltd dated 4.5.62

BDA

from the Vendors as is required by Clause 6 hereof

(b) pay to the Vendors in respect of all minerals produced by the Purchaser from the Mining Title and sold or otherwise disposed of by the Purchaser in an unrefined and unmanufactured state an amount equal to -

(i) in the case of each sale by the Purchaser of minerals F.O.B. Depuch or other port of shipment thereof to other than a subsidiary or associated company of the Purchaser  $2\frac{1}{2}$  per centum of the sale price and

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(ii) in the case of any other sale or a disposal by treatment or otherwise of minerals -

(1) Where the Purchaser has within the period of SIX (6) calendar months preceding the date of sale or disposal sold minerals of the same grade F.O.B. Depuch or other port of shipment thereof  $2\frac{1}{2}$  per centum of the amount which the Purchaser would have received as the sale price of such minerals had it on the date of sale or disposal sold the mineral at a price equal to the last price at which the Purchaser sold minerals within the said period of SIX (6) calendar months of the same grade F.O.B. as aforesaid or

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(2) If the Purchaser has made no sale of minerals of the same grade F.O.B. Depuch or other port of shipment within the six calendar months preceding the sale or disposal to enable the calculation referred to in paragraph (1) to be made then  $2\frac{1}{2}$  per cent of the amount which the Purchaser would have received if on the date of sale or disposal of the minerals the Purchaser had sold the same at a price which the parties agree represents and/or in default of agreement which is fixed by arbitration in accordance with the Arbitration Act 1895 as representing

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EXHIBIT "2 CRLS"-Copy Agreement  
between A.V. Barrett - Leonard and  
others and Rio Tinto Southern  
Pty Ltd dated 4.5.62

BDA

the price F.O.B. Depuch or other Port from which the Purchaser has usually shipped minerals produced from the Mining Title or other Mining Titles in the Pilbara District which a willing but not anxious Purchaser would be prepared to pay for minerals of the same grade at the date of sale or disposal

PROVIDED that payment to the Vendors in accordance with this paragraph (b) shall operate as a discharge of the Purchaser from any liability which may or would otherwise attach to the Purchaser to make any payments of a like nature to the Vendors or any of them under any other agreement in respect of those minerals

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- (c) For the purposes of paragraph (b) of this Clause a sale of minerals C.I.F. shall be deemed to be a sale F.O.B. at a price equal to the difference between such C.I.F. price and the sum of insurance and freight taken into account in calculating such C.I.F. price

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9.      IN the event of the Purchaser selling any lease or tenement in respect of which an obligation to pay any amount has arisen or may arise pursuant to Clause 8 hereof the Purchaser shall at its option either obtain from the buyer thereof a covenant binding such buyer to make payments to the Vendors in the terms of Clause 8 hereof or pay to the Vendors an amount equivalent if such sale is completed before the 1st day of July 1963 to FIFTY per cent (50%) and in any other case to THIRTY-THREE AND ONE THIRD per cent (33-1/3rd%) of the Purchaser's net profit on such sale after deducting all its expenditure on or in connection with that lease or tenement up to the date of sale. In this clause "expenditure" shall mean direct expenditure on the lease or tenement in question (including salaries and wages of personnel working thereon) plus an amount equal to TWENTY

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per cent (20%) thereof to cover indirect expenditure including overheads

10. \_\_\_\_\_ DURING the period of the said option the Purchaser shall from time to time reimburse to the Vendors all lease rentals and other fees paid by the Vendors in respect of the said Mining Title and relating to the period from the 27th day of September 1961 (which said lease rentals shall if necessary be apportioned accordingly) other than such of them in respect of which the said option has been abandoned. 10

11. \_\_\_\_\_ DURING the continuance of the said option the Vendors will at the request and cost of the Purchaser promptly join with the Purchaser in applying for and will use their utmost endeavours to obtain any rights which the Purchaser may require or consider necessary or advisable for the purpose of obtaining a better title or interest in the areas comprised in the said Mining Title and also any exemption or exemptions from labour conditions or rentals relating thereto. and the Vendors hereby appoint the Purchaser to be the Attorney of the Vendors for the purpose of making such applications and of obtaining such rights and such exemptions and for that purpose for the Vendors and in their names to execute and do any deeds documents instruments acts and things that may be necessary or which by these presents the Vendors may be obliged to do or execute and the Vendors hereby ratify and confirm anything that the Purchaser does or causes to be done by virtue of these presents, and the Vendors and each of them severally hereby covenant with the. 20 30 40

Purchaser that they will transfer the said Mining Title and any other documents of title of the Vendors to the areas of land comprised therein to the Purchaser in accordance with the terms of this Agreement and that they will not cause or suffer any act matter or thing to be done at any time during the said option or after its exercise whereby the said Mining Title or any other documents of Title of the Vendors to the abovesaid areas may in any way be lost charged or encumbered and in particular that they will not at any time let any tribute in respect thereof

12. IF the said Mining Title is not at the date of this Agreement or at any time hereafter under exemption from labour conditions the Vendors shall forthwith notify the Purchaser accordingly and shall state in their notice the number of men required to be employed after taking into account any men employed by the Vendors in order to comply with such conditions and if at any time hereafter during the continuance of the said option any exemption from labour conditions relating to the said Mining Title is about to expire the Vendors shall SEVEN (7) days before the date of expiry of such exemption notify the Purchaser of the date of expiry and of the number of men aforesaid. Within SEVEN (7) days after receipt from the Vendors of any notice as aforesaid the Purchaser will employ on the Mining Title in accordance with the notice the number of men as set out in such notice and will continue so to employ them until

the requisite exemption can be obtained or until the termin



-ation of the said option whether by expiry abandonment or otherwise PROVIDED ALWAYS that the obligations of the Purchaser under this clause shall not be conditional on receipt of notice from the Vendors in any case in which the Purchaser has received the relevant information directly from the Mines Department.

13.\_\_\_\_AT any time during the currency hereof the Purchaser may call on the Vendors at the expense of the Purchaser to place the documents of title to the said Mining Title in escrow and in that event the Vendors shall lodge all the documents of title to the areas comprised in the said Mining Title and a proper and effectual transfer or proper and effectual transfers thereof duly executed by them but with a blank for the name of the transferee with the Bank of New South Wales at Perth in the State of Western Australia and shall give to the Bank irrevocable instructions that upon receipt of notice that the said option has been exercised in respect of any lease or leases tenement or tenements forming part of the said Mining Title the documents of title and transfers relating thereto are to be delivered to the Purchaser for registration

14.\_\_\_\_THE Purchaser may lodge and register such caveats or other documents as it may think fit to protect its interests hereunder and during the continuance of the said option the Vendors agree not to take any steps to remove the same and in the event of the expiry or abandonment of the said option the Purchaser shall promptly withdraw such

EXHIBIT "2 CRI.8"-Copy Agreement  
between A.V. Barrett - Leonard and  
others and Rio Tinto Southern  
Pty Ltd, dated 4.3.62

caveats or such of them as relate to those parts of the said Mining Title in respect of which the said option is no longer current

15. \_\_\_\_\_ DURING the continuance of the said option the Purchaser shall be entitled to:-

- (a) the exclusive right to enter upon inspect examine test take reasonable and bona fide samples from and carry out prospecting development and any other work on the said Mining Title and to do all things incidental thereto 10
- (b) the right to use any plant machinery or other chattels of the Vendors now on the said Mining Title
- (c) The right to bring onto and use on the said Mining Title any other plant machinery or other chattels and
- (d) the right (which shall also continue for a period of TWO (2) months after the expiration or sooner determination of the said option) to remove any of the plant machinery or other chattels referred to in paragraph (c) hereof from the said Mining Title 20

PROVIDED that in the event of any ore won on any part of the areas comprised in the said Mining Title by the Purchaser during the continuance of the said option in relation to that part being sold or otherwise disposed of by the Purchaser the net proceeds of sale or disposal shall be held by the Purchaser and shall be paid to the Vendors. in the event of the said option not being exercised in relation to that part but otherwise such net proceeds shall be retained by the Purchaser for its own use. 30 40

16. \_\_\_\_\_ DURING the continuance of the said option the Vendors other than the Corporation Vendors will at the ex-

EXHIBIT "2 CRL3"-Copy Agreement  
between A.V. Barrett - Leonard and  
others and Rio Tinto Southern  
Pty Ltd dated 4.5.62

pense of the Purchaser make visits to the areas comprised in the said Mining Title at such times as the Purchaser may reasonably request

17.\_\_\_\_UPON the termination of the said option (otherwise than by exercise) in respect of any one or more part of the said Mining Title the Purchaser will make available to the Vendors all geological topographical and similar informa- 10 tion obtained by the Purchaser in relation to those parts of the said Mining Title in the course of its investiga- tions thereon (but not including technical and other inform- ation not obtained by it directly from such investigations)

18.\_\_\_\_THE Purchaser may at any time and from time to time hereafter by notice to the Vendors abandon the said option either wholly or in respect of some one or more lease or 20 leases tenement or tenements forming part of the said Mining Title or any area comprised therein and as from the date upon which such notice is received or deemed to be received by the Vendors the obligations of the Purchaser hereunder shall subject as aforesaid cease either wholly or as the case may be in respect of those parts of the said Mining Title in respect of which the notice is given 30

19.\_\_\_\_ALL notices given pursuant to the terms of this Agree- ment shall be in writing and may be given by delivery to the party to whom the same is addressed and addressed in the case of the Vendors to "Messrs. Hancock & Wright" at their address aforesaid and in the case of the Purchaser 40 to the Purchaser at its registered office aforesaid or may

EXHIBIT "2 CRLS"-Copy Agreement  
between A.V. Barrett - Leonard and  
others and Rio Tinto Southern  
Pty Ltd dated 4.5.62

be given by letter or telegram which shall be deemed to be received on the day when in due course of post or due course of receipt of telegram such notice would reach the address given if posted in a prepaid registered letter or, in the case of a telegram addressed through the telegraph office to the address aforesaid of the party to whom such notice is given.

20. \_\_\_\_\_ ANY amount to be paid to the Vendors hereunder may be paid as to one half thereof to Cooper Bros. Goyder & Co. on behalf of the Messrs. Barrett-Leonard and as to the other half to the Commercial Bank of Australia Limited at Head Office St. George's Terrace Perth to the credit of "Hancock and Wright" and the receipt of the respective payments by that firm and that Bank for any amounts so paid shall be sufficient evidence of payment to the Vendors hereunder

21. \_\_\_\_\_ THE Purchaser shall not without the prior consent in writing of the Vendors assign the said option except to a Company which is a subsidiary of The Rio Tinto Mining Company of Australia Limited within the meaning of that term in the Companies Act 1958 of the State of Victoria

22. \_\_\_\_\_ THIS Agreement embodies the entire agreement and understanding between the parties with respect to the Mining Title and supersedes all prior agreements and undertakings relating to the subject matter hereunder. Except as herein otherwise provided neither this Agreement nor any provisions hereof may be changed waived discharged or terminated orally but only by an instrument in writing signed by or on behalf of the party against whom enforcement of

EXHIBIT "2 CPL6"-Copy Agreement  
between A.W. Barrett - Leonard and  
others and Rio Tinto Southern  
Pty Ltd dated 4.5.62

the change waiver discharge or termination is sought.

IN WITNESS whereof the parties hereto have executed these presents the day and year first hereinbefore written

SIGNED by the said ARTHUR VIVEASH BARRETT-LENNARD in the presence of

*James Glava Solicitor Perth*

*A.V. Barrett-Lennard*

SIGNED by the said FRANK ST. AUBYN BARRETT-LENNARD in the presence of

*James Glava*

Frank St. Aubyn Barrett-Lennard by his duly authorised agent: 10

*A.V. Barrett-Lennard*

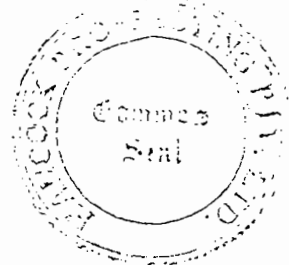
SIGNED by the said EDWARD GUY BARRETT-LENNARD in the presence of :

*James Glava*

Edward Guy Barrett-Lennard by his duly authorised agent:

*A.V. Barrett-Lennard*

THE COMMON SEAL of HANCOCK PROSPECTING PTY. LIMITED was hereto affixed by the Governing Director LANGLEY GEORGE HANCOCK in accordance with the Articles of Association



20

*L.G. Hancock*  
Governing Director

SIGNED by the said LANGLEY GEORGE HANCOCK in the presence of :

*C. Wright*

*L.G. Hancock*

SIGNED by the said ERNEST ARCHIBALD MAYNARD WRIGHT in the presence of :

*C. Wright*

*E. A. Wright*

EXHIBIT "2 CRL3" - Copy Agreement between A.V. Barrett - Leonard and others and Rio Tinto Southern Pty Ltd dated 4.3.62

THE COMMON SEAL of WRIGHT  
PROSPECTING PTY. LIMITED was  
hereto affixed by the Govern-  
ing Director ERNEST ARCHIBALD  
MAYNARD WRIGHT in accordance  
with the Articles of Associa-  
tion :

*E A Wright*



Governing Director

THE COMMON SEAL of RIO TINTO  
SOUTHERN PTY. LIMITED was here  
-to affixed in the presence of:

*atkeach*  
*J. Lang*

Director

Secretary

EXHIBIT "2 CRL3"-Copy Agreement  
between A.V. Barrett - Leonard and  
others and Rio Tinto Southern  
Pty Ltd dated 4.5.62



Ex 3.

EXHIBIT "3"-Paper presented by  
Messrs Uys & Bradford entitled  
"The Beneficiation of Iron Ore by  
Heavy Medium Separation" 1981

The Beneficiation of Iron Ore  
by Heavy Medium Separation

by

J. Uys and W.H. Bradford

## ABSTRACT

The various methods for beneficiating iron ore are discussed in outline, and specific reference is made to the application of heavy medium separation at Sishen, Hamersley and Mount Newman.

Instrumentation philosophy at these installations is discussed, and operating problem areas are indicated.

## INDEX

- |    |                                            |    |
|----|--------------------------------------------|----|
| 1. | Abstract/Index                             | 10 |
| 2. | Introduction                               |    |
| 3. | General Review of Technology               |    |
| 4. | Descriptions of Sishen Export Concentrator |    |
|    | - Hamersley Concentrator                   |    |
|    | - Mount Newman Concentrator                |    |
| 5. | Instrumentation                            |    |
| 6. | Conclusions                                |    |
| 7. | References/Acknowledgements                |    |
| 8. | Flowsheets                                 |    |



Heavy medium separation has for a long time had an important position in the major technologies used in the physical processing of ores.

The advantages that it has always offered over competing processes are:-

- low energy requirements
- relatively simple and uncomplicated flowsheets
- a tailings product that is easy to dispose of and store on a long-term basis.

Current trends are tending to favour these existing advantages in the following ways:-

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- Energy costs are tending to increase, and in countries heavily dependent on imported oil, energy requirements can be a politically sensitive matter when new projects are being established.
- A general tendency towards smaller projects, where simple processes can offer a lower degree of risk and hence make a project more inherently attractive.
- Increasing demands for operators to take long term responsibility for their tailings disposal sites, and their environmental effects.

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This is not to claim that heavy medium separation is the answer to all beneficiation problems in the iron ore industry, but simply to indicate that where the possibility of using it exists, on both new and older projects which may have been evaluated some years ago, a review of costs will almost certainly indicate its increasing attraction, against more energy intensive processes.

Taken individually these three factors may well have no effect on any one specific project, but assuming the development of a multiplicity of smaller projects then they must tend to favour the increasing application of heavy medium separation at the expense of competing processes.

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To return to basics it appears worthwhile at this stage restating some of the major current constraints on an iron ore producer.

Iron ore deposits vary in their mineralogical characteristics and it therefore follows that each ore body requires a specifically designed plant to recover the mineral at the required grade at optimum economy. The flowsheet for the design of such a plant is based on in depth mineralogical and metallurgical studies of the deposit, on marketing investigations for the potential products and on practical engineering design concepts.

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"The Beneficiation of Iron Ore by  
Heavy Medium Separation" 1981

In the case of iron ores, the most important factors affecting the marketability of the product, the design decisions and the economics of the mining and processing operations are:-

#### THE SIZE FACTOR

A price differential of about U.S. \$3.00 per tonne exists between lump ore sized at minus 30 plus 6mm and fines at minus 6mm.

The reason for this is that lumpy iron ore can be charged directly to blast furnaces, while the fines must be further treated to agglomerate them into a physical form suitable as furnace feed. 10

Prices obviously vary depending on the supply area and the market area and on the time of contract negotiation. Current Australian iron ore supplied to Japan on an f.o.b. basis attracts U.S. \$20.00 for lump ore and U.S. \$17.00 for fines.

#### THE GRADE

The presence of gangue increases the transportation cost per iron unit and obviously increases the smelting costs. Steelworks in consequence aim to buy iron ore at the highest grade available. The operators balance the iron ore grade they produce with these market requirements and with the practical aim of maintaining high overall iron recoveries for their operation. Since penalties are exerted on below-grade products and since bonuses for above-grade products are not that attractive, quality control and mine planning form the heart of the optimisation of an iron mining operation, particularly where no beneficiation process is being employed. 20

It is worth noting that for hematite ores, typical lump grades are 63.5 - 65.3% Fe while fines grades range over 60 - 62.5% Fe. 30

#### THE IMPURITY LEVELS

Apart from usual gangue constituents such as silica and alumina, impurities such as phosphorus and sulphur are strictly controlled since they have a detrimental effect on the pig iron refining steps in the production of steel. Again penalties are exerted at various levels of such impurities.

Many ores require some form of beneficiation other than that naturally achieved by crushing and screening, in order to meet the grade and impurity levels and even when high grade ore bodies are mined, large volumes of low grade ore are usually found which need to be beneficiated in order to optimise the total iron ore recovery from the ore body. 40

In Western Australia, until recent years, the iron ore producers other than Robe River have not needed to install beneficiation plants and have met grade by crushing and dry screening the run-of-mine ore after careful selection of "grade blocks" of grade greater than 59 - 60% Fe in the mine.

On the other hand in South and North America most operators have to beneficiate their iron ores in some form to meet grade, and are therefore able to mine their total orebody often running at run-of-mine grades of about 40% Fe. Since many of these ore bodies have impurities that are finely disseminated in the ore, fine grinding followed by complex metallurgical processing is required to beneficiate these ores and is always followed by pelletising to produce a marketable product. 10

The Australian iron ores tend to run into unacceptably high levels of alumina and in certain areas phosphorus, and thus selective mining has been necessary. The low grade and high-impurity ore has usually been separately stockpiled.

Beneficiation, basically by heavy medium separation, has recently been introduced at Hamersley and at Mount Newman. These beneficiation plants ensure that product grade requirements can be met for effectively all the ore reserve. These facilities also allow the mining of additional low grade ore pockets in the ore reserve as well as contact zones, where ore is adjacent to gangue, and also allows the reclamation of low grade ore from stockpiles. 20

Thus poor quality ores which would otherwise have been discarded as waste can be fed to the concentrator. This significantly reduces waste: ore ratios, increases the mine life and reduces the overall cost per tonne of ore sold over the life of the mine.

When scanning present day iron ore operations many show a similar development pattern. In the early stages of development of the ore body, selective mining concentrates on the high grade zones and the run-of-mine is crushed and screened, often using dry screening techniques. 30

Beneficiation of some form, often only for certain parts of the ore body, follows as production levels increase and as more is known about the mineralogical and metallurgical characteristics of the ore.

To put heavy medium separation in context, it is worth considering briefly the various physical processes in use in the industry at present.

Because each iron ore type has its own peculiar mineralogical characteristics and requires specific metallurgical treatment to produce optimum recoveries of saleable products, beneficiation methods vary widely. Treatment varies from simple crushing and screening operations to complex combinations of various forms of beneficiation.

The extent to which beneficiation methods are employed depends on the level and nature of diluents and the form of dissemination of the gangue and the impurities in the ore structure. 10

To compare the various beneficiation routes it is probably best to look at their application at various mines.

#### BENEFICIATION BY DIFFERENTIAL CRUSHING AND SCREENING

This is by far the most common iron ore treatment method since it is the cheapest involving only crushing, screening and conveying equipment and in its simplest form operates under dry conditions. Grade control is complex when employing this relatively inflexible treatment method and usually selective mining needs to be resorted to. This reduces the overall recovery from the total ore body and increases the waste to ore ratio. 20

Because shale bands are often narrow and folded through the ore bodies and because of the increasing size of blasting patterns as well as shovel and truck arrangements, particularly on the larger mines, large blocks of the ore body containing good quality iron ore have to be discarded as waste.

In most ores treated by only crushing and screening methods, the shale is more friable than the ore and hence the iron is concentrated into the coarser ore fractions. 30

Impurities usually also tend to concentrate in the fines. Some operators have thus been able to produce lump grade ore from their low grade ore bodies by screening only but are left with considerable stockpiles of low grade fines. This applies at Mount Tom Price (Hamersley).

Some operators have stockpiled their low grade ore as and when mined onto separate stockpiles while others have dumped this material with their waste to save the additional cost of separate stockpiling. Generally however mine planning is done in such a way that concentration of the low grade ores can be introduced at a later stage. 40

Well designed differential crushing and screening circuits allow the production of maximum amounts of lump at a high Fe grade, while still maintaining a saleable grade of iron ore fines for sinter feed or pelletising.

While lump ore does attract considerably better prices than fines, flexibility has to be provided in these crushing and screening circuits, because at times, like now, when iron ore markets are poor, fines are more readily sold than lump ore.

To quote specific examples, in South Africa the Sishen Iron Ore Mine operated by crushing and screening of selectively mined ore from 1953-1963 prior to the introduction of heavy medium beneficiation. 10

In Australia Mount Tom Price and Paraburdoo of Hamersley Iron, Mount Newman mine and the Goldsworthy operations basically rely on crushing and screening only, although Hamersley and Mount Newman have recently introduced various types of further beneficiation.

At Mount Newman the main flow of ore is trucked out of the pit to two crushing and screening streams. Run-of-mine ore is reduced to nominally minus 200mm in primary gyratory crushers and is then dry screened at 100mm. Plus 100mm oversize is further crushed in secondary gyratory crushers. 20

Nominally minus 100mm ore is then railed to Port Hedland where the ore is dry screened at nominally 30mm and 6mm on large double deck screens. Plus 30mm oversize is crushed in tertiary gyratory crushers. Final lump and fine ore products are stockpiled at the wharf prior to shiploading.

Hamersley Iron at Paraburdoo, Mount Tom Price and Dampier operate somewhat differently. Run-of-mine ore is crushed in primary gyratory crushers nominally to minus 200mm and this crushed ore is then stockpiled on large conical stockpiles.

Minus 200mm ore is dry screened at 50mm and the oversize crushed in Standard Cone Crushers. Screen and crusher undersize are dry screened at 30mm and 6mm, and the plus 30mm oversize is reduced in Shorthead Cone Crushers. 30

Lump and fine ore are separately stockpiled at the mines and separately railed to the port.

Final screening is carried out on the lump ore at the port and some fines are pelletised.

#### BENEFICIATION BY WET SCREENING AND DESLIMING

Where water is readily available or in those cases where the screening characteristics or the mineralogy of the ore demand, wet screening and/or desliming techniques are used to upgrade the ore. 40

This does not change the coarse ore flowsheet significantly other than introducing high pressure water sprays over the screens. The fines are usually classified and the ultrafines are then deslimed. This desliming duty is usually carried out by cyclones. The cyclone underflow is then sent to filters and is dried sufficiently to suit pelletising.

Typically at Aguas Claras in Brazil, run-of-mine ore is crushed to 200mm in a primary gyratory crusher and crushed ore is stockpiled. Reclaimed crushed ore is then wet screened on large primary screens fitted with high pressure water sprays.

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Plus 50mm oversize is crushed and then wet screened to produce a coarse ore and a natural pellet ore. Again high pressure water sprays are used.

The minus 6mm undersize from the secondary screens is gravity fed to spiral classifiers. The sand fraction is finished minus 6mm plus 100 mesh sinter feed. The classifier overflow is deslimed in cyclones, overflow being rejected to a tailings thickener and slimes dam, while the cyclone underflow is pan filtered and the filtercake steamed to about 9% moisture to meet pelletising feed requirements.

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#### GRAVITY CONCENTRATION METHODS

In those iron ores where grade is not achieved by the above crushing, screening and washing methods but where the ore is liberated from its gangue at reasonably coarse sizes and reveals a density difference between the liberated gangue and value particles, then wet gravity separation methods are commonly resorted to.

These concentration methods fall into two main categories, those requiring a heavy medium for separation and those requiring water only. While the former is applicable over the size range of 100mm to 0.5mm, the latter is only applicable on material up to about 8 - 10mm and is ineffective on ultrafines.

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#### Water Only Gravity Concentration

Jigs, tables, spirals, cones and water only cyclones are the typical equipment items in use in such beneficiation plant.

The application of this equipment because of its limitation to specific size fractions of the ore to be treated is usually complementary to other beneficiation methods used on the remaining ore fractions.

One of the disadvantages of this beneficiation method is the difficulty of producing a final concentrate of the correct grade as well as a discardable tailing at acceptable overall iron recovery. This can result in a clumsy flowsheet due to the necessity of producing a middlings product and the resulting complex material flows.

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EXHIBIT "B" - Paper presented by  
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"The Beneficiation of Iron Ore by  
Heavy Medium Separation" 1981



At the McKinley Mine in the Mesabi Range in Minnesota, for example, the hematite - limonite - goethite ore is beneficiated by crushing, screening, washing, spiral concentration and desliming to produce coarse and fine iron ore concentrates averaging about 60% Fe. Primary ore after crushing is screened on screens fitted with high pressure water sprays. Undersize is classified at 6mm and the minus 6mm feed is concentrated in five-turn spirals. Concentrates are dewatered on screens and drum filters.

### Beneficiation by Heavy Medium Separation

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When the gravity separation requires high density cut-points to achieve the required iron grades and when the washability characteristics of the ore are more difficult, a heavy medium has to be employed to effect the gravity separation.

This heavy medium is typically a suspension in water of a particular type of fine sized magnetic ferrosilicon (15% Si) prepared so as to have the necessary stability and viscosity properties.

The separating vessels commonly used are static baths on coarse ore and cyclones on fine ore.

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A top size of up to 100mm can be readily beneficiated. The bottom size limit in heavy medium separation is determined by the necessity to recover as much as possible of the costly ferrosilicon medium from the final products and this limits its economic application down to 0.5mm beyond which screening even with special polyurethane screens is not effective.

Very recently developments now extend this bottom range to 63 micrometres. In these flowsheets magnetic separators rather than screens are used to recover the ferrosilicon.

Grade control in heavy medium beneficiation plants is relatively simple since such circuits have a density control system on the circulating medium that allows preselection of the operating density, as long as this is within the range of the particular ferrosilicon being used.

At Mount Tom Price, Hamersley Iron have recently erected a beneficiation plant incorporating heavy medium separation (HMS) down to 0.5mm and high intensity magnetic separation on the fines.

In the case of the Mount Newman low grade ores, whose washability characteristics are considerably different, the heavy medium concentrator comprises heavy medium separation down to 1mm with the fines being treated on Reichert cones.

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Many properties have combinations of the above water-only and heavy media separation beneficiation plants.

For example Hanna's Whitney mine ore has been treated in a concentrator which consisted of a scrubbing and screening section producing minus 30 plus 6mm lump and minus 6mm fine ore fractions. The lump ore fraction was treated in heavy medium separation drums. The fines were classified to produce a minus 6mm + 28 mesh ore fraction which was beneficiated in heavy medium cyclones. The minus 28 mesh fines were then concentrated in a spiral plant.



## MAGNETIC SEPARATION

This broad field can be divided into:-

low intensity magnetic separation

high intensity wet or dry magnetic separation.

### Low Intensity Magnetic Separation

Where recovery is readily feasible such as with magnetite and taconite ores, coarse cobbing together with wet drum magnetic separation after grinding form the basis of most flowsheets. Ores with a head grade as low as 30 - 35% Fe are beneficiated and after pelletising yield a 65% Fe product.

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Erie, the taconite pioneers at Hoyt Lakes in Minnesota on the eastern end of the Mesabi range, work six taconite mining areas producing feed with a head grade around 30% Fe. Their plant which consists of gyratory and cone crushers, rod and ball mills, magnetic separators, thickeners and filters as well as a pellet plant and shaft furnace, produces pellets averaging 65% Fe.

This concentrator has 36 grinding streams and a very complex arrangement of primary, secondary, tertiary and quarternary permanent magnet magnetic separators.

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At Savage River primary crushed magnetite ore is reduced in size to 10 mesh in autogenous mills and a primary magnetic concentrate is produced in wet drum permanent magnet separators. This concentrate is reground in ball mills to pass 200 mesh prior to secondary magnetic separation.

### Wet High Intensity Magnetic Separation (WHIMS)

For feebly magnetic iron ore such as the hematite/itabirite formations in South America and for hematite fines beyond the bottom range of heavy medium beneficiation, the WHIMS route has in general been successfully employed.

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At CVRD, the world's largest commercial scale plant employing wet high intensity magnetic separation for the recovery of hematite has been operating and expanding since 1972.

At CVRD the installed mining capacity is 46 million tons/year of run-of-mine feed. Of this, 18 million tons/year is high grade hematite treated only by crushing and screening equipment. The remaining 28 million tons/year is an itabirite feed from which some 2 million tons/year of high grade hematite can be screened off at plus 30mm to produce a 66.5% Fe product and some minus 6 plus 1mm fines which can be screened out as sinter feed assaying 65% Fe. However, the bulk of the itabirite exists in the form of finely disseminated hematite and quartz, and requires a fine grind for liberation. 10

The competitive processes for the treatment of these finely disseminated itabirites, were WHIMS, flotation and gravity separation on spirals. All were researched and WHIMS was selected as the most attractive comparing capital and operating cost as well as overall recovery and grade.

The WHIMS units installed produce a concentrate assaying approximately 67% Fe, which is pelletised at the port. 20

### FLOTATION

Prior to the advent of WHIMS treatment and particularly for the treatment of the low grade finely disseminated iron ores in North America, flotation was and is being used to beneficiate iron ores where contaminants are finely disseminated. This process is often used in combination with other beneficiation steps. After crushing (usually 3 stage) and grinding, flotation is performed using either cationic or anionic collectors following desliming. Flotation concentrates are filtered and dewatered to less than 10% moisture prior to pelletising. 30

Typically at the Empire Mine of Cleveland-Cliffs, fine grained martite-hematite ore requiring grinding to 85% minus 25 microns to achieve liberation, is crushed in a single stage gyratory primary crusher prior to autogenous milling followed by closed-circuit pebble milling and flotation. Magnetic roughing is carried out prior to flotation.

### SELECTIVE FLOCCULATION

At Cleveland-Cliffs Iron Co.'s Tilden operation in Michigan, the mineralisations characteristics have forced the development of a new process, to replace magnetic separation as the rougher stage of concentration. The mineral suite present is not amenable to magnetic processing, and following very fine grinding (similar to the Empire operation) the pulp is selectively flocculated with starch, which causes the iron bearing minerals to agglomerate, while leaving the silica in a dispersed state. Treatment in a thickener produces an underflow enriched in iron and a reject overflow. The enriched overflow is then treated with an amine collector in flotation cells to float off further silica prior to dewatering of the iron concentrate, and pelletising. 40

EXHIBIT "3"-Paper presented by  
Messrs Uys & Bradford entitled  
"The Beneficiation of Iron Ore by  
Heavy Medium Separation" 1981

## PELLETISING

Both in South and North America this method of producing a saleable coarse iron ore product is very common mainly because the ores in most cases cannot be beneficiated in the coarse form. It is often also due to the fine dissemination of contaminants in the ore which require fine grinding for liberation.

Goethitic limonite ores are also readily beneficiated by this heat treatment, driving off the approximately 10% bound moisture to achieve saleable pellet grade.

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Minntac, Butler, National and Reserve are amongst the larger pellet plant operators in North America and CVRD are presently the largest in South America.

## SISHEN EXPORT CONCENTRATOR (See Flowsheet in Section 8)

The Sishen Iron ore is generally a hard high grade hematite with relatively soft bands of soft shale and minor amounts of banded ironstone and flagstone associated with it. Crushing to minus 100mm results in a satisfactory degree of liberation to produce, by heavy medium separation, a sink and float product containing 67% Fe and 20% to 30% Fe respectively. The presences of banded ironstone and flagstone in the concentrator feed necessitates HMS operation at abnormally high cut-point densities.

The project scope was as follows:-

- a) Primary, Secondary and Tertiary crushing installations and crushed ore stockpile.
- b) Washing and screening plant and beneficiation plant feed stockpiles.
- c) Concentrator to handle four size fractions.
- d) Concentrator and tailings dewatering and disposal systems.
- e) Quarternary and fines crushing and screening facilities.

The total feed rate of the concentrator is approx. 5,000 T/hour and is broken down as follows:-

| Size Fraction (mm) | Type of Separator | No of Modules | Capacities Required | (T/hour) Design | 20 |
|--------------------|-------------------|---------------|---------------------|-----------------|----|
| - 90 + 30          | WEMCO Drum (HMS)  | 5             | 420                 | 520             |    |
| - 30 + 9           | WEMCO Drum (HMS)  | 3             | 280                 | 346             |    |
| - 9 + 5            | DSM Cyclone (HMS) | 4             | 100                 | 132             |    |
| - 5 + 0.5          | DSM Cyclone (HMS) | 4             | 160                 | 200             |    |

The nature of the Sishen ore together with the difference in washability characteristics for the size fractions above dictated provision of separate HMS treatment facilities for the 4 different size fractions. The fraction of the ore with size grading minus 9 plus 5mm is marketed as a separate product for direct reduction applications or is crushed to minus 6mm and added to the fine ore fraction.

## HAMERSLEY CONCENTRATOR (See Flowsheet in Section 8)

The decision by Hamersley Iron Pty Ltd., to proceed with secondary beneficiation facilities at Mount Tom Price was based primarily on the availability of extensive reserves of previously mined and in-situ low grade ore particularly amendable to beneficiation by heavy medium separation (HMS) and wet high intensity magnetic separation (WHIMS)

EXHIBIT "3"-Paper presented by Messrs Uys & Bradford entitled "The Beneficiation of Iron Ore by Heavy Medium Separation" 1981

The concentrator is Western Australia's first wet iron ore beneficiation plant and the design was based on extensive pilot and laboratory test data produced by the Hamersley Iron Research and Development Department.

The plant was designed to process 13 million tons/year of feedstock.

Plant commissioning took place in early 1979 with full design production being achieved during the second half of 1979.

The project scope was as follows:-

- a) Modifications to the existing primary crushing installation to allow low grade fine iron ore to be routed separately from high grade coarse iron ore. 10
- b) Secondary and tertiary crushing plant for low grade ore.
- c) Washing and screening plant and bin storage for low grade ore (concentrator feed).
- d) A concentrator to handle four size fractions of ore, utilising HMS and WHIMS processes.
- e) Product (concentrate and tailing) dewatering and disposal systems.

The approximate total feed rate to the concentrator is 1850 tonnes per hour broken down as follows:- 20

| Size Fraction (mm)    | Type of Separator | No. of Modules | Capacities Required | (T/hour) Design |
|-----------------------|-------------------|----------------|---------------------|-----------------|
| - 80 + 30             | WEMCO Drum (HMS)  | 1              | 500                 | 660             |
| - 30 + 6              | WEMCO Drum (HMS)  | 2              | 600                 | 660             |
| - 6 + 0.5             | DSM Cyclone (HMS) | 3              | 400                 | 600             |
| -0.5 + 63 micrometres | WHIMS             | 2              | 180                 | 200             |

The modular design concept allows independent operation of the different plant modules contingent upon operation of equipment items common to all the process plant. The design incorporates plant by-pass facilities on the minus 80 plus 30 and the minus 30 plus 6mm fractions during periods when the ore grade as mined is high or during extended shut down periods resulting from scheduled maintenance requirements. 30

Each size fraction gives rise to a concentrate and a tailing. In addition some ore slimes are released during processing which are passed to a thickener as a dilute slurry.

MOUNT NEWMAN CONCENTRATOR (See Flowsheet in Section 8)

As for Hamersley Iron extensive testwork to determine the nature of the low grade contact ore preceded the decision to proceed with the design and construction of the concentrator. All ore fractions exhibited minimal near gravity material between the high density hematite and the low density shales. The absence of any composite hematite/shale particles indicated that sharp separations are possible with processes relying on density differential. The similar washability characteristics of the minus 100 plus 30mm and the minus 30 plus 6mm contact ore fractions precluded the necessity of providing separate treatment facilities for the low two size fractions as was the case with the Hamersley Iron low grade ore. 10

The project scope was as follows:-

- a) Washing and screening plant and bin storage for low grade concentrator feed.
- b) Concentrator designed to handle three ore size fractions utilising HMS and Reichert Cones.
- c) Concentrate and tailing dewatering and disposal systems.

The approximate total feed rate to the concentrator is 1 160 tonnes per hour broken down as follows:- 20

| Size Fraction (mm)     | Type of Separator | No of Modules | Capacities Required | (T/hour) Design |
|------------------------|-------------------|---------------|---------------------|-----------------|
| - 100 + 6              | WEMCO Drum (HMS)  | 2             | 342                 | 400             |
| - 6 + 0.5              | DSM Cyclone (HMS) | 1             | 280                 | 370             |
| - 0.5 + 63 micrometres | Reichert Cones    | 1             | 200                 | 280             |

Whereas at the Hamersley Iron mine site the concentrate is tertiary crushed and sized to produce minus 30 plus 6mm lump and minus 6mm fines, the Newman concentrator product is stored on a single stockpile and railed as a combined concentrate with size minus 100mm plus 63 micrometres for subsequent reduction and sizing into lump and fine ore at the port side. 30

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The Hamersley Iron Mine at Mount Tom Price in Western Australia has one of three iron ore concentrators which have recently been designed by the Mitchell Cotts Consortium. The other plants are at the Mount Newman Mining Co.'s deposit at Mount Whaleback also in Western Australia, and the Sishen Export Plant at Sishen in South Africa.

The client approach to this aspect of design varied considerably and was related to the availability and cost of operating labour. In Australia, and with particular reference to the Pilbara region direct labour and infrastructure costs are very high and as such the clients opted for maximum instrumentation in an attempt to reduce operating labour requirements.

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In South Africa the client approach was the exact opposite in that work opportunities for unskilled labour had to be created. The net result therefore is that on a direct comparison basis a South African iron ore concentrator would utilise five to six times the operating labour that would be provided on an Australian concentrator.

The Australian plants at Hamersley and Newman have therefore included sophisticated instrumentation loops including mini-computers and programmable logic controllers with analogue controllers to monitor and record data and visually display operating information.

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Of critical importance to the successful operation of the Australian plants was the selection of the correct overall instrumentation and control systems to meet the requirements of the two plants. Both projects involved the selection of major items of instrumentation and control which were innovative to the iron ore industry in Western Australia.

The selection process commenced with visits to overseas mining operations. The aim of these visits was to determine the experience of mining companies in the operation of heavy medium plants with particular regard to the philosophies behind their approach to automation and selection of suitable control systems.

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Additional valuable pointers were provided from discussions with a U.K. based firm of consultants in process plant overall control schemes, and also with the National Coal Board's Mining Research and Development Establishment.

From these visits and discussions, it became clear that because both plants had a similar environment and their main objectives were coincident, then their overall control philosophies would be similar. However, because of the differences in plant design, great attention would need to be given to the analogue process control equipment on the Mount Newman plant.

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EXHIBIT "3"-Paper presented by  
Messrs Uys & Bradford entitled  
"The Beneficiation of Iron Ore by  
Heavy Medium Separation" 1981



Probably the main conclusion regarding instrumentation and control which stemmed from the experience of other operators was that the design of automation systems needs to be correctly specified from the start of a project. This is not meant to imply that equipment suppliers or type of equipment have to be specified, but rather that the overall aims and final form of the system be established.

Further, it is important that suspected process flow problem areas are identified at an early stage and designed to ensure that such problems are within the scope of available control equipment, so that catastrophic overflows, etc. are avoided.

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#### DESIGN PHILOSOPHY FOR HAMERSLEY AND MOUNT NEWMAN

During the establishment of overall aims and configuration, the experience of the operators visited indicated clearly that the best approach to the implementation of a control system was to recognise the requirement for splitting the work into two phases on a programmed basis.

Phase 1 - The achievement of the desired sequence of start-up and shut-down of individual modules, at the same time ensuring that all field devices are operating correctly and reliably.

Phase 2 - The utilisation of the results obtained in Phase 1 to optimize the operation of the process in regard to throughput and product quality.

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Established experience indicated that of the two phases the second is more difficult to achieve although it provides for a potentially much more profitable operation than Phase 1. Understandably, implementation of Phase 2 is more difficult and expensive if it has not been catered for in the initial overall strategy.

Estimates of the time to be allowed for completion of Phase 1 naturally vary but typically a period of 18-24 months is accepted.

Following the completion of Phase 2, the stage should have been reached where the instrumentation enables each piece of equipment to operate at its optimum condition, resulting in a plant that is operating to achieve maximum productivity.

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A point that could be overlooked is the need to achieve reliability in even the most apparently insignificant mechanical and electrical devices. Poor attention to equipment selection will result in more operating problems with an automated plant than one manually operated, thus nullifying the overall control philosophy. Since more frequent operation of on-off devices will occur in an automated plant, the need for selecting robust and reliable equipment is increased.

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An important comment by established operators in general was the need for a product quality analyser if true optimization is to be achieved. Such a device is extremely important where one plant is expected to process a varying range of feeds to a varying range of products. It appears that large amounts of development effort are being expended on such devices.

EXHIBIT "3"-Paper presented by  
Messrs Uys & Bradford entitled  
"The Beneficiation of Iron Ore by  
Heavy Medium Separation" 1981

Opinions were also obtained on the staffing of automated plants. Although such plants often result in reduced manpower levels, the calibre and attitude of employees to automation was of prime importance for a successful operation. As a high degree of understanding of the system as possible, from the plant manager down, is essential.

Comments in less general areas of overall control philosophy revolved around the degree of manual over-ride facilities which should be available to the operators.

Opinion was divided on this point, but a predominant feeling was that in the event of problems occurring in an automatic system with over-ride, operators reverted to the manual mode too readily. Naturally, it would in some cases be the correct action, but in many cases equipment was operated in the manual mode on key plant control devices.

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Another specific area of discussion related to the use of the traditional overall plant mimic panel as opposed to the modern concept of schematised plant mimic displays, incorporating status and process information on a Video Display Unit (VDU). Here again, opinion was divided and the correct choice is influenced by a number of diverse factors.

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- a) As accurate a concept as possible of the final function and form of the overall control and instrumentation system must be established at the earliest opportunity.
- b) Possible severe control problem areas must be highlighted and examined in consultation with process staff, to ensure that sufficient control capabilities can be allowed for.
- c) Careful attention must be given to the selection of field devices and instrumentation in the light of duty requirements and operating environment.
- d) Thought should be given to the degree of manual over-ride facilities available to the operator.
- e) Careful consideration should be given to the methods employed to present plant status and process data to the operator.
- f) To ensure that all plant management and operating personnel are familiar with the automated plant their early involvement in the project is desirable.

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It is gratifying to be able to say that with the operating experience now obtained on both Australian plants, the general concept of overall system control requirements was accurate in that the quantity 40 and type of equipment is adequate to meet long term automation development requirements

This stage of affairs can be attributed to:-

- a) Examination of the experience of others faced with similar problems.
- b) Competent advice from specialised consultants.
- c) Working closely with the end users whose constructive comments and/or recommendations were invaluable.



1. Heavy medium separation has been successfully applied at Sishen, Hamersley and Mount Newman to hematite/shale ores, on materials down to 0.5mm in size.
2. The ore breakage pattern has been found to be a critical factor, which can easily lead to an imbalance between the capacities of coarse and fine ore treatment equipment installed in a concentrator. In the case of Sishen, the breakage characteristics were well established in an existing operating plant and the heavy medium concentrator was built around that specification. 10
3. In the case of both Hamersley and Mount Newman, in spite of careful study work, the proportion of fines in the feeds has proved to be higher than anticipated, which has led to imbalances as referred to in (2) above.
4. The provision of surge capacity at Hamersley and Mount Newman has been affected by unforeseen material hang-up problems with wet ore, which have significantly reduced bin capacities. In the case of Mount Newman this has created more problems as the surge bins were smaller in size than at Hamersley, and hang-up has had a greater proportional effect. 20
5. Mount Newman has had greater problems with maintaining high availabilities than Hamersley, because of the different natures of their design concepts.
6. The over-riding factor is the amount of inter-module surge capacity available in the two plants. Hamersley has a great deal of surge capacity in comparison with Mount Newman's virtually flow-through arrangement. This design difference dictates that a smooth controlled flow of ore through all stages of Mount Newman plant is essential if design tonnages are to be achieved. What little surge capacity there is has had to be optimised since a tendency for surge holding to increase would result in dumping at the primary crusher having to be halted and the decreasing surge holding eventually starving the heavy medium and cone plant causing them to operate with a sporadic on-off feed condition. In the Hamersley operation the plant can operate for long periods with the primary crusher down. Similarly, no interruption of truck dumping is necessary if a serious hold-up occurs in the heavy medium section of the plant. 30
7. Also of great importance is the modular design of the cyclone plant. At Hamersley three independent modules are fed via two belt feeder arrangements from a common surge bin. Modules 1 and 2 are fed jointly by one belt and module 3 by a separate belt. The cyclone plant is so designed that any number of the three modules may be run at any time. Although Mount Newman has a three module cyclone plant there are no arrangements for running any of the three separately. These three modules also share a common circulating medium sump. 40

8. Instrumentation is becoming increasingly important in plant operation, and the philosophy and requirements in this area must be defined at a very early stage of the project to ensure that both commissioning and operation are successfully achieved, and that the controls required to optimise plant operation under all reasonable variations in plant feed are available to the operating staff.
9. The different process control requirements were acknowledged at an early stage in each of the two Australian plants and design philosophies formulated accordingly. It was realised that while the Hamersley plant could proceed on the accepted Phase 1/Phase 2 principle quite easily, Mount Newman would not be able to treat the Phases separately but would rather be obliged to attempt to initiate Phase 2 as early as practicably possible if full plant potential was to be realised. 10
10. One of the advantages of being able to attack the overall plant control problems on a Phase 1/Phase 2 step basis are shown up clearly by comparing the present circumstances of the two plants. Hamersley is in Phase 1 and has had the opportunity and time to evaluate the performance and reliability of the numerous items of instrumentation, without seriously affecting overall plant performance, before proceeding to the optimisation of plant operation in Phase 2. Mount Newman on the other hand, has been adversely affected to a serious degree by various factors discussed previously. 20
11. It is probable that the greatest number of applications which might be encountered on future plants could be best met by a system somewhere in between the two discussed here. There is still a long way to go before plants can be built that will reach rated capacity in the first week of operation. Until then the Phase 1/Phase 2 philosophy for overall plant control and instrumentation is a good approach. While the experience of others who have trodden similar paths is extremely valuable, care must be taken to ensure that conditions peculiar to the local situation are not overlooked. 30 40

## REFERENCES

1. Beneficiation of Iron Ores - R.E.R. Falls - Unpublished Paper - 1978.
2. Instrumentation in Iron Ore Plants - D.Knight - Paper presented at the Mitchell Cotts Engineering Conference - Johannesburg - October, 1979.
3. Cleveland-Cliffs takes the wraps off revolutionary new Tilden iron ore process - Robert Sisselman - E/MJ October, 1975.

## ACKNOWLEDGEMENTS

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The views expressed in this paper are the views of the authors, and are not necessarily those of Mitchell Cotts as a company.

EXHIBIT "3"-Paper presented by  
Messrs Uys & Bradford entitled  
"The Beneficiation of Iron Ore by  
Heavy Medium Separation" 1981

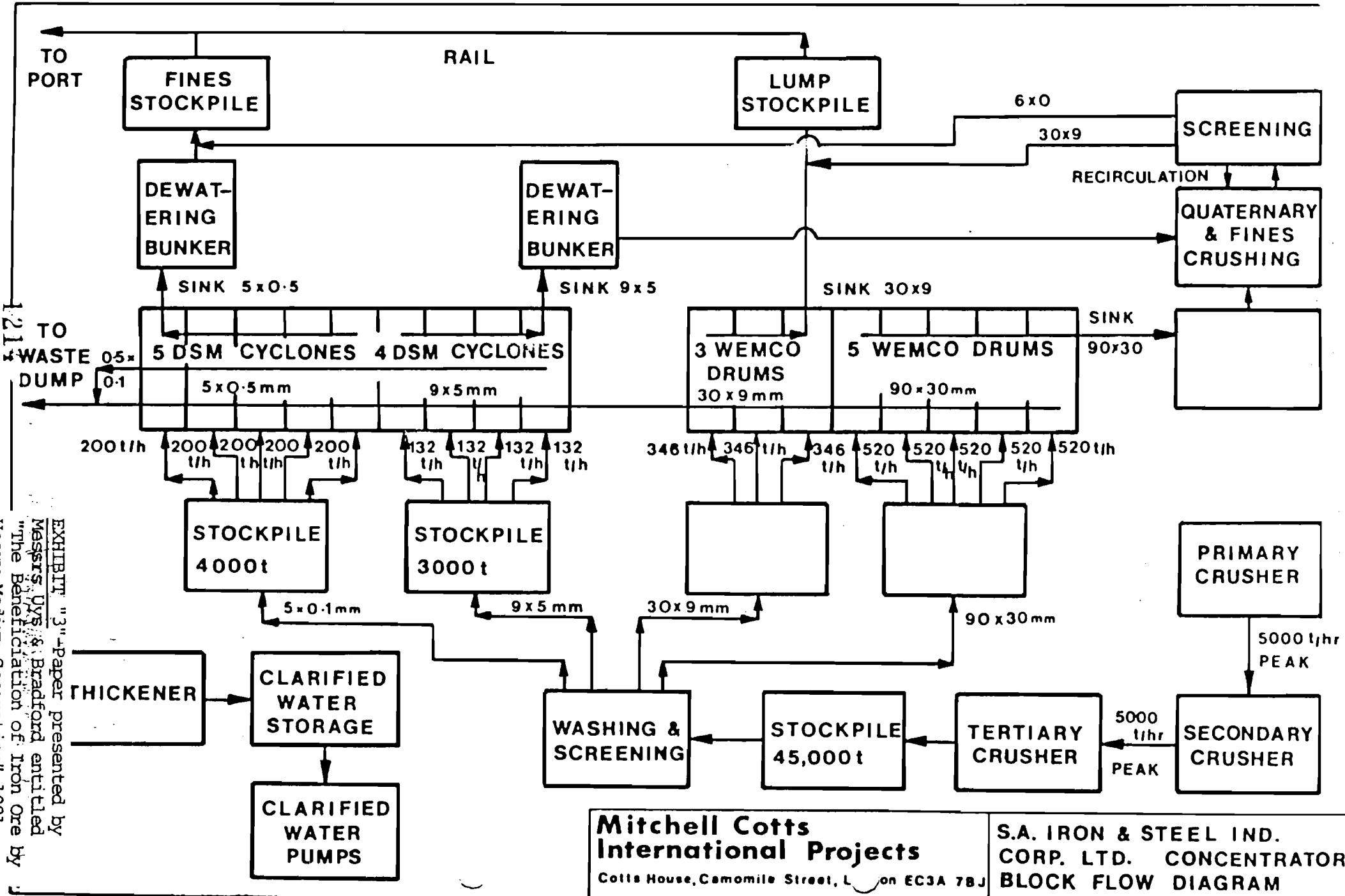
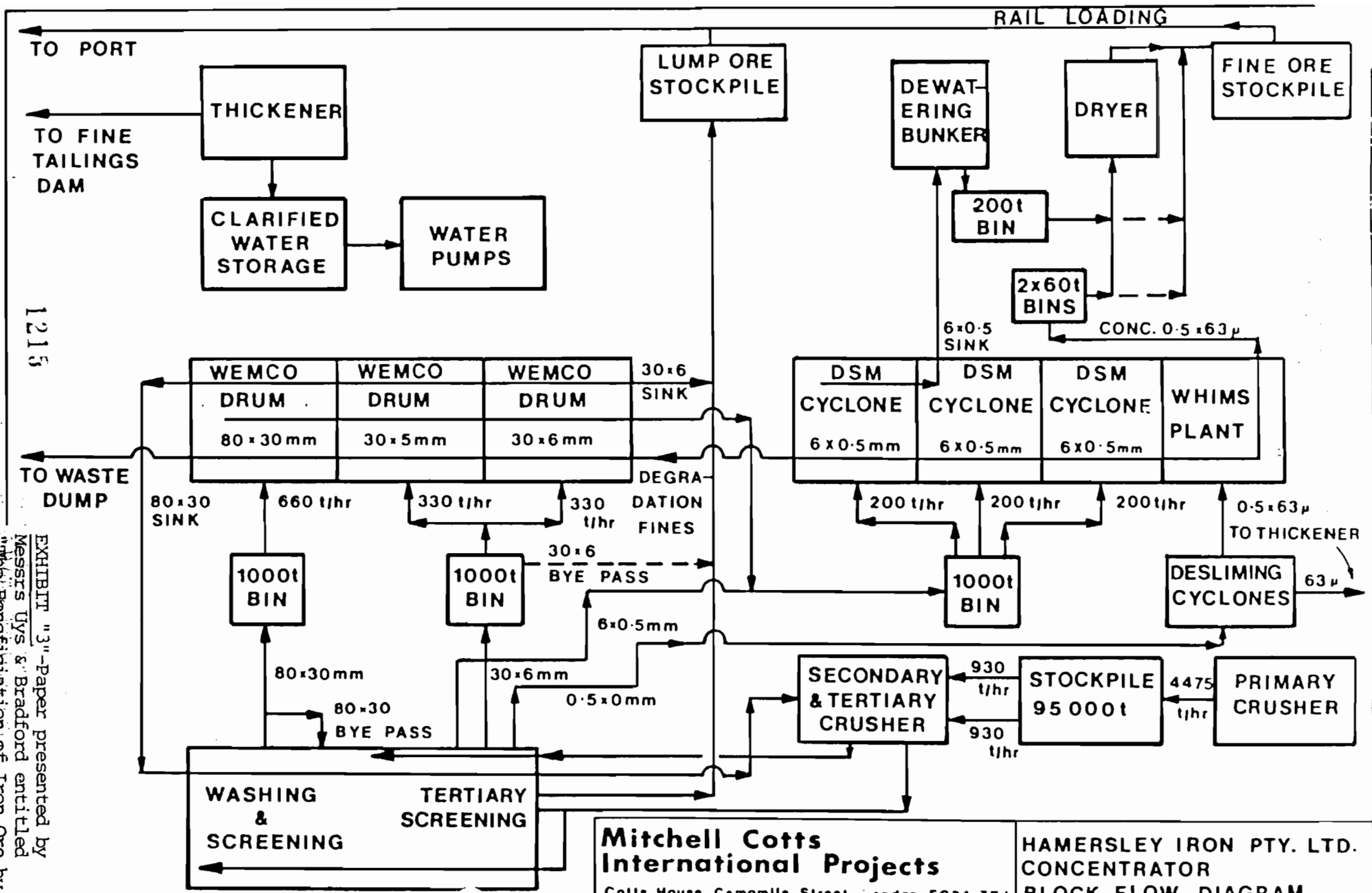


EXHIBIT "3"-Paper presented by  
 Messrs. D. S. & Bradford entitled  
 "The Beneficiation of Iron Ore by  
 Heavy Medium Separation" 1981

**Mitchell Cotts**  
**International Projects**  
 Cotts House, Camomile Street, London EC3A 7BJ

**S.A. IRON & STEEL IND.**  
**CORP. LTD. CONCENTRATOR**  
**BLOCK FLOW DIAGRAM**

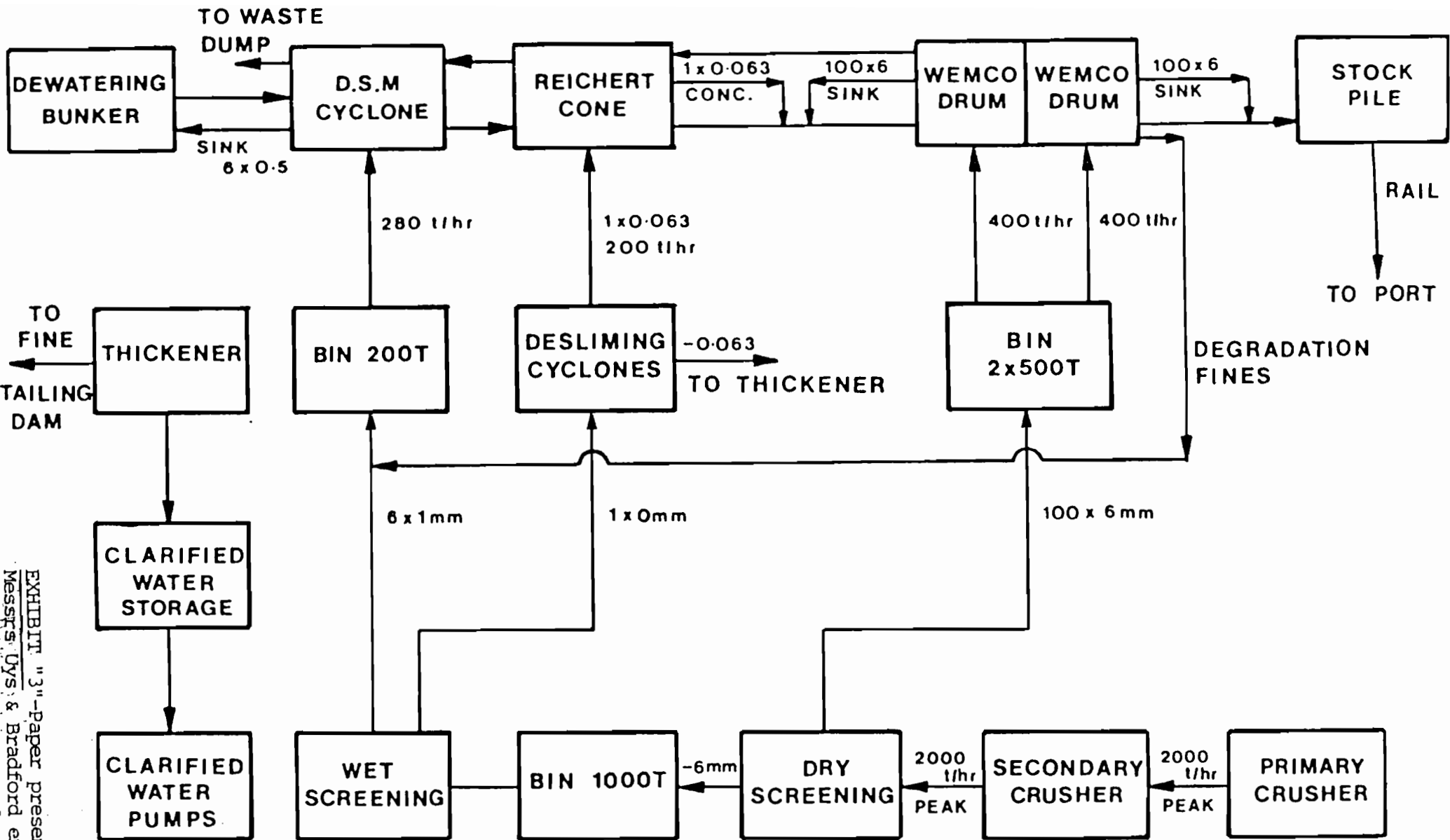


Mitchell Cotts  
International Projects

Cotts House, Camomile Street, London EC3A 7BJ

HAMERSLEY IRON PTY. LTD.  
CONCENTRATOR  
BLOCK FLOW DIAGRAM





**Mitchell Cotts  
International Projects**

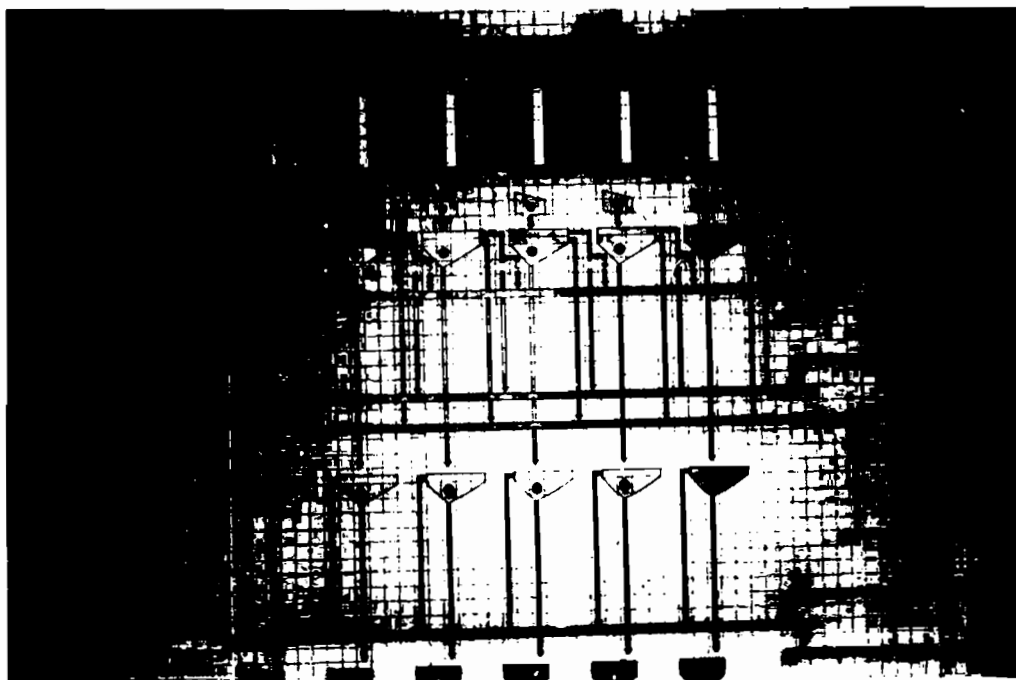
Cotts House, Camomile Street, London EC3A 7BJ

**MOUNT NEWMAN MINING Co.  
CONCENTRATOR  
BLOCK FLOW DIAGRAM**

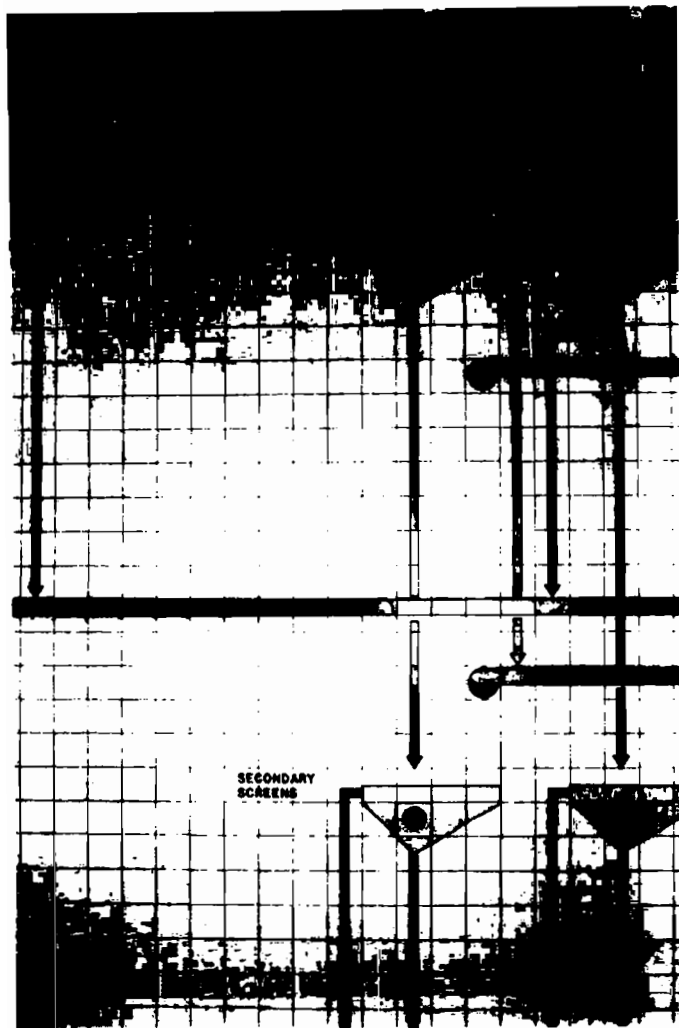
EXHIBIT "3"-paper presented by  
Messrs. Dye & Bradford entitled  
"The Beneficiation of Iron Ore by  
Heavy Medium Separation" 1981

CONTROL ROOM MIMIC PANEL  
Section portraying "wet screen house"

EXHIBIT "4" -Three photographs of  
Tom Price concentrator control  
room mimic panel 1983



83-10/8



83-10/10



83-10/9

EXHIBIT "4"-Three photographs of  
Tom Price concentrator control room  
mimic panel 1983

EXHIBIT "5"-Three photographs of Tom  
Price concentrator plant lookout display  
panel 1983



CONCENTRATOR PLANT LOOKOUT  
DISPLAY PANELS

High Grade Plant

83-12/18

EXHIBIT "5"-Three photographs of Tom  
Price concentrator plant lookout display  
panel 1983



Concentrator

83-12/16

Atmospheric Sciences and Company  
72 1400 2000



Concentrator

83-12/17

EXHIBIT "5"-Three photographs of Tom  
Price concentrator plant lookout display  
panel 1983

Hamersley Holdings Limited

Annual Report 1976

and notice of meeting to  
be held on April 15, 1977

EXHIBIT "6"-Annual Reports of  
Hamersley Holdings Limited for the  
years 1976, 1978, 1981 and 1982

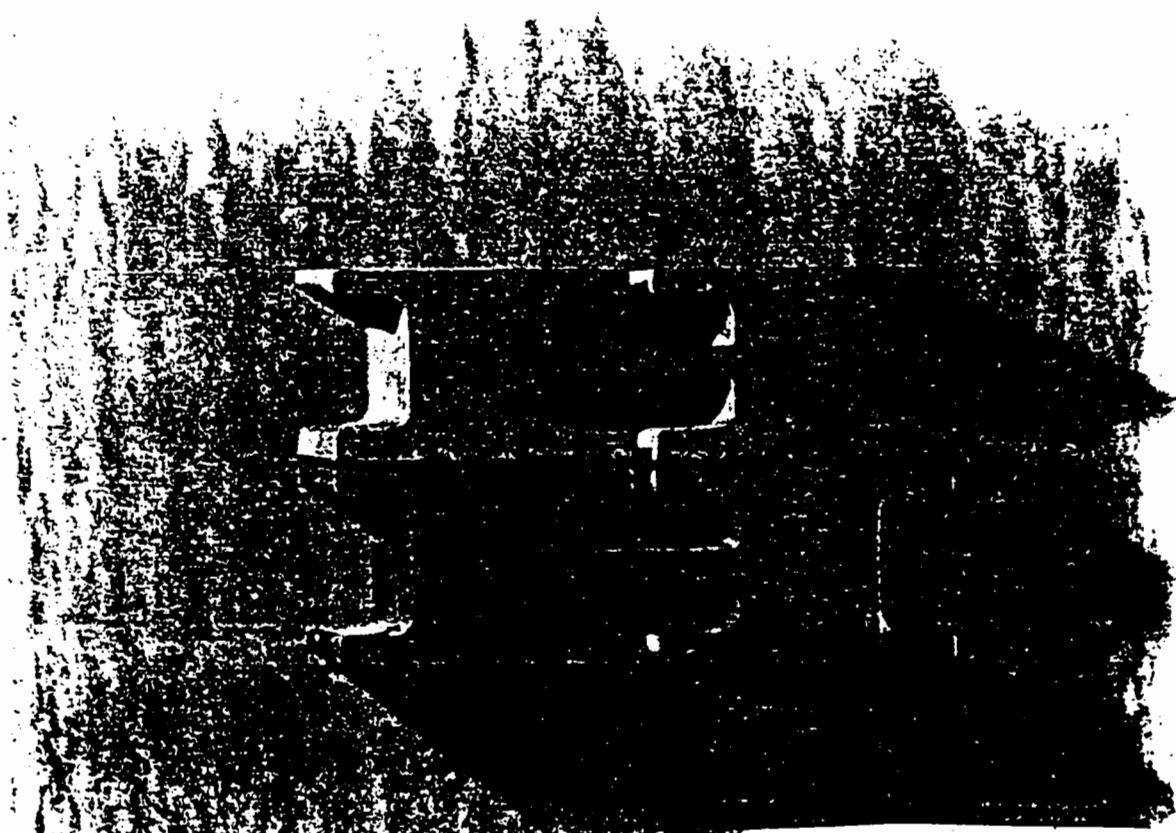
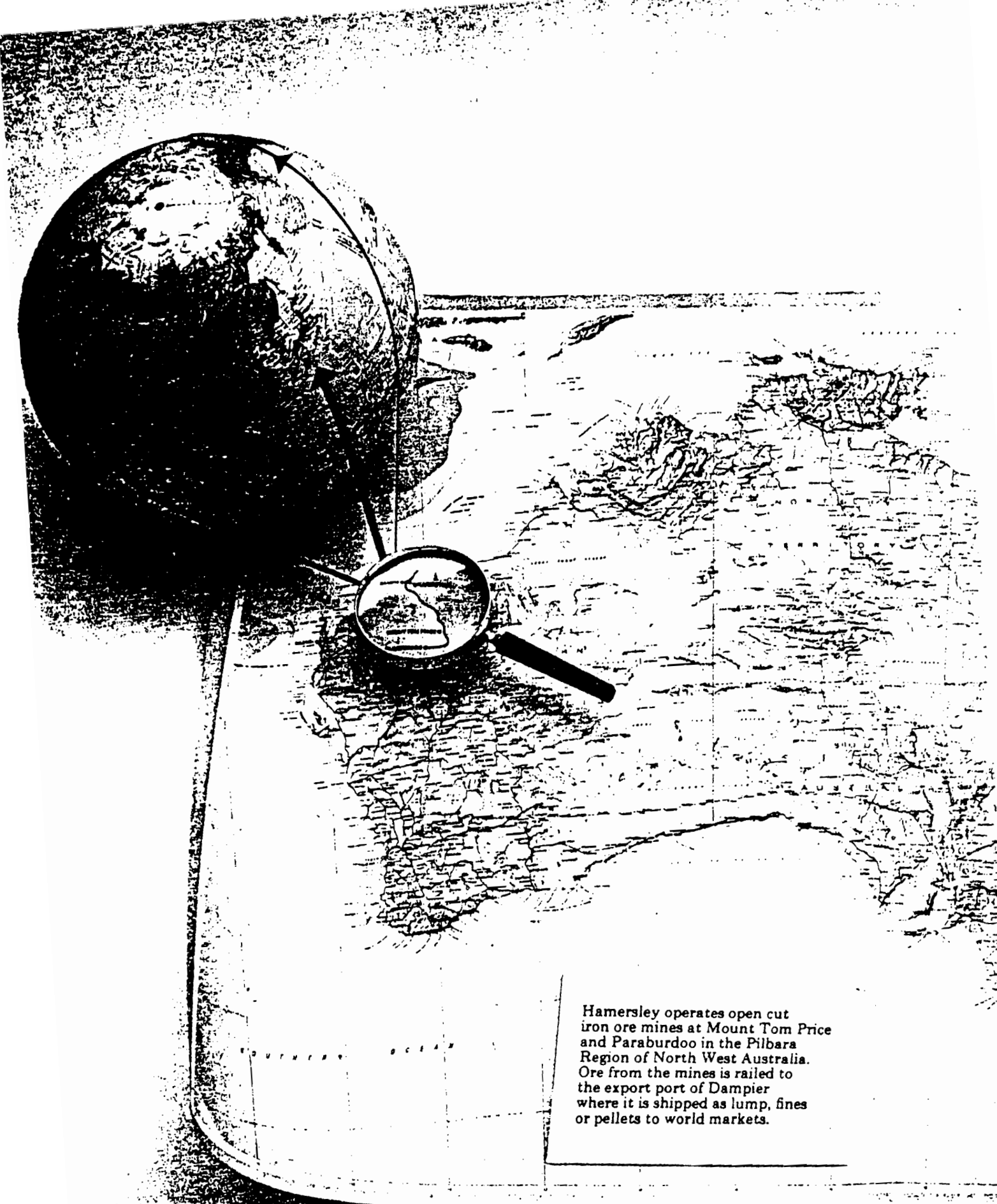


EXHIBIT "6"-Annual Reports of  
Hamersley Holdings Limited for the  
years 1976, 1978, 1981 and 1982



Hamersley operates open cut iron ore mines at Mount Tom Price and Paraburdoo in the Pilbara Region of North West Australia. Ore from the mines is railed to the export port of Dampier where it is shipped as lump, fines or pellets to world markets.

EXHIBIT "6"-Annual Reports of Hamersley Holdings Limited for the years 1976, 1978, 1981 and 1982

# 1976 in brief

Earnings increased in 1976, largely as a result of higher ore shipments and higher prices.

Dividend payout was lifted from 8c to 11c a share, but returns to shareholders, in relation to the real value of assets employed, are still inadequate.

Reconstruction of major items of equipment and industrial disputes meant that saleable ore production was below the level of shipments, requiring a run down of stockpiles.

A concentrator project to treat low grade ore at Mount Tom Price was announced. This project, together with associated capital expenditures, will lift capacity of the Hamersley operation from 40 to 46 million tonnes of saleable ore per annum.

US\$80m was raised in a Eurobond note and debenture issue to help finance the expansion programme.

| STATISTICS                                    | 1976          | 1975          |
|-----------------------------------------------|---------------|---------------|
| Consolidated net earnings                     | \$45 422 000  | \$26 709 000  |
| Net earnings from trading                     | \$56 057 000  | \$26 021 000  |
| Net sales revenue                             | \$362 353 000 | \$285 255 000 |
| W. A. Government royalties                    | \$20 394 000  | \$16 126 000  |
| Borrowings—long and short term                | \$285 563 000 | \$262 113 000 |
| Interest paid/payable                         | \$22 933 000  | \$18 996 000  |
| Expenditure on property, plant and equipment  | \$36 199 000  | \$53 150 000  |
| Saleable ore produced (tonnes)                | 35 183 000    | 36 107 000    |
| Ore shipped (tonnes)                          | 36 089 000    | 32 460 000    |
| Net sales revenue per tonne shipped           | \$10.04       | \$8.79        |
| Net earnings as a percentage of sales revenue | 12.5          | 9.4           |
| Consolidated net earnings per share           | 18.7c         | 11.0c         |
| Dividend per share                            | 11c           | 8c            |

## Notice of meeting

The Annual General Meeting of Hamersley Holdings Limited will be held at 11.00 am on Friday, April 15, 1977 on the 24th floor of the C.R.A. building, 95 Collins Street, Melbourne.

A separate notice of meeting and proxy form is enclosed. All shareholders are cordially invited to attend.

The closing date for the receipt of nominations for the office of director to be voted on at the Annual General Meeting is April 3, 1977.

| Contents                        |          |                                                                                                                                                                                                             |
|---------------------------------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1976 in brief                   | 1        | All Hamersley production and shipment figures are quoted in metric tonnes. However, sales are negotiated in long tons, and this measure has been used where contractual tonnages are quoted in this report. |
| Notice of meeting               | 1        |                                                                                                                                                                                                             |
| Chairman's statement            | 2        |                                                                                                                                                                                                             |
| Managing Director's review      | 5        |                                                                                                                                                                                                             |
| The concentrator project        | 11       |                                                                                                                                                                                                             |
| Directors' report               | 12       |                                                                                                                                                                                                             |
| Statement of earnings           | 16       |                                                                                                                                                                                                             |
| Balance sheets                  | 17       |                                                                                                                                                                                                             |
| Notes on accounts               | 18       |                                                                                                                                                                                                             |
| Statistical summary             | 26       |                                                                                                                                                                                                             |
| Source and application of funds | 28       |                                                                                                                                                                                                             |
| Ten years of operations         | (centre) |                                                                                                                                                                                                             |



# Chairman's statement

## Ten years of rapid expansion

Hamersley made its first shipment of iron ore in August 1966. Since then Hamersley has expanded its operations to become one of the world's largest iron ore producers and a major earner of export revenue for Australia. Over these ten years, Hamersley shipped 217 million tonnes of ore, valued at \$1 700 million.

In order to support its mining operations, Hamersley constructed major infrastructure facilities in the remote Pilbara region. Four modern towns, with high quality housing and community facilities, were developed. The population of these towns is now almost 14 000 people. Ports, railways, power and water supplies were also established by the company. In 1976 Dampier handled 37.6 million tonnes of cargo, more than any other port in Australia.

The total investment by Hamersley in the Pilbara at the end of 1976 was \$821 million and would cost more like \$1 500 million today.

The pace of Hamersley's expansion far exceeded the most optimistic expectations of the early 1960's. The annual capacity of 5 million tonnes planned in 1965 has been increased to 10 million tonnes today, and the first year's sales of 3.3 million tonnes are now made in less than a single month.

The contribution that Hamersley made to Australia's economic development during these years is set out in the centre section of this Annual Report.

## But profits have not been adequate

Yet, while the massive investments and revenues benefited employees, suppliers, contractors, and governments, the shareholders waited at the end of the queue for an appropriate return on their investment. To enable the development loans to be repaid, shareholders had to wait five years from the beginning of operations before any dividends became payable out of earnings.

Then from 1971 to 1975, when dividends began to be distributed and shareholders could have expected to reap returns from the Hamersley enterprise, profitability was held back by adverse economic conditions. During this period, Australia experienced sustained cost inflation. The Japanese steel industry was hit by two severe recessions, in 1972 and 1975. Exchange rate movements, to the end of 1975, generally had an adverse effect on iron ore prices.

Over these years Hamersley's dividend payout has been approximately 52% of net earnings, the other 48% being ploughed back into the operations. Although this payout is above the average for Australian companies, the yield to shareholders represents only 8.7% which is significantly below the current rates on long term bonds.

The "risk takers" share has been significantly less than governments'. Total dividends to date amount to \$131 million, whereas current company tax and government royalties amount to \$169 million. If private industry is to maintain its record of developing Australia's mineral resources, the governments must exercise restraint in their tax and royalty collection to ensure that the "risk takers" get a fair go.

## Reported earnings boosted by inflation

In 1976, the trading position of Hamersley showed some recovery from the depressed conditions of the previous years. The effects of increased ore shipments and higher average prices in Australian dollars were partly offset by continued high inflation.

Consolidated net earnings for 1976 were \$45 422 000 (1975 - \$26 709 000) including a net realised exchange loss of \$165 000 on loan repayments during the year (1975 - a gain of \$2 426 000) and after making provision for a possible exchange loss on future repayments of loans of \$10 470 000 (1975 - \$1 738 000).

However, the reported net earnings are calculated on the basis of historical

accounting principles. The 1976 result would have been substantially lower if depreciation and stock adjustments had been made on the basis of the current cost accounting methods being proposed by the Australian Accounting bodies, or if Hamersley's fixed assets had been revalued on the basis of current replacement costs.

In line with the higher reported net earnings, Directors declared increased dividends for the current year. An interim dividend of 4 cents a share (4 cents in 1975) was paid in October. A final dividend of 7 cents a share (4 cents in 1975) was declared on January 21, 1977 and is payable to shareholders registered on Friday, March 18, 1977. The large disparity between the interim and final dividends is due to earnings for the second half being much higher than forecast earlier in the year.

## Shipments increase in 1976

In my statement to shareholders last year, I indicated that the steel industry was still in a state of recession and it was our expectation that shipments for 1976 would be lower than in the previous year. However, a recovery in the steel industry, which was not in evidence in March last year, occurred during the second calendar quarter and, as far as the Japanese steel industry was concerned, continued into the last half before it finally levelled out. The recovery in Europe and U.S.A., commencing at about the same time, was neither so marked nor so sustained. Steel production in both these areas was cut in the later months of the year. Hamersley found, however, that sales remained buoyant right up to the end of the year, as a direct result of our marketing efforts and our reliability as a supplier.

Shipments rose from 32 460 000 tonnes to 36 089 000 tonnes in 1976, with the lump : fines ratio remaining constant. Pellet shipments were lower due to the protracted shutdown of the plant from August to November.



### Devaluation helpful to exporters

Net sales revenue rose from \$285 255 000 in 1975 to \$362 353 000 in 1976, reflecting the increased shipments of ore and higher average selling prices.

Revenue per tonne shipped in 1976 benefited from price rises negotiated with the Japanese Steel Mills and from the lower average exchange rate for the Australian dollar against the U.S. dollar. The major devaluation at the end of November 1976 was an essential ingredient in the eventual recovery of Australian industry, providing a much needed stimulus to exporters and manufacturers alike. In particular, the devaluation recognises that Australia's exchange rate before November, and high internal cost structure, was incompatible with a viable export industry.

### Further price increases required

Despite the devaluation, prices currently received by Hamersley are below the levels which would give an adequate return on the Company's massive investment in the Pilbara.

Price rises were negotiated during 1976 with the Japanese Mills on the No. 1 Contract and the Pellet Contract. Negotiations on pricing for the other major contracts are currently under way.

The Japanese Mills have agreed to more frequent price reviews. This agreement recognises that long-term fixed pricing is no longer appropriate in a world economy marked by high inflation and fluctuating exchange rates.

### Strikes and cost inflation cause problems

Production of saleable ore did not match the increase in shipments in 1976, requiring the Company to run down its stockpiles during the year. Production for the year was down by 924 000 tonnes, and as a result, stockpiles in the port area were reduced by about 1.1 million tonnes. The industrial situation improved in 1975, but the man hours lost increased significantly last year. While indexation reduced the number of strikes relating to wages, there was a significant increase in hours lost as a result of other union problems including political strikes and demarcation issues.

Some noticeable gains from productivity improvements and from cost management were achieved, but clearly these cannot compete with the high inflationary cost pressures.

### New expansion programme

The agreement by the Japanese Mills in September to purchase additional tonnages from 1979 enabled Hamersley to undertake a further major expansion of its production facilities. This expansion, based on the concentration of low grade ore at Mount Tom Price, will lift annual

production capacity to 46 million tonnes. The new concentrator will treat 11 million tonnes of material to produce a net increase of 7.7 million tonnes of high grade ore a year. The concentrator, associated facilities and other planned capital expenditures will cost in the order of \$375 million.

The concentrator project, by using ore from waste stockpiles and low grade material produced in normal mining operations, allows operating costs associated with the new venture to be contained. At the same time the project means a better utilisation of Hamersley's large infrastructure investment in the Pilbara.

The economics of this project were significantly improved by the Investment Allowance introduced early in 1976 and the taxation changes relating to the mining industry announced in the Federal Budget in August.

The project will provide permanent employment for 270 people when it is completed in 1979, with a peak of 875 during the construction phase.

In consideration of the large capacity of the proposed concentrator, the Western Australian Government agreed to re-schedule Hamersley's commitments to produce metallised agglomerates (Himet\*) in Western Australia. The requirement to submit proposals for the initial one million tonnes a year Himet plant was deferred until 1980 to be more consistent with the expected availability of natural gas from the North-West Shelf. Also, the total Himet commitment was reduced by one million tonnes a year as a consequence of the decision to proceed with the concentrator.

R. T. Madigan (left), Chairman, and D. S. Stewart, Managing Director of Hamersley Holdings Limited.

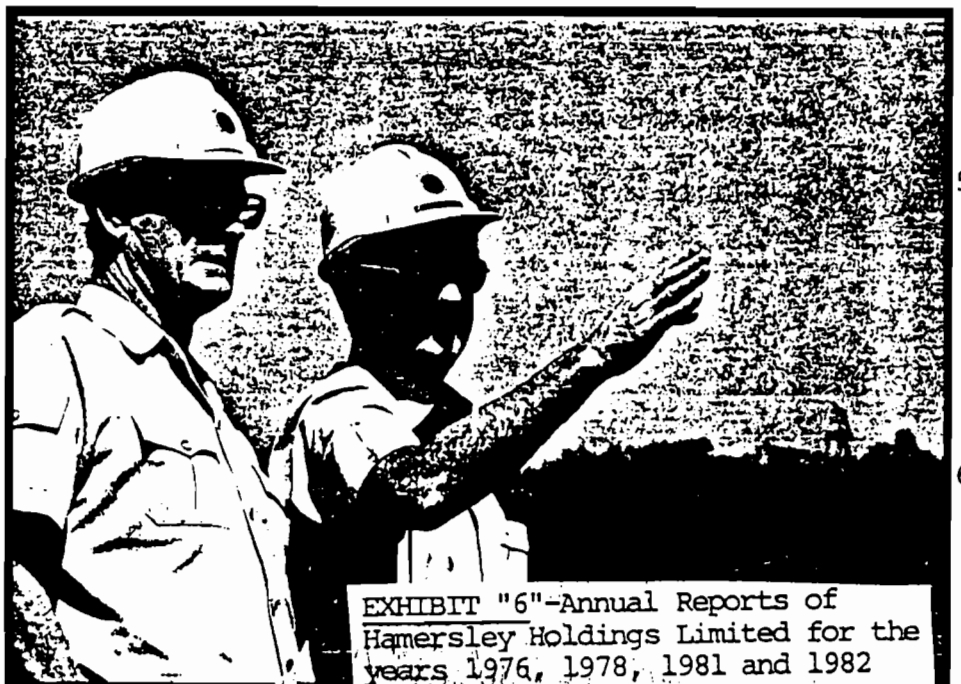


EXHIBIT "6"—Annual Reports of Hamersley Holdings Limited for the years 1976, 1978, 1981 and 1982

\*Registered Trademark of Hamersley Iron Pty. Limited.

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On the basis of current orders, Hamersley seems likely to ship about the same tonnage in 1977 as in the previous year.

**F. S. Anderson**

In October 1976 we received the sad news of the death of F. S. Anderson, appointed the first Managing Director of Hamersley in 1962.

During his career, Struan Anderson occupied key executive positions in Consolidated Zinc and (later) the CRA Group, and was an executive director of those Companies. He helped lay the foundation for the great expansion of the Australian mineral sector in the last two decades.

His work in the marketing, financing, and construction of the Hamersley project set new standards of achievement and excellence in our industry.

**Management changes**

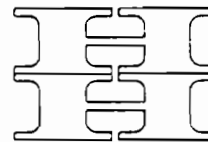
Mr. F. F. Espie, an Executive Director of Conzinc Riotinto of Australia Limited, was appointed to the Hamersley Board in June 1976 to replace the late Sir Val Duncan.

Mr. J. J. Craig, General Manager Administration and Finance retired at the end of 1976 after a distinguished career with the Company. Mr. T. Barlow, General Manager Marketing and Development, was appointed Managing Director of another Company in the CRA Group, but remains on the Board of Hamersley Iron Pty. Limited. Mr. C. A. Watts was appointed General Manager Finance and Administration and also alternate Director to Mr. R. H. Carnegie. Mr. J. A. Innes was appointed General Manager Development, and Mr. J. K. Hamilton General Manager Marketing.

Directors express their thanks to employees for their efforts during 1976—a year in which Hamersley shipped record tonnages.

*R. T. Madigan*

Chairman  
February 14, 1977.



R. T. Madigan, O.B.E.  
Chairman of Directors

D. S. Stewart, O.B.E.  
Managing Director

R. H. Carnegie

F. F. Espie, O.B.E.

G. A. Jedenoff

J. R. B. Longden, O.B.E.

J. T. Ralph

W. R. Roesch 10

C. C. Trumble

R. H. Harding

Alternate for J. T. Ralph

C. A. Watts

Alternate for R. H. Carnegie

**Secretaries**

C. J. S. Renwick

R. M. Houston 20

**General Managers**

J. K. Hamilton  
Marketing

J. A. Innes  
Development

H. F. Sanderson  
Engineering

C. L. Smith  
Operations

C. A. Watts  
Finance and Administration 30

**Registered Office:**

78 Northbourne Avenue  
Canberra City

**Principal Office:**  
31 Spring Street  
Melbourne

**Share and/or loan  
security registers:**

A.C.T.  
78 Northbourne Avenue  
Canberra City 40

VIC.  
84 Flinders Lane Melbourne  
31 Spring Street Melbourne

N.S.W.  
2 O'Connell Street Sydney

W.A.  
191 St. George's Terrace Perth

NEW YORK U.S.A.  
111 Wall Street New York

**Stock Exchanges:**  
Listed on exchanges in all  
Australian States and New Zealand 50

**Bankers:**  
Bank of New South Wales

**Auditors:**  
Coopers & Lybrand

**Solicitors:**  
Arthur Robinson & Co.

EXHIBIT "6"—Annual Reports of  
Hamersley Holdings Limited for the  
years 1976, 1978, 1981 and 1982

## Managing Director's review



### Mining and secondary processing

#### Mining

Total production from the Mount Tom Price and Paraburdoon mines dropped from 36 107 000 tonnes in 1975 to 35 183 000 tonnes in 1976—down 924 000 tonnes. Saleable ore production from Mount Tom Price and Paraburdoon, and material hauled down the rail system, were inhibited during the year by a planned programme of reconstruction of major ore handling equipment both at the port and at Mount Tom Price. This programme, planned to correct structural and operational deficiencies, meant that some key equipment was out of operation for up to several weeks.

These effects were further aggravated by industrial disruptions, the most serious of which occurred in September and resulted in the complete cessation of the operation.

Continuous shift operations were introduced at both mines in the second half of the year thereby increasing mine productivity. Previously the mines were operated on a six day basis. The seven day working week brings the mines into line with all other production operations throughout the Hamersley system.

Recovery of saleable material from material mined rose from 51% to 61%. This improvement in the ore:waste ratio resulted largely from prior development programmes and will be maintained in future mining activities. Improved quality control techniques have enabled more selective mining to be carried out further improving the recovery of saleable material. One of the development programmes was the opening up of the "Prongs" area at Mount Tom Price. This area, at the eastern end of the main orebody, was the subject of extensive development in the previous year.

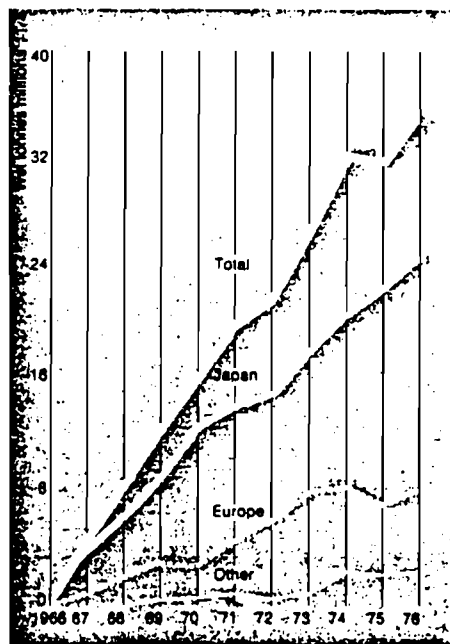
Saleable production at Mount Tom Price was 22 405 000 tonnes compared with 22 300 000 tonnes in 1975. Production in 1976 consisted of 12 908 000 tonnes of

high grade lump, 9 089 000 tonnes of high grade fines and 408 000 tonnes of low grade fines. Total material movement in the mine was 30 676 000 tonnes. Saleable ore production at Paraburdoon in 1976 was 12 778 000 tonnes compared with 13 807 000 tonnes in 1975. Production consisted of 6 124 000 tonnes of high grade lump, 6 229 000 tonnes of high grade fines and 425 000 tonnes of low grade fines. Material mined was 26 570 000 tonnes.

Five new Wabco 3200B haul trucks were commissioned at Mount Tom Price in 1976. These are the largest trucks operated by Hamersley and have a capacity of 230 tonnes. Fifteen Terex 33-15 trucks of 150 tonne capacity have been ordered for Paraburdoon, and will be delivered during 1977/78. These will replace Dart 100 tonne capacity trucks

which have been in operation since 1969. As part of the concentrator project, particular attention in the Tom Price area was directed to the further definition of ore reserves including material which would be suitable for concentrator feed. Following the decision to proceed with the concentrator project, an intensive geological programme is being carried out to determine the ultimate extensions of the Mount Tom Price orebody, both as to high grade ore, and the low grade material which may be processed to produce a high grade product.

At Paraburdoon the detailed evaluation of the 4West orebody has been proceeding preparatory to the mining from this area in the early 1980's. At the same time, a geological programme is being carried out on the fringe areas of 4East and 4West orebodies.



Shipments by markets

#### Pellets

Production for 1976 was 1 265 000 tonnes compared with 1 940 000 tonnes in 1975. A major maintenance shutdown of the pellet plant was carried out during 1976. This programme involved replacement of some 70% of the refractory, combined with extensive repairs and modification to some of the mechanical and electrical systems of the plant. The shutdown was planned to last from August to September. However, as a result of industrial disturbances the plant did not recommence operation until November. The previous poor performance of the pellet plant has been of major concern to the company. The shutdown of 1976 completes the maintenance and upgrading efforts of the previous two years, and should result in a more satisfactory plant performance in 1977.

Pellet production has achieved planned targets since production recommenced but some test work planned for early 1977 may indicate further improvement in the total process optimisation.

## Marketing and shipping

### Marketing

Following the modest upturn of world steel production in the first half of 1976, recovery faltered towards the end of the year in the major market areas. Overall world steel production rose by about 5.8% to 684 million tonnes. This is still well below the world steel production levels achieved during 1973/74.

#### World steel production

|               | (million tonnes) |       |
|---------------|------------------|-------|
|               | 1976             | 1975  |
| Japan         | 107.4            | 102.3 |
| E.E.C.        | 134.4            | 124.6 |
| U.S.A.        | 116.3            | 106.0 |
| Rest of World | 325.4            | 313.4 |
| Total         | 683.5            | 646.3 |

Hamersley was able to ship increased tonnages compared with the previous year. Shipments rose from 32 460 000 tonnes to 36 089 000 tonnes, comprising 17 137 000 tonnes of high grade lump, 16 162 000 tonnes of high grade fines, 1 243 000 tonnes of low grade ore and 1 547 000 tonnes of pellets. The shutdown of the pellet plant from August to November sharply reduced pellet production during 1976.

Sales to Japan accounted for approximately 70% of shipments, the balance being made to Europe, People's Republic of China, U.S.A. and Republic of Korea. Hamersley currently accounts for over 40% of Australia's iron ore exports.

Average revenue per tonne of ore shipped rose from \$8.79 to \$10.04 in 1976, due to such factors as the devaluation of the Australian dollar and price rises negotiated on some Japanese contracts.

Iron ore is priced in U.S. dollars. The average value of the Australian dollar against the U.S. dollar in 1976 as compared with the previous year was about 6.5% lower.

Prices for the No. 1 Contract with the Japanese steel mills were renegotiated for the two year period commencing April 1, 1976. The price increases will be phased in over 18 months. The first increase applied from October 1, 1976.

During the year, negotiations were concluded to expand the tonnage delivered

*J. K. Hamilton (left), General Manager, Marketing, C. J. S. Renwick, Company Secretary, and D. S. Stewart, Managing Director, signing Hamersley's major new sales agreement with the Japanese mills.*



annually to Japan under Nos. 1 and 4 Contracts. This extra tonnage, starting in 1979, will reach 6 000 000 tons per annum, and will be divided equally between these two contracts. Delivery periods were also extended to 1990. The additional ore will be supplied from the upgrading of low grade ore in the proposed concentrator plant (see page 11).

The contracts to supply low grade ore to Kobe Steel Limited of Japan have been converted to high grade ore, commencing 1978 and extending through to 1990. Tonnage supplied under these contracts will reach 1 450 000 tons per annum.

In the Asian region the contract with Pohang Iron and Steel Company of the Republic of Korea was extended. Further discussions are currently being held with other possible buyers in the Asian market.

Although Hamersley's sales to this market (excluding Japan) are not yet large, they should be of growing importance in the future.

While world iron ore demand is forecast to expand at around 5% per annum to 1990, it is expected that the Asian region should grow by some 8% per annum during the same period, a rise of about 70 million tonnes.

The Hamersley position in the European ore market was maintained during 1976, although the level of shipments was adversely affected by the decline of steel production in Europe through the second half of the year.

### Shipping

1976 was a year of consolidation for the Shipping Department and the opportunity was used to rationalise certain operational and shipping arrangements.

Advantage was taken of the continuing shipping freight market recession to obtain shipping cover for the years ahead.

The oversupply of shipping, particularly for vessels of 100 000 dwt plus capacity, the impact of the global trade recession and the continued weak demand for tanker employment, largely contributed to the stagnation of freight rates throughout 1976.

The Hamersley subsidiary, Northern Cross Chartering, Oslo, continued to provide useful freight market intelligence and data to assist in Company policy and operating decisions.

EXHIBIT "6"—Annual Reports of Hamersley Holdings Limited for the years 1976, 1978, 1981 and 1982

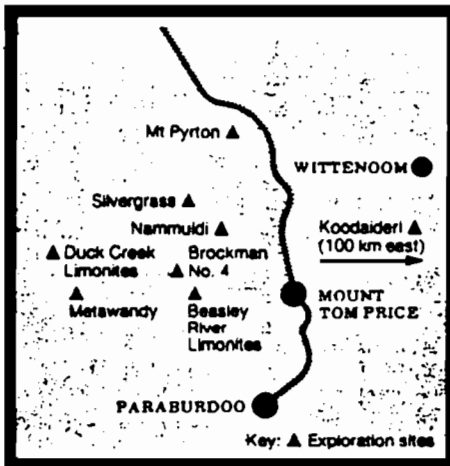
# Exploration, research and development

## Exploration

The search for new ore resources continued throughout 1976 within development range of the existing Hamersley transport system and infrastructure. A limited regional investigation was also pursued over prospective iron stratigraphy within the Hamersley "area of influence" of the Pilbara, for iron and associated industrial materials.

Reserves of Marra Mamba type ore of marketable quality reported last year at Nammuldi and Silvergrass have been upgraded during 1976 from "possible" to "probable" category and have been wide-grid drilled to the economic limits of the deposits.

Following regional studies carried out by the Company, the Western Australian Government has granted further temporary reserves in the Nammuldi area and an area straddling the Hamersley railway system north of Mount Tom Price. Work will progress in these areas during 1977 on the basis of extensive geophysical investigations conducted during the



latter part of 1976. Prospective deposits in these areas are more likely to exist in the Marra Mamba Iron Formation.

Exploration for new mineralisation commenced recently in the Mount Pynton region to the north west of Mount Tom Price. A re-examination of previously known prospects is entailed with this work and the activity will continue into 1977. The area is of interest, given the short (30 kilometre) distance from the railway system.

Expenditure on exploration and evaluation of prospects within the Hamersley sector of the Pilbara over the last nine years now exceeds \$18 million. A continuing programme will be required to ensure the longer term future of Hamersley's ore resources.

## Research and development

The CRA/Hamersley Iron & Steel Division was transferred to Hamersley as part of an expanded Hamersley Development Division from May 1, 1976.

By March 1976 detailed engineering and process design studies had confirmed the technical and economic feasibility of the Mount Tom Price low grade ore concentration project. A Hamersley team was established in Perth in mid-year to undertake project management of all areas of the expansion including the concentrator plant itself.

Investigations into direct reduction technology for the production of *Helmet*\* continued throughout 1976. These focused mainly upon monitoring the progress of new plants overseas, which represented the more promising natural gas-based technologies now under development. It is expected that several of these technologies will, within one or two years, be adequately proven to provide Hamersley with a sound basis for process selection. The timing and price of natural gas supply from the North-West Shelf to Dampier will have a major influence on the prospects of the *Helmet* project.

Increased emphasis was given during 1976 to studies aimed at the better

*J. A. Innes (left), General Manager, Development, H. F. Sanderson, General Manager, Engineering, and C. L. Smith, General Manager, Operations, inspecting a model of the planned stockpile redevelopment and expansion at Parker Point, Dampier.*



EXHIBIT "6" - Annual Reports of Hamersley Holdings Limited for the years 1976, 1978, 1981 and 1982

definition of the long term ore reserve position, and the Company's capacity to meet the iron ore requirements of the steel industry well beyond the term of existing contracts. In this context, detailed studies have been initiated on the mining of specific Marra Mamba orebodies at Nammuldi and Silvergrass. An intensive testwork programme on Nammuldi ore is being pursued with the objective of assessing its physical properties and amenability to various forms of processing.

Other research and development work during the year was associated mainly with refining the metallurgical design of the concentrator and process optimisation within the existing operations, including crushing, screening and pelletising. In several of these areas, the Company has benefited from its collaborative research programmes with the Mineral Research Laboratories of CSIRO.

### Towns

The total population of Tom Price, Paraburdoo, Dampier and Karratha has now reached almost 14 000 of which 9 900 or about 71% of the total population are Hamersley employees and their dependants.

Additions and improvements have been made to various facilities within the townships, particularly in relation to shopping and educational facilities.

The concentrator project will require the construction at Tom Price of an entirely new town area which will be known as Tom Price West. This will incorporate initially some 175 houses together with a 12 classroom primary school and sporting fields. (The facilities of the present Primary and Secondary schools will also be upgraded to cope with future increases in school age population.) Tom Price West will be capable of further expansion should this be necessary in the future.

Some major improvements to the shopping facilities in Tom Price itself are also planned. It is gratifying that these works are being undertaken on a commercial basis by the operators of the shopping facilities.

During 1976 a new Pre-Primary school and a new Junior Primary school were opened at Karratha. Further classroom additions were made to the Senior High School. Thirteen students from this school completed their full secondary education course in 1976; most have now gone on to tertiary studies.

In August 1976 colour television transmission started at Tom Price and Paraburdoo thus joining Dampier and Karratha where colour was introduced some twelve months earlier. Tom Price and Paraburdoo do not have "live" television as do the residents on the coast. Taped programmes are flown to mine sites for transmission. Improvements are being carried out to the transmitter at Tom Price designed to improve the signal strength to provide better viewing for residents at Tom Price and Paraburdoo.

Early in 1977 a new medical centre will be opened in Karratha, a mobile laboratory will be operational at Tom Price and new X-ray facilities will be installed at the Dampier Hospital.

### Railways

In 1976 the railways system handled 5 589 mainline traffic movements. This was a gross haulage of 55.7 million tonnes with ore payload of 34.8 million tonnes.

During the year, longer trains, with a higher power to weight ratio were introduced. These trains, with 184 ore cars require three locomotives compared with two locomotives for the 154 ore car trains previously used. Mainline running times and terminal turnabout times have been reduced.

Increasing haulage volumes bring attendant problems of track degradation and the need for maintenance techniques which can slot into heavy traffic patterns. A high priority has been given to research

Ore train crossing the Spring Creek Bridge on the journey to Dampier.



on train and track dynamics, concrete sleepers, high strength rail and computerised traffic information. These projects have either been implemented or are at an advanced stage.

During 1976, 63 kilometres of track were re-railed. The sleeper replacement programme was deferred in favour of a more intensive effort in 1977.

Locomotive availability improved in 1976, as a result of concentrated maintenance efforts. For the future, a special technical development group has been established with the professional engineering skills required to handle the complex mechanical and electrical problems of locomotives and other railway equipment. A major review of the railways workshop layout is in hand.

At the end of 1976 the railway's rolling stock included 41 locomotives and 2 082 ore cars.

### Port

Tonnage shipped in 416 ore carriers from the East Intercourse Island and Parker Point berths was 36 089 000 tonnes, (see map inside back cover). A total of 242 ore carriers presented at Parker Point and 174 at East Intercourse Island. Stockpiles at Parker Point and East Intercourse Island were not full at the end of 1976 and most of the excess tonnage gathered in the ports at the end of 1975 has been shipped.

Sixty-five vessels also berthed at the cargo wharf, discharging 17 342 tonnes of general cargo and 213 128 tonnes of fuel. The ore carrier, the M.V. Adria Maru took 168 654 tonnes from East Intercourse Island – the largest dry bulk shipment ever to leave an Australian port.

Concurrently with the concentrator project, several major works are being implemented at the port to enable the shiploading facilities to handle the increased tonnages. These works include extension of stockpiling facilities at Parker Point and East Intercourse Island and deepening the departure channel at Parker Point to take ore carriers of 120 000 dwt (currently 100 000 dwt).

Pilbara Harbour Services Pty Limited commissioned a new tug – the Pilbara Jupiter during 1976. The tug, which has engines capable of developing 2500 h.p., will be handling the larger tonnage ore carriers using the port.

### Power

Hamersley has invested about \$62 million in its power facilities since commencement of operations a decade ago. The Company currently operates a 120 MW steam turbine power station at Dampier, with independent diesel stations at Tom Price and Paraburdoo with an installed capacity of about 32 MW and 27 MW respectively.

During 1976 some 393 957 MWh were produced. The diesel stations at the mine sites ran for most of the year with little reserve capacity, while the Dampier station operated on about 50% of its installed capacity.

As a means of providing power for the concentrator project, a high tension transmission line will be constructed from Dampier to Tom Price and Paraburdoo.

# Industrial relations and environment

## Industrial relations

Labour turnover declined from 48% in 1975 to 40% in 1976. The trend reflects in part the further improvement of town facilities, and consequent increasing attractiveness of life in the North West. The depressed employment prospects elsewhere in Australia also contributed to improving stability of the workforce.

Married employee turnover is now only 14.4%. About 31% of staff and 12% of wages employees have more than 5 years service. There are 42 employees with more than 10 years service.

The Industrial Agreement negotiations with four separate union groups took place between September 1975 and May 1976. New terms and conditions of employment were negotiated without any significant industrial disruption. However, the overall industrial relations situation declined throughout 1976 when 270 487 man hours were lost due to strikes compared with 65 538 man hours lost in 1975. Sixty-five separate strikes of more than one day totalled almost 210 000 lost man hours. The Medibank strike involved 30 000 lost man hours.

The willingness to process grievances and disputes through the detailed procedures of the Industrial Code negotiated in 1975 waned during 1976. The original dedication to the intents of the code has been eroded by the departure of "on-site" union representatives who were involved in its formulation. There remains, however, a strong desire amongst most employees for continuation of the Industrial Code. Its provisions are now being jointly reviewed by staff and wages employees representatives.

At the end of 1976, 4 391 people were employed by Hamersley.

## Training and welfare

Comprehensive training schemes and educational programmes for employees were conducted by the Company and external educational institutions. Courses were directed both towards job skills and personal development.

The Company employed 128 apprentices and 34 trainees in 1976. The traineeships with the Company are awarded to those who wish to work towards sub-professional, technical and commercial qualifications. Apprentices and trainees

come largely from the families of Hamersley employees, thus helping to maintain the family unit in the townships.

A graduate development scheme is in operation. It provides for a two-year training programme. During this period, the individual is assigned four separate work situations. Some 22 young men and women joined the scheme in 1976 in the mining, civil, electrical, mechanical engineering, metallurgical and business study disciplines.

The Technical Education Division of the Education Department of Western Australia, the Western Australian Institute of Technology and Murdoch University continued their educational programmes in the Pilbara during 1976.

There was an improvement in safety performance during the year. Safety committees have been formed in many

*Horse riding is a popular outdoor activity at Tom Price and Paraburdoo.*



departments at the operating sites to encourage safe working practices. Hamersley has joined other Pilbara mining companies to form the Pilbara Safety Advisory Committee which will provide for an exchange of information on safety training programmes and equipment.

## Environment

Activities carried out by the Environmental Control Department include the monitoring of noise, dust, toxic gases and other pollutants in order to ensure that the Company meets all requirements set out in State and Federal Environmental legislation.

Investigations were conducted in 1976 on regeneration of mined out areas. The objective is to blend these areas into the surrounding landscape by encouraging colonisation by native flora. This natural rehabilitation process is being monitored on a number of sites in the Pilbara.

In co-operation with the Western Australian Department of Agriculture, and the CSIRO, arrangements have been made to assess the performance in the Pilbara of a large range of fruit and nut trees. Numerous exotic species, as well

*Natural plant colonization on waste material at Paraburdoo.*



as more commonly known fruit varieties will be assessed in an attempt to provide local residents with suitable plant material and encourage greater domestic fruit production.

Plans have been developed with the Western Australian Department of Forestry to establish several plantations for trials of various tree species in which their adaptation to Pilbara conditions will be assessed.

Managing Director.  
February 14, 1977.



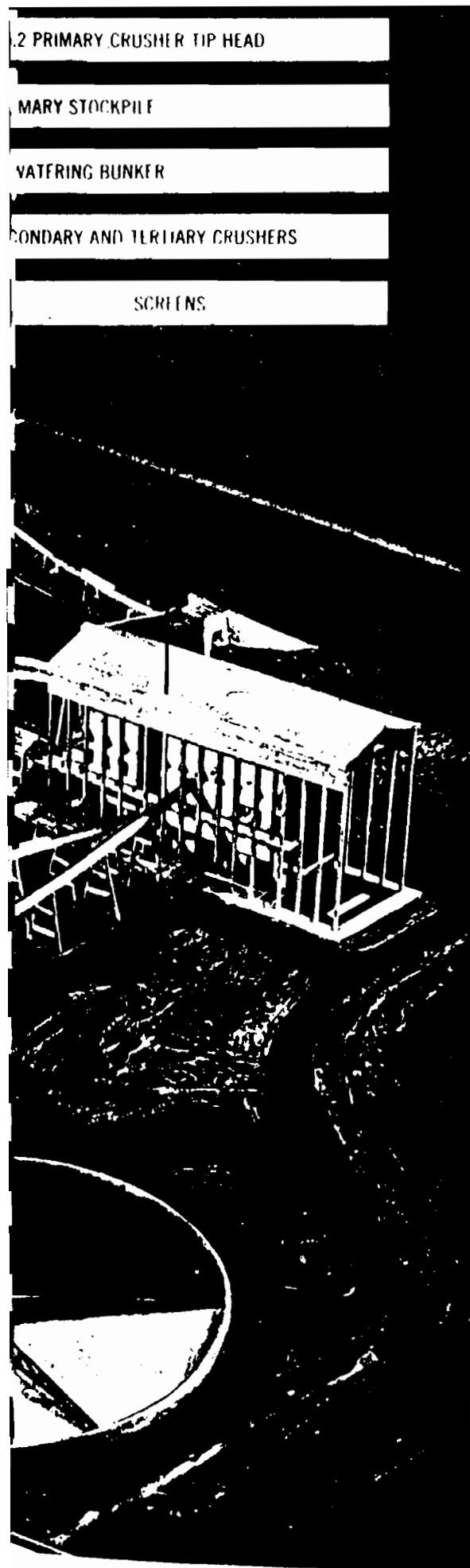
HEAVY MEDIUM CYCLONES AND WET HIGH INTENSITY MAGNETIC SEPARATORS

HEAVY MEDIUM DRUM SEPARATORS

FINE TAILINGS THICKENER

EXHIBIT "6"-Annual Reports of Hamersley Holdings Limited for the years 1976, 1978, 1981 and 1982.





## The concentrator project

*Hamersley's expansion programme to lift annual production capacity to 46 million tonnes of saleable ore, is based on a concentrator project at Mount Tom Price. This section summarises how Hamersley's latest secondary processing development will operate.*

Concentrator feed will comprise shaley low grade iron ore. This ore is essentially a mixture of the iron mineral, hematite, and shale of relatively low iron content. Large tonnages of low grade ore have been mined and dumped since the commencement of mining at Mount Tom Price. Further larger tonnages will be mined in the future to permit the extraction of high grade ore. About thirteen million tonnes per annum will be available from these sources as low grade feed, producing a net increase of 7.7 million tonnes of marketable ore.

Low grade ore will be fed to the No. 2 Primary Crusher tip head. Ore coarser than 200mm will enter the crusher from which it will pass to the existing crushing and screening facilities. Ore finer than 200mm will be conveyed to the concentrator plant primary stockpile.

Ore will be withdrawn from the primary stockpile and separated into four basic size fractions for subsequent treatment.

The large size fraction (200mm to 80mm) will be crushed to normal product size by the secondary and tertiary crushers, without prior concentration. The crushed product will be combined with some of the lump ore from the high grade plants on a new stockpile/loadout facility.

The intermediate size fraction (80mm to 6mm) will be treated in the heavy medium drum separator plant. The coarse concentrate produced undergoes crushing before being transferred to the new lump stockpile.

The small sized fraction (6mm to

0.5mm) will be upgraded in the heavy medium cyclone plant. The resulting concentrate will be de-watered before being conveyed to the modified fines handling system.

Both the heavy medium drum and cyclone plants utilise the difference in specific gravities of the iron and shale components to effect separation. The Mount Tom Price low grade ore is eminently suitable for concentration, as the shales are easily separated from the iron minerals. The effectiveness of these methods of concentration has been proven in the treatment of iron ore and other minerals throughout the world.

The smallest size (less than 0.5mm) will be treated in hydro-cyclones in which the ultrafine fraction will be removed and pumped to a thickener.

Here much of the water is recovered for re-use while the solids are pumped to a tailings dam. The coarser product from the hydrocyclones will be upgraded by wet high intensity magnetic separation. While this technology is relatively new, it is successfully employed on a large scale in Brazilian and Canadian iron ore operations.

Concentration of low grade ore will significantly increase the annual production of high grade products from the Mount Tom Price orebody. Utilising large tonnages of excess low grade ore will not accelerate the depletion of the total ore reserves. The product from the concentrator has the additional advantage of being low in phosphorus. This will permit the more efficient usage of higher phosphorus Paraburdoo ore in the total Hamersley operation, and will improve quality control prior to product shipment.

The expanded production from Mount Tom Price will require extensions and modifications to the existing ore handling system. These requirements include additional locomotives and ore cars, new stockpiles at Mount Tom Price and Dampier and expanded train loading facilities. In addition, new social infrastructure such as housing, a school and water supply facilities will be constructed.

1.0

2.0

3.0

4.0

5.0

6.0

EXHIBIT "6"-Annual Reports of Hamersley Holdings Limited for the years 1976, 1978, 1981 and 1982.

(Incorporated in the Australian Capital Territory)

*Your Directors have pleasure in presenting the Annual Report and Group Accounts of Hamersley Holdings Limited (the "Company") and its subsidiaries for the year ended December 31, 1976.*

**Directors**

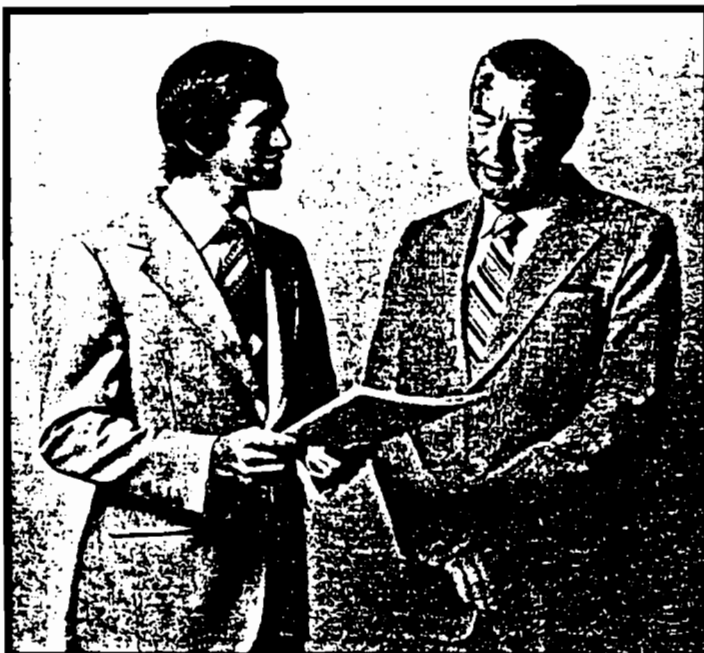
At the date of this Report the following were Directors of the Company:

| Director                                      | Shareholdings in the Company and in related corporations as shown in the Register of Directors' Shareholdings at January 21, 1977 |      |      |      |      |
|-----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|------|------|------|------|
|                                               | HHL                                                                                                                               | BCL  | CRA  | MKU  | RTZ  |
| R. T. Madigan<br>(Chairman)                   | 5579                                                                                                                              | 189  | 784  | —    | —    |
| D. S. Stewart<br>(Managing Director)          | —                                                                                                                                 | —    | —    | —    | —    |
| R. H. Carnegie                                | 1000                                                                                                                              | 6000 | 6000 | 1000 | —    |
| F. F. Espie                                   | —                                                                                                                                 | —    | —    | 1300 | —    |
| G. A. Jedenoff                                | —                                                                                                                                 | —    | —    | —    | —    |
| Captain J. R. B. Longden                      | —                                                                                                                                 | 1000 | 414  | —    | 1976 |
| J. T. Ralph                                   | —                                                                                                                                 | 114  | 476  | —    | —    |
| W. R. Roesch                                  | —                                                                                                                                 | —    | —    | —    | —    |
| C. C. Trumble                                 | —                                                                                                                                 | —    | —    | —    | —    |
| R. H. Harding<br>(Alternate for J. T. Ralph)  | 1267                                                                                                                              | 336  | 1400 | 1000 | —    |
| C. A. Watts<br>(Alternate for R. H. Carnegie) | —                                                                                                                                 | —    | —    | —    | —    |

All shareholdings held beneficially  
 HHL Hamersley Holdings Limited  
 BCL Bougainville Copper Limited  
 CRA Conzinc Riotinto of Australia Limited  
 MKU Mary Kathleen Uranium Ltd.  
 RTZ The Rio Tinto-Zinc Corporation Limited

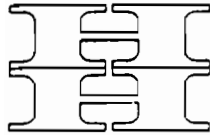
**Activities**

The principal activities of the corporations in the Group during the period covered by this Report were the mining, transport, pelletising and shipping of iron ore, the exploration for mineral deposits, the holding of temporary reserves for iron ore deposits, the servicing of sales contracts, the provision of tug, harbour and ship agency services, shipbroking and consultancy, participation in shipping ventures and the raising of finance for such purposes. During this period, no significant change occurred in the nature of the activities of any of the corporations in the Group.



**EXHIBIT "6"—Annual Reports of Hamersley Holdings Limited for the years 1976, 1978, 1981 and 1982**

*J. B. Arthur, Treasurer (left) and C. A. Watts, General Manager, Finance and Administration, discuss the arrangements for financing the Concentrator Project.*



### Revenue and net earnings

Net sales revenue of the Group increased by 27% from \$285 255 000 in 1975 to \$362 353 000 in 1976. The lift in revenue reflects higher volume of ore shipments, some improvement in average selling prices and the effects of a lower average exchange rate for the Australian dollar.

Consolidated net earnings for 1976 amounted to \$45 422 000 (1975—\$26 709 000) including net realised exchange losses of \$165 000 (1975—gain of \$2 426 000) on loan repayments during the year and after making provision for possible exchange losses on future repayments of loans of \$10 470 000 (1975—\$1 738 000).

The above consolidated net earnings result has been determined according to historical accounting methods. If current cost accounting principles were applied to reflect the effects of inflation on replacement costs of plant and stocks, that result would have been significantly lower.

No adjustment to the income tax provision was made for the Cost of Sales Valuation Adjustment which the Government is proposing to introduce in the autumn session of Parliament and which it has been announced will be effective for the 1976 calendar year.

The contribution of each corporation in the Group to the consolidated net earnings was as follows:

|                                        | 1976     | 1975     |
|----------------------------------------|----------|----------|
|                                        | \$000    | \$000    |
| Hamersley Holdings Limited             | 429      | 2        |
| Hamersley Iron Pty. Limited            | 44 470   | 26 493   |
| Hamersley Exploration Pty. Limited     | —        | —        |
| Mount Bruce Mining Pty. Limited        | 81       | (46)     |
| Hamersley Europe Pty. Limited          | 18       | 6        |
| Pilbara Harbour Services Pty. Limited  | 537      | 319      |
| Himet Corporation Limited              | —        | —        |
| Metallised Ores Limited                | —        | —        |
| Hamersley Iron Finance N.V.            | —        | —        |
| Hamersley Japan Limited                | 4        | 5        |
| Northern Cross Chartering Limited A/S. | (117)    | (70)     |
|                                        | \$45 422 | \$26 709 |

### Significant events

During the year events of particular significance to the Company were:

1. The decision by Hamersley, announced in September, to expand its annual capacity to 46 million tonnes. This expansion will satisfy part of the Group's processing commitments to the State of Western Australia.
2. The agreement made between the Japanese Steel Mills and Hamersley Iron Pty. Limited in September, whereby the mills undertook to purchase from Hamersley Iron Pty. Limited at least 4 500 000 tons of high grade ore in 1979 and 6 000 000 tons of high grade ore annually from 1980 through 1990, in each case in addition to deliveries under existing sales contracts. At the same time, it was agreed to extend Nos. 1 and 4 Contracts to 1990.

### Subsidiaries

No subsidiaries were acquired or disposed of during the financial year.

### Reserves and provisions

Hamersley Holdings Limited  
The following material movements occurred in provisions during the year:

Possible loss on investments  
— transfers from \$ 210 000

### Hamersley Iron Pty. Limited

The following material movements occurred in provisions during the year:

|                                         |              |
|-----------------------------------------|--------------|
| (a) Major maintenance                   |              |
| — transfers to                          | \$12 516 000 |
| — charges against                       | \$11 924 000 |
| (b) Long service leave                  |              |
| — transfers to                          | \$ 1 288 000 |
| — charges against and transfers from    | \$ 118 000   |
| (c) Possible future net exchange losses | 10           |
| — transfers to                          | \$10 470 000 |
| (d) Doubtful debts                      |              |
| — transfers to                          | \$ 45 000    |
| — charges against                       | \$ 9 000     |
| (e) Exploration and development         | 20           |
| — transfers to                          | \$ 2 913 000 |
| — charges against                       | \$ 928 000   |

### Pilbara Harbour Services Pty. Limited

The following material movements occurred in provisions during the year:

|                                      |           |
|--------------------------------------|-----------|
| Long service leave                   |           |
| — transfers to                       | \$ 23 000 |
| — charges against and transfers from | \$ 2 000  |

### Hamersley Japan Limited

The following material movements occurred in provisions during the year:

|                    |          |
|--------------------|----------|
| Long service leave |          |
| — transfers to     | \$ 8 000 |

Other Corporations in the Group  
No other material movements occurred in reserves or provisions in any other corporation in the Group during the year. 40

### Shares and debentures

No corporation in the Group issued any shares or debentures during the period covered by this Report. However, on January 5, 1977 the Company issued: 50

(a) 9½ % Debentures due 1992 (US\$40 000 000),

(b) the Series H Security Stock securing the above issue of Debentures,

(c) 8½ % Notes due 1984 (US\$40 000 000), and,

(d) the Series I Security Stock securing the above issue of Notes. 60

The net proceeds from the above issues of Debentures and Notes were for general corporate purposes and to provide part of the total funds required for the expansion of the annual production capacity of Hamersley Iron Pty. Limited to 46 million tonnes. 70



**Dividends**

A final dividend for 1975 of 4 cents per share was declared on January 23, 1976 and was paid in May, 1976. This dividend was mentioned in the last Report. An interim dividend for 1976 of 4 cents per share was declared on August 2, 1976 and was paid on November 4, 1976.

A final dividend for 1976 of 7 cents per share was declared on January 21, 1977 and is payable on May 4, 1977.

**Additional Information**

**(a)** The Directors of the Company (before the Statement of Earnings and Balance Sheet were made up) took reasonable steps to ascertain the action taken in relation to the writing off of bad debts and to cause all known bad debts to be written off and adequate provision to be made for doubtful debts.

The Directors of the Company are not aware of any circumstances which would render the amount written off for bad debts, or the amount of the provision for doubtful debts inadequate to any substantial extent.

**(b)** The Directors of the Company (before the Statement of Earnings and Balance Sheet were made up) took reasonable steps to ascertain whether any current assets were unlikely to realise, in the ordinary course of business, their value as shown in the accounting records of the Company and the Group and were satisfied that such assets would so realise that value. The Directors of the Company are not aware of any circumstances which would render the values attributed to current assets or liabilities in the Group Accounts misleading or inappropriate.

**(c)** Save for a contingent liability of Hamersley Iron Pty. Limited in respect of a guarantee for a loan of US\$80 000 000 (A\$73 600 000) raised by the Company on the Eurobond Market and which was lent to Hamersley Iron Pty. Limited, there does not exist at the date of this Report either any charge on the assets of any corporation in the Group or any contingent liability of any corporation in the Group which has arisen since the end of the financial year.

**(d)** No contingent liabilities of the Company or of any corporation in the Group have become enforceable or are likely to become enforceable within the succeeding period of twelve months which would materially affect the Company or any corporation in the Group in their ability to meet their obligations as and when they fall due.

**(e)** The Directors of the Company are not aware of any circumstances not otherwise dealt with in this Report or the Group Accounts, which would render any amount stated in the Group Accounts misleading.

**(f)** The results of the Company and of the Group operations during the period covered by this Report have not been affected by any item, transaction or event of a material and unusual nature except as mentioned in this Report.

**(g)** Between December 31, 1976 and the date of this Report no item, transaction or event of a material and unusual nature has occurred which, in the opinion of the Directors, will affect substantially the results of the Group for the period ending December 31, 1977.

**(h)** (i) As at January 18, 1977, there were 27 718 ordinary shareholders who held all the Company's issued capital on which the voting rights are one vote for each share held.

(ii) As at January 18, 1977, the twenty largest holders of the ordinary shares of the Company held a total of 90.5% of the issued ordinary shares of the Company. Of this figure 54% (130 977 000 shares) are held by Conzinc Riotinto of Australia Limited, 95 Collins Street, Melbourne, Victoria, in which the following companies have an interest:

C.R.A. Holdings Pty. Limited, 95 Collins Street, Melbourne, Victoria  
R.T.Z. Australian Holdings Limited, and  
The Rio Tinto-Zinc Corporation Limited, both of 6 St. James's Square, London and 28.32% (68 679 750 shares) are held by

Kaiser Steel Corporation, 300 Lakeside Drive, Oakland, California  
in which the following have an interest:  
Kaiser Industries Corporation, and  
The Trustees of Henry J. Kaiser Family Foundation, both of 300 Lakeside Drive, Oakland, California.

(iii) As at January 18, 1977, the distribution of the ordinary shares of the Company (which comprise the total issued capital of the Company) was:

| No. of Shares   | No. of Shareholders |
|-----------------|---------------------|
| 1- 1 000        | 23 531              |
| 1 001- 5 000    | 3 742               |
| 5 001-10 000    | 235                 |
| 10 001 and over | 210                 |
| <b>Total</b>    | <b>27 718</b>       |

**(i)** Since the end of the previous financial year certain of the Directors of the Company have received, and become entitled to receive, benefits as follows, namely: Mr. R. T. Madigan, Mr. D. S. Stewart, Mr. R. H. Carnegie, Mr. F. F.

Espie, Mr. J. T. Ralph, Mr. R. H. Harding and Mr. C. A. Watts, each of whom is engaged in the full-time employment of the Company and/or its related corporations and has received, or become entitled to receive, in connection with that employment, his fixed salary and normal superannuation, medical and other benefits relating to such employment; Captain J. R. B. Longden, who, by reason of his contract of employment as an employee of an overseas related corporation, has received, or become entitled to receive, his fixed salary and benefits pursuant to pension arrangements established outside Australia in which he participated, such benefits being contributions to such arrangements paid by an overseas related corporation and being those normally applicable to executive directors of those related corporations. Save as aforesaid, and save as to any pro rata payment of, or entitlement to, emoluments such as are included in the Group Accounts, since the end of the previous financial year, no Director of the Company has received, or become entitled to receive, a benefit (other than a benefit included in the aggregate amount of Directors' emoluments shown in the Group Accounts, or the fixed salary of a full-time employee of the Company) by reason of a contract made by the Company or a related corporation with the Director, or with a firm of which he is a member, or with a company in which he has a substantial financial interest.

**(j)** The Company is a company of the kind specified in the Schedule to the Order dated December 10, 1974, made by the Registrar of Companies "in respect of classes of companies relating to the 'rounding off' of amounts in accounts and directors' reports."

Signed this 26th day of January, 1977 in accordance with a resolution of the Directors.

*R. T. Madigan*  
Chairman

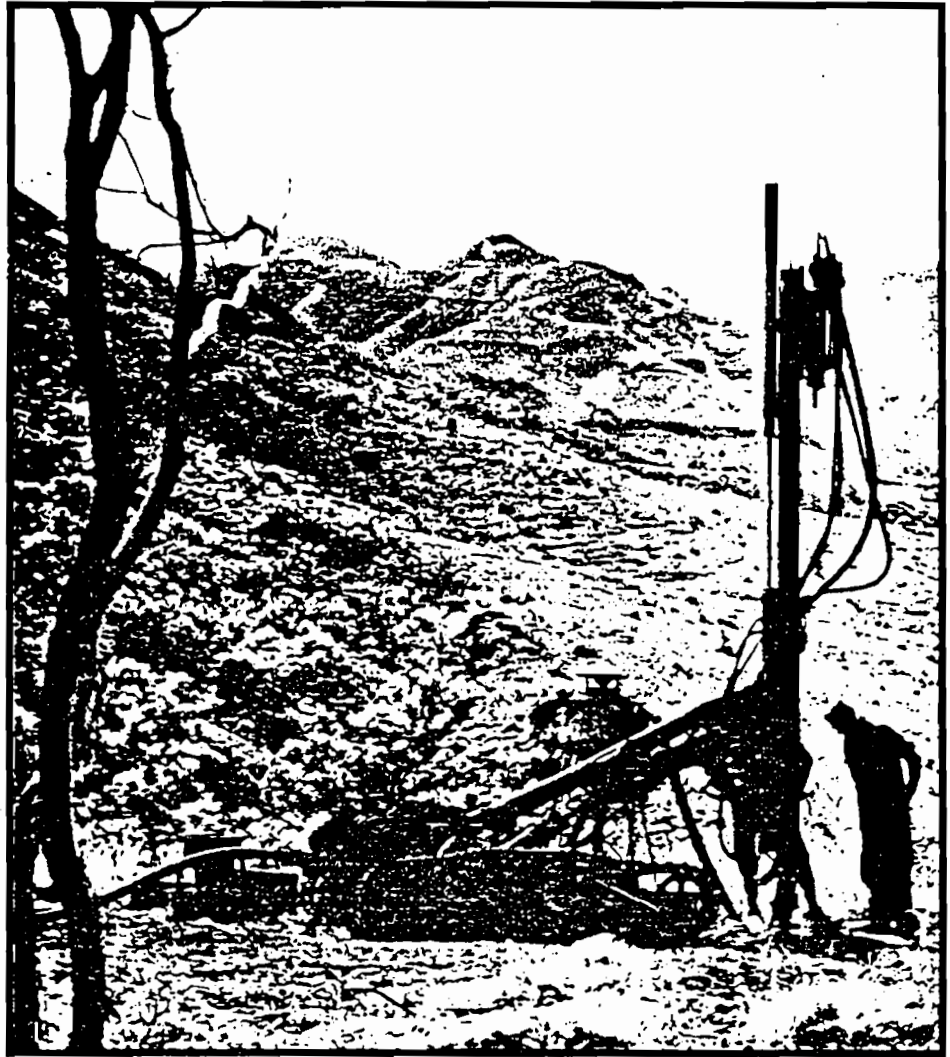
*J. T. Ralph*  
Director



*Ten years of operations*

EXHIBIT "6"-Annual Reports of  
Hamersley Holdings Limited for the  
years 1976, 1978, 1981 and 1982

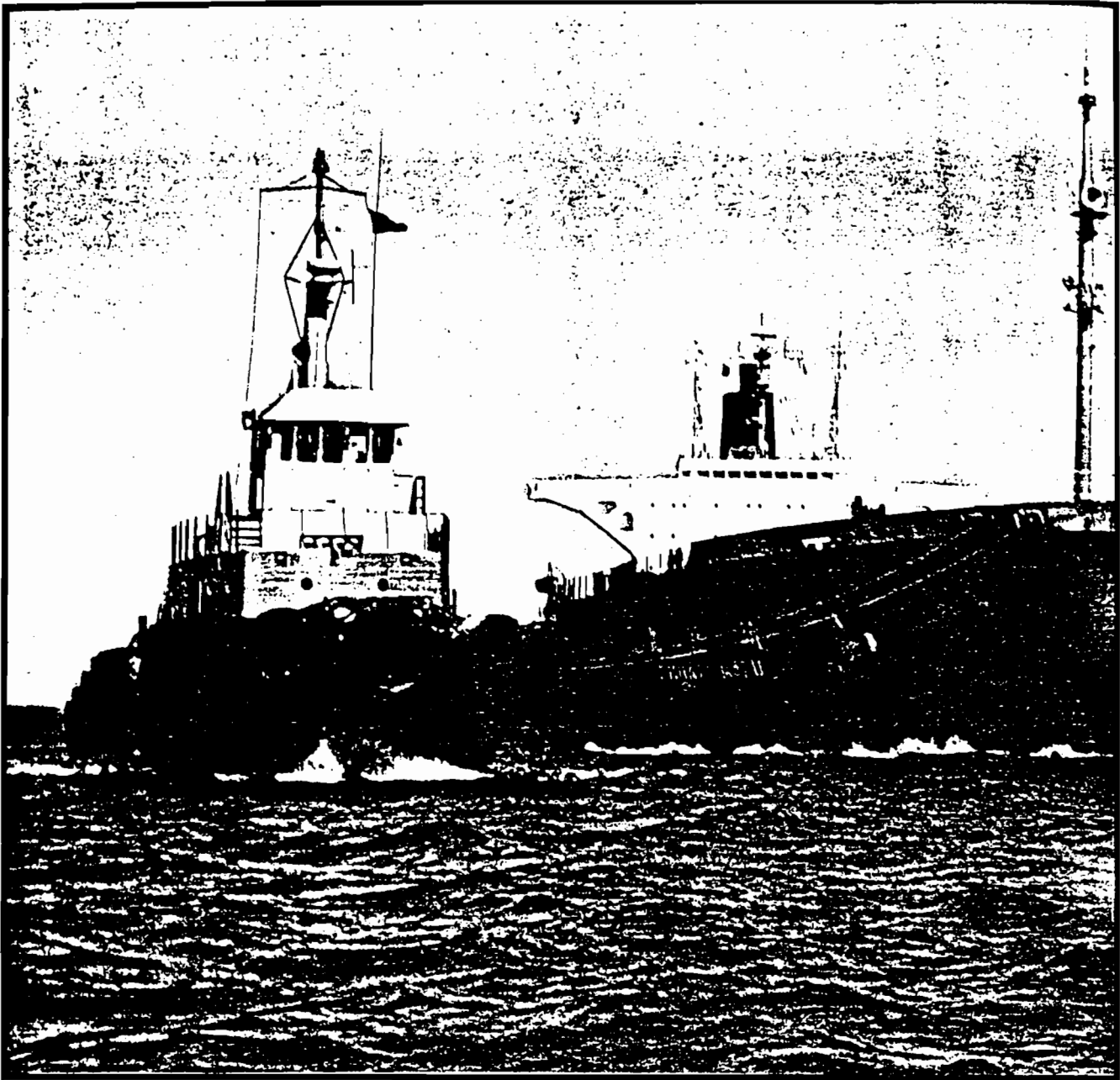
# Early days...



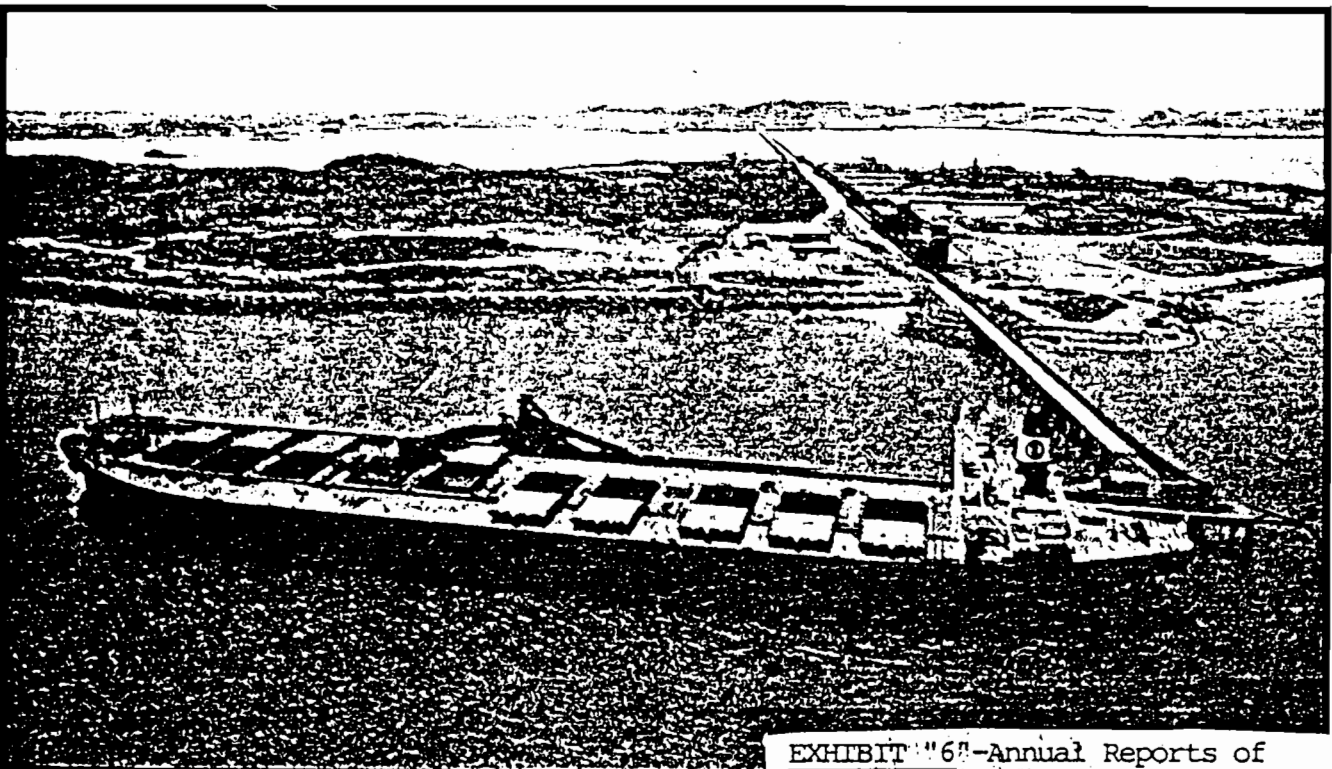
*P*rior to the early 1960's the Pilbara was one of the most barren and isolated regions of Australia. Mining has brought industry and population to the area.  
(Above) Exploration drilling at Mount Tom Price.  
(Right) Tom Price township soon after its establishment.



EXHIBIT "6"-Annual Reports of Hamersley Holdings Limited for the years 1976, 1978, 1981 and 1982.



The new tug, Pilbara Jupiter, in the Port of Dampier.



loading iron ore at the East Intercourse Island berth in the Port of Dampier.

EXHIBIT "6"-Annual Reports of Hamersley Holdings Limited for the years 1976, 1978, 1981 and 1982

## The discovery 1961-1962

In September 1962, two CRA geologists —Bill Burns and Ian Whitcher—landed by helicopter on one of the many mountains that make up the Hamersley Ranges in the North West of Western Australia. That mountain, later to be named Mount Tom Price, contained one of the world's richest deposits of iron ore.

In March 1961, The Rio Tinto Mining Company of Australia (RTMA) commenced exploration for iron ore in the Hamersley Ranges, after the lifting of the iron ore export embargo.

Work in the following twelve months revealed a number of hematite iron ore deposits. Early in 1962, Consolidated Zinc (with whom RTMA merged to form Conzinc Riotinto of Australia in July 1962) viewed these results, together with representatives of Kaiser Steel Corporation, including a senior engineer, Tom Price. Subsequently both companies joined in the exploration programme.

The discovery which was to lead to the formation of Hamersley came in the last few days of a regional iron ore search mapped out by CRA's Director of Exploration —Haddon King, and led by geologist Frank Hughes. Regrettably the discovery was made only one day prior to the death of Tom Price in California.

As Alan Trengove says in his recent publication, *Adventure in Iron – Hamersley's First Decade* – "One of the world's richest deposits of iron ore was not found simply by luck as is widely imagined. It was due, rather, to the vision, perseverance and scientific skills of a number of men who were encouraged to pursue their objectives within a framework of enlightened government policies."

## The negotiations 1962-1965

In October 1962, one month after the discovery of "the mountain of ore", the Hamersley Group was formed – CRA holding 60% of the shares and Kaiser Steel 40%.

Before development of the Mount Tom Price deposit could begin, Hamersley had to secure a mineral lease. Sales contracts had to be written and vast sums of money had to be raised to carry out the development programme. By July 1963 an agreement had been reached with the Western Australian Government on the development of the deposit. This agreement committed the Company to specified capital expenditures, town development, royalty payments and future processing activities. After months of negotiations, the Japanese mills were finally prepared to commit themselves to a sales contract for 65.5 million tons to be delivered at an annual rate of about 5 million tons.

With this contract in hand, Hamersley was able to set about raising the capital. Over \$100 million would be needed to finance the mine development, crushing and screening plant, railway, port and towns. No Australian company had ever attempted to borrow sums of such magnitude. This capital requirement was far beyond the capacity of Australian money markets.

The U.S. banks with their massive lending strength were the most likely source of loan funds. Negotiations commenced late in 1964. By April 1965 all significant problems had been resolved and the American banks committed themselves to lending Hamersley \$US120 million, repayable over seven years.

## The construction 1965-1966

In January 1965, two weeks after obtaining the Japanese commitment to the 65.5 million ton sales contract, construction teams moved onto the site.

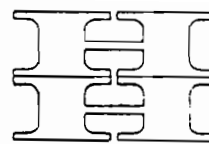
Sir Charles Court, Premier of Western Australia, describes the challenge: "It is important to remember that Hamersley's great undertaking literally started at the grass roots. There were no ready made port, town, railway, water supply, power or other basic services. They had to establish their own beachhead at King Bay (now Dampier)." The work had to be carried out in the heat of subtropical conditions.

The Australian construction company, Central Engineering Services (now Minenco), assisted by officers of Kaiser Steel Corporation, numerous Australian contractors and suppliers, was able to complete the basic construction work in 20 months — in time to meet the first contractual delivery in August 1966.

The port had to be dredged to accept the largest ore carriers of the day and a shiploading facility established at Parker Point. Almost 300 kilometres of railway line stretching from Dampier to Tom Price had to be built through difficult country at a rate of almost two kilometres a day, and towns established at Dampier and Tom Price.

In the 20 months, 10 million man hours were worked, 12 million cubic metres of earth and rock were moved, and some 300 000 tonnes of plant and equipment were used or installed.





## The first decade 1966-1976

Before the initial construction programme was completed, Hamersley marketing teams in Europe and Japan were negotiating new sales contracts.

The Pellet Contract, signed in 1965 with the Japanese mills enabled the first iron ore secondary processing development to be established in the Pilbara. Hamersley's pellet plant came "on stream" in 1968 - ten years before Hamersley's commitment with the Western Australian Government. Two other major sales contracts were negotiated with the Japanese mills and the Company commenced shipping ore to Europe. By 1969, Hamersley's annual production capacity had risen to about 18 million tonnes.

In 1967, Hamersley became a public company with a \$25 million capital raising. This was the first of a number of issues made to the Australian public. By the end of 1976 some 28 000 public shareholders owned directly 11.5% of the issued capital, CRA held 54%, Kaiser Steel 28.3%, and a number of Japanese steel mills and trading companies 6.2%.

Hamersley gained access to the Paraburdoo iron ore deposits south-west of Mount Tom Price, in 1968. The Paraburdoo ore could be satisfactorily blended with the Mount Tom Price ore to extend the life of the original mine. As with the Mount Tom Price deposit, agreement had to be reached with the Western Australian Government on development plans.

In November 1969, the Japanese mills agreed to purchase some 112 million tons of ore, enabling the Paraburdoo development to commence. A 100

kilometre railway line was constructed from Paraburdoo to Tom Price, a shiploading facility built at East Intercourse Island, including an enlarged and deepened shipping channel to cater for the largest ore carriers, and towns established at Paraburdoo and Karratha (near Dampier). This expansion was to raise the capacity of operations to 40 million tonnes per annum.

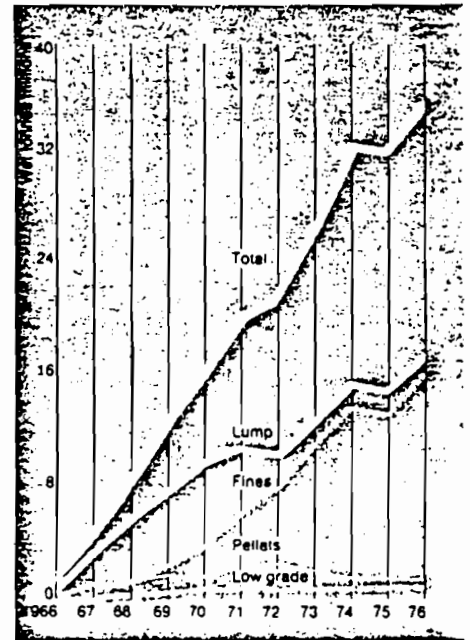
Just as the Paraburdoo expansion was nearing completion a serious recession occurred in the Japanese steel industry and commercial production at the new mine was held up almost a year. The mine eventually came into production in 1973.

By July 1973 Hamersley had shipped 100 million tonnes to world markets. It took just a further three years - to July 1976 - for Hamersley to ship the second 100 million tonnes. Capital expenditures required to support the Hamersley operations by 1976 were running at about \$50 million a year, while operating expenses totalled almost \$200 million.

Towards the end of 1976, Hamersley negotiated further sales with the Japanese steel mills for 188 million tons of ore. This tonnage, to be delivered by 1990, has a current market value of about \$2 500 million.

On the basis of these extra Japanese sales, together with other contracts signed in Asia and Europe, Hamersley has announced its concentrator expansion, which will lift the capacity of the operations to 46 million tonnes.

Hamersley's first decade was a period of remarkable activity and achievement. Now with the announcement of the concentrator project, ten years after the first ore carrier left Dampier, Hamersley's second decade of expansion has commenced.



Shipments by products



Total operating personnel

### Housing and population

|            | Company owned |                 | Total population |
|------------|---------------|-----------------|------------------|
|            | Houses        | Single quarters |                  |
| Dampier    | 503*          | 614             | 2 904            |
| Karratha   | 635           | —               | 4 519            |
| Tom Price  | 780           | 571             | 3 706            |
| Paraburdoo | 573           | 392             | 2 520            |
|            | 2 491         | 1 577           | 13 649           |

\*including flats

# Contribution to Australia

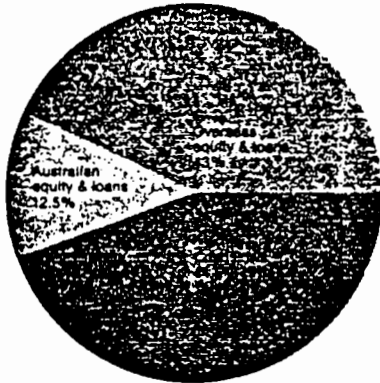
In the 10 years since establishment, Hamersley has become one of the world's largest iron ore producers and a major Australian exporter. The capital expenditures and revenues earned by Hamersley have made a significant contribution to Australia's economic development.

## Capital expenditure

Hamersley has spent over \$800 million establishing its operations in North West Australia. This amounts to almost \$190 000 per employee. These sums have been financed by overseas and Australian equity and debt raisings, and the cash flows obtained from export sales.

The approximate contributions these various sources have made to Hamersley's capital expenditure programme are set out below:-

## Financing sources



With this finance Hamersley has, in addition to plant and equipment expenditures, constructed ports, railways and towns in North West Australia. Social and industrial infrastructure expenditures account for almost \$2 out of every \$3 Hamersley has invested. As an indication of the heavy burden imposed by infrastructure expenditures, the cost of a family home in the Pilbara, for example, is now about \$70,000.

| Capital expenditure 1965-1976* | \$m        |
|--------------------------------|------------|
| Plant and equipment            | 287        |
| Social infrastructure          | 210        |
| Industrial infrastructure      | 324        |
| <b>Total:</b>                  | <b>821</b> |

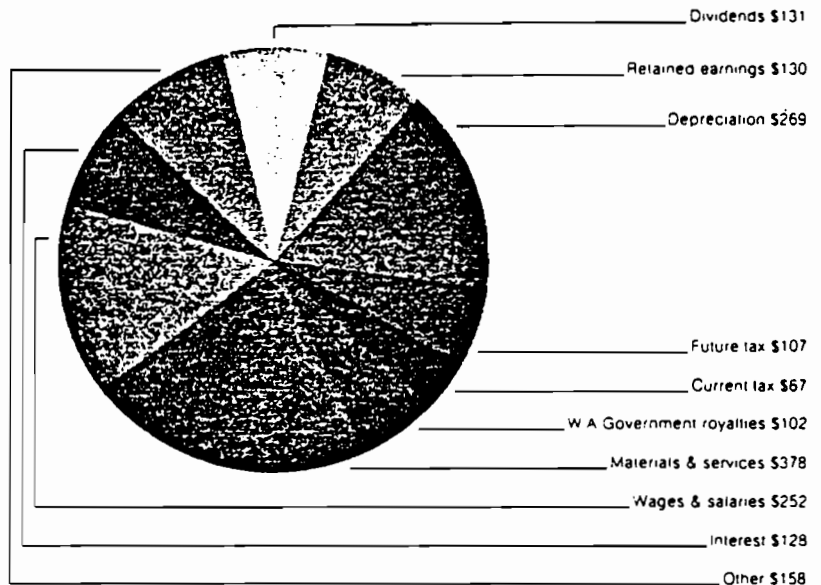
\*Including Karratha developments and Millstream water supply expenditures

Local contractors and suppliers have benefited greatly from these investment expenditures, as most of this capital has been spent in Australia. Numerous Australian enterprises ranging from suppliers of railway sleepers to foodstuffs, insurance companies to home builders, are linked with the development of the Hamersley project.

## Revenues

Hamersley's revenues are almost entirely earned from the export of iron ore. Since operations commenced, revenues have totalled over \$1 700 million.

## Allocation of Hamersley's revenues 1966-1976 (\$ millions)



Suppliers have obtained the largest share of Hamersley's revenues. In addition to the purchases of materials and services of \$378 million, Hamersley's cash flows (made up of retained earnings, depreciation and future tax) have also helped finance construction work.

Employees have been paid \$252 million in wages and salaries since 1966. Currently there are almost 4 400 employees on the Hamersley payroll.

Governments will have received, upon the payment of current tax to date, a total of \$169 million made up of \$102 million in royalties to the Western Australian Government and \$67 million paid/payable in current tax to the Federal Government. This figure does not include future tax, sales tax, payroll tax, withholding tax on dividends and interest, and taxes paid by employees on wages and salaries.

Lenders have been paid \$128 million in interest payments.

Shareholders' distribution totals \$131 million, a significant proportion of which has remained in Australia.

## Balance of payments

Some 70% of the sums raised or earned by Hamersley have remained in Australia after allowing for dividend and loan repayments overseas and the purchases of imported goods and materials. In other words, the benefits of the Hamersley enterprise have remained largely in Australia, for the benefit of Australians.

Between 1965 and 1976 Hamersley contributed almost \$1 500 million to Australia's international reserves.

## Decentralisation

"Four towns, 2 261 homes, seven schools, four shopping centres, three hospitals—such statistics are not usually associated with iron ore production. The high quality town facilities of Dampier, Karratha, Tom Price and Paraburdoo, have encouraged Hamersley employees to bring their wives and children to the once inhospitable North West. These modern towns are as much a part of the industry as the ore itself."

This comment was made by Hamersley's Managing Director, D. S. Stewart, in 1974. Since then Hamersley has constructed a further 230 homes and continued to improve and expand its schooling.

medical, and other community facilities required for the increasing population of the towns.

The towns established by Australia's mining industry in the last 10 years probably represent the most significant industrial decentralisation since the Depression.

In order to help provide a stable population Hamersley's recruitment policy has been, wherever possible, to employ married personnel.

Married employees are provided with fully equipped homes, town houses and apartments of various styles according to individual requirements and availability.

Single employees are accommodated in furnished individual rooms. Dining rooms and recreation facilities are provided. New "motel type" units for single employees have also been built for those seeking more luxurious accommodation.

The proliferation of community organisations and voluntary projects undertaken by the residents themselves, is indicative of a growing community spirit in the Pilbara.

High construction standards have been followed in developing the towns. Dampier, for example, was hit in 1975 by one of the most savage cyclones recorded on the North West Coast. The damage to the town was minimal.

The Hamersley towns have been built to last, providing the basis for further growth of Australia's massive iron ore resources.



Three bedroom bungalow style house recently constructed at Paraburdoo.

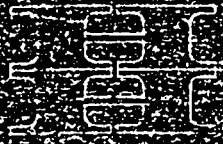


(Above) Sir Maurice Mawby was the Chairman of Hamersley from its formation in 1962 until 1971.

(Right) Haddon King was CRA's Director of Exploration in September 1962 when the Mount Tom Price iron ore deposit was discovered

(Below) George Hills was the Managing Director of Central Engineering Services (now Minenco) during the construction of the Hamersley project.





*Financial information*

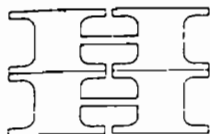
EXHIBIT "6"-Annual Reports of  
Hamersley Holdings Limited for the  
years 1976, 1978, 1981 and 1982

# Statements of earnings

for years ended December 31

| Hamersley Holdings |        |                                                                 | Hamersley Group |         |        |
|--------------------|--------|-----------------------------------------------------------------|-----------------|---------|--------|
| 1976               | 1975   |                                                                 | 1976            | 1975    |        |
| \$000              | \$000  | Note                                                            | \$000           | \$000   |        |
|                    |        | <b>Income</b>                                                   |                 |         |        |
| 21 846             | 17 458 | Net sales revenue                                               | 362 353         | 285 255 |        |
| 27 260             | 19 404 | Interest from subsidiary companies                              |                 |         |        |
| 678                | 656    | Dividends from subsidiary companies                             |                 |         |        |
| 49 784             | 37 518 | Miscellaneous income                                            | 8 024           | 2 241   |        |
|                    |        |                                                                 | 370 377         | 287 496 | 10     |
|                    |        | <b>Costs and expenses</b>                                       |                 |         |        |
| 135                | 543    | Production cost of sales, marketing and administration expenses | 199 123         | 173 757 |        |
|                    |        | Depreciation of fixed assets                                    | 49 112          | 43 185  |        |
|                    |        | Exploration and development expenditure                         | 2 913           | 3 366   |        |
|                    |        | Amortisation of deferred revenue expenditure                    | 621             | 1 691   |        |
| 10 284             | 8 278  | Interest paid/payable                                           |                 |         |        |
| 11 562             | 9 180  | — subsidiary companies                                          | 22 933          | 18 996  | 20     |
| 9                  |        | — other                                                         | 10 635          | (688)   |        |
| 21 990             | 18 001 | Exchange losses (net)                                           | 17              |         |        |
| 27 794             | 19 517 |                                                                 | 285 337         | 240 307 |        |
|                    |        | Earnings before tax                                             | 2               | 85 040  | 47 189 |
| 105                | 111    | Less:                                                           |                 |         |        |
|                    |        | Income tax — current                                            | 3               | 41 060  | 24 581 |
| 105                | 111    | — future                                                        | 3               | (1364)  | (4054) |
| 27 689             | 19 406 |                                                                 | 39 696          | 20 527  |        |
|                    |        | Earnings after tax                                              | 45 344          | 26 662  |        |
|                    |        | Outside shareholder's proportion of loss by subsidiary          | (78)            | (47)    | 30     |
| 27 689             | 19 406 | Net earnings                                                    | 45 422          | 26 709  |        |
| 12 134             | 12 132 | Add:                                                            |                 |         |        |
|                    |        | Retained earnings brought forward                               | 111 291         | 103 986 |        |
| 9 702              | 9 702  | Less:                                                           |                 |         |        |
| 16 979             | 9 702  | Dividends:                                                      |                 |         |        |
| 26 681             | 19 404 | Interim 1976 — paid November, 1976                              | 9 702           | 9 702   |        |
| 13 142             | 12 134 | Final 1976 — payable May, 1977                                  | 16 979          | 9 702   |        |
|                    |        | Retained earnings carried forward                               | 26 681          | 19 404  | 40     |
|                    |        |                                                                 | 130 032         | 111 291 |        |

EXHIBIT "6"—Annual Reports of  
Hamersley Holdings Limited for the  
years 1976, 1978, 1981 and 1982



# Balance sheets

at December 31:

| Hamersley Holdings |                |                                         | Hamersley Group |                |
|--------------------|----------------|-----------------------------------------|-----------------|----------------|
| 1976               | 1975           |                                         | 1976            | 1975           |
| \$000              | \$000          | Note                                    | \$000           | \$000          |
|                    |                | <b>Capital and reserves</b>             |                 |                |
| 60 637             | 60 637         | Ordinary shares                         | 4 60 637        | 60 637         |
| 68 425             | 68 425         | Share premium                           | 68 425          | 68 425         |
| 374                | 374            | Capital reserve                         | 374             | 374            |
| 13 142             | 12 134         | Retained earnings                       | 130 032         | 111 291        |
| <u>142 578</u>     | <u>141 570</u> |                                         | <u>259 468</u>  | <u>240 727</u> |
|                    |                | <b>Outside shareholder's interest</b>   | (111)           | (33)           |
| <u>142 578</u>     | <u>141 570</u> |                                         | <u>259 357</u>  | <u>240 694</u> |
|                    |                | <b>Future income tax</b>                | 107 238         | 108 603        |
|                    |                | <b>Deferred liabilities</b>             |                 |                |
|                    |                | (Maturing later than one year)          |                 |                |
| 102 512            | 98 776         | Debtore stock and other secured loans   | 5 259 013       | 236 170        |
| 159 551            | 140 444        | Equipment and other loans — unsecured   | 6 12 522        | 14 652         |
| <u>262 063</u>     | <u>239 220</u> |                                         | <u>271 535</u>  | <u>250 822</u> |
|                    |                | <b>Provisions</b>                       |                 |                |
| 997                | 997            | Maintenance and other                   | 7 20 351        | 18 560         |
|                    |                | <b>Current liabilities</b>              |                 |                |
|                    |                | Bank overdraft — unsecured              | 2 938           | 2 200          |
| 20 297             | 15 495         | Creditors                               | 8 63 004        | 54 802         |
| 16 979             | 9 702          | Dividend payable                        | 16 979          | 9 702          |
| 216                | 144            | Income tax                              | 65 621          | 24 730         |
| <u>37 492</u>      | <u>25 341</u>  |                                         | <u>148 542</u>  | <u>91 434</u>  |
| <u>443 130</u>     | <u>407 128</u> | <b>Total funds</b>                      | <u>807 023</u>  | <u>710 113</u> |
|                    |                | <b>These funds were represented by:</b> |                 |                |
|                    |                | <b>Fixed assets</b>                     |                 |                |
|                    |                | Property, plant and equipment           | 9 535 080       | 549 882        |
|                    |                | Exploration and development             | 10              |                |
| 400 869            | 378 026        | Subsidiary companies                    | 11              |                |
| 258                | 48             | Investments                             | 12 258          | 48             |
| 741                | 1 134          | Advances                                | 13 21 761       | 20 636         |
|                    |                | <b>Current assets</b>                   |                 |                |
|                    |                | Stocks and stores                       | 14 44 653       | 48 724         |
| 40 364             | 27 548         | Debtors                                 | 15 36 427       | 30 325         |
| 895                | 365            | Short term deposits                     | 126 037         | 41 959         |
| 3                  | 7              | Cash and bank balances                  | 9 695           | 10 607         |
| <u>41 262</u>      | <u>27 920</u>  |                                         | <u>216 812</u>  | <u>131 615</u> |
|                    |                | Deferred revenue expenditure            | 16 2 215        | 1 335          |
|                    |                | Exchange fluctuation                    | 17 30 897       | 6 597          |
| <u>443 130</u>     | <u>407 128</u> | <b>Total assets</b>                     | <u>807 023</u>  | <u>710 113</u> |

December 31, 1976

## 1. Summary of accounting policies

The principal accounting policies set out below are consistent with those adopted in the previous year, unless otherwise stated. The Group applies these policies on historical cost concepts.

### (a) Consolidation

The consolidated accounts include the accounts of the subsidiary companies listed in Note 11.

### (b) Income tax

The provisions for current and future taxation are calculated on earnings before tax. Certain items of expense, principally depreciation, are claimed for tax purposes in periods different from those for accounting purposes. The resulting net differences in the charge are reported as future income tax.

10

### (c) Foreign exchange

Current assets, current liabilities, long term loans and contingent liabilities in foreign currencies have been converted to Australian currency at the rates of exchange ruling at balance date. All other amounts in foreign currencies have been converted at the appropriate rate of exchange at the date of the relevant transactions.

Provision has been made for a proportion of possible future unrealised exchange losses on loan repayments.

### (d) Depreciation of property, plant and equipment

Depreciation is provided on the straight line method by charges to income at rates based on the estimated useful life of the respective assets. Major new plant and facilities are usually depreciated on a basis pro rata with production, until such time as the plant is capable of operating at full design capacity. Generally, assets are fully depreciated over the shorter of their economic life or twenty years.

20

### (e) Maintenance and repairs

Maintenance, repair costs and minor renewals are charged against earnings as incurred. Maintenance provisions are raised in respect of periodic overhauls of major operating plant the cycle of which may extend beyond one financial year.

### (f) Stock valuations

Stocks of ores and pellets are valued at the lower of cost or net realisable value, cost being direct material and labour. Stores stocks are valued at standard costs after allowance for obsolescence.

30

### (g) Deferred revenue expenditure

Where material expenditure is incurred, the benefit from which extends over a period of years, the costs incurred are amortised over the period in which the benefit will be derived, or five years, whichever is less.

### (h) Exploration and development expenditure

Expenditure on exploration, development and research is fully provided against or written off as incurred.

## 2. Earnings before tax

| Earnings before tax were arrived at after charging and crediting the following items: | Hamersley Holdings |        | Hamersley Group |        |    |
|---------------------------------------------------------------------------------------|--------------------|--------|-----------------|--------|----|
|                                                                                       | 1976               | 1975   | 1976            | 1975   |    |
|                                                                                       | \$000              | \$000  | \$000           | \$000  |    |
| <b>Charges</b>                                                                        |                    |        |                 |        |    |
| Interest paid/payable:                                                                |                    |        |                 |        |    |
| Debenture stock and other long term loans                                             | 21 846             | 17 458 | 22 902          | 18 804 | 10 |
| Bank overdraft                                                                        |                    |        | 31              | 192    |    |
| Provisions for maintenance and other (Note 7)                                         |                    |        | 13 825          | 12 209 |    |
| Provisions against investments (Note 12)                                              |                    | 255    |                 | 255    |    |
| Auditors' remuneration (Note 20)                                                      | 22                 | 13     |                 |        |    |
| Bad and doubtful debts (Note 18)                                                      |                    |        | 45              | 9      |    |
| Loss on sale of fixed assets                                                          |                    |        | 293             | 976    |    |
| <b>Credits</b>                                                                        |                    |        |                 |        |    |
| Interest on short term deposits                                                       | 43                 | 44     | 7 295           | 1 778  |    |
| Profit on sale of fixed assets                                                        |                    |        | 274             | 332    |    |
| Provision against investment no longer required (Note 12)                             | 210                |        | 210             |        | 20 |

## 3. Income tax

|                                                        | Hamersley Group |         |    |
|--------------------------------------------------------|-----------------|---------|----|
|                                                        | 1976            | 1975    |    |
|                                                        | \$000           | \$000   |    |
| <b>(a) Taxation on earnings for the year comprise:</b> |                 |         |    |
| Current                                                | 44 412          | 24 606  |    |
| Less: overprovision in prior years                     | 3 352           | 25      | 30 |
|                                                        | 41 060          | 24 581  |    |
| Future                                                 | (4 717)         | (4 054) |    |
| Add: transfer from provision for current tax           | 3 353           |         |    |
|                                                        | (1 364)         | (4 054) |    |

**(b)** The following major items were the main reasons for income tax (current and future) varying from the tax prima facie payable on earnings for the year:

|                                 | Hamersley Group |                |    |
|---------------------------------|-----------------|----------------|----|
|                                 | 1976            | 1975           |    |
|                                 | \$000           | \$000          |    |
| <b>Permanent differences:</b>   |                 |                |    |
| Investment and other allowances | 2 003           | 31             | 40 |
| Net exchange gains/(losses)     | (9 368)         | 688            |    |
| Non allowable depreciation      | (830)           | (1 339)        |    |
| Other                           | 324             | (148)          |    |
|                                 | (7 871)         | (768)          |    |
| <b>Timing differences:</b>      |                 |                |    |
| Depreciation                    | (233)           | (135)          |    |
| Provisions                      | (115)           | (27)           |    |
| Losses carried forward          | (115)           | (163)          |    |
|                                 | (463)           | (325)          | 50 |
| <b>Total</b>                    | <b>(8 334)</b>  | <b>(1 093)</b> |    |
| Approximate tax effect          | (3 542)         | (465)          |    |

**(c)** The effective rate of income tax for Hamersley Holdings Limited is negligible as the majority of its earnings comprises rebateable dividends.

## 4. Capital

### (a) Authorised capital

The authorised capital of the Company comprises 300 000 000 ordinary shares of 25 cents each: \$75 000 000 (1975 \$75 000 000).

60

### (b) Issued capital

The issued capital of the Company is 242 550 000 ordinary shares of 25 cents each fully paid: \$60 637 500 (1975 \$60 637 500).



**5. Debenture stock and other secured loans**

The following debenture stock and secured loans are secured by fixed and floating charges covering substantially all the assets of Hamersley Holdings Limited and Hamersley Iron Pty. Limited. The Trust Deeds under which the debenture stock was issued place restrictions on the dividend policy of both these companies.

|                                            | Hamersley Holdings |        | Hamersley Group |         |    |
|--------------------------------------------|--------------------|--------|-----------------|---------|----|
|                                            | 1976               | 1975   | 1976            | 1975    |    |
|                                            | \$000              | \$000  | \$000           | \$000   |    |
| Australian Stock                           | 74 959             | 74 959 | 74 959          | 74 959  | 10 |
| Guaranteed Debentures due 1985             |                    |        | 13 777          | 12 702  |    |
| Guaranteed Debentures due 1986             |                    |        | 15 154          | 13 496  |    |
| Guaranteed Bearer Notes due 1979           |                    |        | 16 749          | 17 631  |    |
| Guaranteed Bearer Notes due 1979           |                    |        | 29 909          | 24 089  |    |
| Guaranteed Bearer Bonds due 1987           |                    |        | 38 782          | 30 139  |    |
| Guaranteed Debentures due 1987             |                    |        | 21 124          | 19 054  |    |
| Guaranteed Debentures due 1982             |                    |        | 30 860          | 27 787  |    |
| Series C United States Debentures due 1990 | 27 553             | 23 817 | 27 553          | 23 817  |    |
|                                            | 102 512            | 98 776 | 268 867         | 243 674 |    |
| Less: Instalments due within 12 months     |                    |        | 9 854           | 7 504   |    |
|                                            | 102 512            | 98 776 | 259 013         | 236 170 |    |

The Australian Debenture Stock of \$74 959 000 is repayable \$13 286 200 1978; \$12 500 000 1980; \$12 500 000 1981; \$1 064 800 1982; \$1 619 500 1985; \$22 219 100 1990; and \$11 769 400 in 1995. Interest rates vary between 7¼% and 8½% per annum, depending on date of maturity. The amount outstanding includes bank loans of \$25 000 000.

The Guaranteed Debentures due 1985 were issued by Hamersley Iron Finance N.V. and are secured by Series A Security Stock issued by Hamersley Holdings Limited. Interest is payable at 9½% per annum and sinking fund payments are due \$US1 000 000 1977/1979, \$US2 000 000 1980/1984, with a final payment of \$US2 000 000 in 1985.

The Guaranteed Debentures due 1986 were issued by Hamersley Iron Finance N.V. and are secured by Series B Security Stock issued by Hamersley Holdings Limited. Interest is payable at 9% per annum and sinking fund payments are due \$US1 000 000 1977/1980, \$US2 000 000 1981/1985 with a final payment of \$US2 500 000 in 1986.

The Guaranteed Bearer Notes due 1979 were issued by Hamersley Iron Finance N.V. and are secured by Series C Security Stock issued by Hamersley Holdings Limited. Interest is payable at 6¾% per annum and the Notes are repayable in annual instalments of D.Fls. 15 million on March 1 in the years 1977 to 1979.

The Guaranteed Bearer Notes due 1979 of Sw. Fr. 80 million were issued by Hamersley Iron Finance N.V. and are secured by Series D Security Stock issued by Hamersley Holdings Limited. Interest is payable at 6¾% per annum and the Notes are repayable on April 5, 1979.

The Guaranteed Bearer Bonds due 1987 were issued by Hamersley Iron Finance N.V. and are secured by Series E Security Stock issued by Hamersley Holdings Limited. Interest is payable at 6¾% per annum and the Bonds are repayable in annual instalments of D.M. 10 million on July 1, in the years 1978 to 1987.

The Guaranteed Debentures due 1987 were issued by Hamersley Iron Finance N.V. and are secured by Series F Security Stock issued by Hamersley Holdings Limited. Interest is payable at 8% per annum and sinking fund payments are due on November 15 each year of \$US1 250 000 1977/1981, \$US2 500 000 1982/1986, with a final payment of \$US4 250 000 in 1987.

The Guaranteed Debentures due 1982 were issued by Hamersley Iron Finance N.V. and are secured by Series G Security Stock issued by Hamersley Holdings Limited. Interest is payable at 10% per annum and sinking fund payments are due on June 1 each year of \$US1 400 000 1977/1981, with a final payment of \$US26 600 000 in 1982.

The Series C United States Debentures due 1990 are secured by Series C United States Security Stock. Interest is payable at 11% per annum and the Debentures are repayable in annual instalments of \$US3 000 000 on October 15 in the years 1981 to 1990.

## 6. Equipment and other loans — unsecured

|                                        | Hamersley Group |               |
|----------------------------------------|-----------------|---------------|
|                                        | 1976            | 1975          |
|                                        | \$000           | \$000         |
| Equipment loans — Banks                | 6 054           | 6 729         |
| — Other institutions                   | 9 898           | 10 941        |
| Other loans                            | 744             | 769           |
|                                        | <u>16 696</u>   | <u>18 439</u> |
| Less: Instalments due within 12 months | 4 174           | 3 787         |
|                                        | <u>12 522</u>   | <u>14 652</u> |

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These loans are repayable over periods of up to six years. The interest rates vary between 5½ % and 8% per annum.

|                                        | Hamersley Holdings |                |
|----------------------------------------|--------------------|----------------|
|                                        | 1976               | 1975           |
|                                        | \$000              | \$000          |
| (a) Banks                              | 28 931             | 26 198         |
| (b) Subsidiary companies               |                    |                |
| (i) Hamersley Iron Finance N.V.        | 137 424            | 118 700        |
| (ii) Hamersley Iron Pty. Limited       | 3 050              | 3 050          |
|                                        | <u>169 405</u>     | <u>147 948</u> |
| Less: Instalments due within 12 months | 9 854              | 7 504          |
|                                        | <u>159 551</u>     | <u>140 444</u> |

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The loans in (a) above represent moneys deposited with the banks by Hamersley Iron Finance N.V. and, together with the loans in (b) (i), represent the borrowings under the Guaranteed Debentures, Notes and Bonds referred to in Note 5 above. Repayment of these Debentures, Notes and Bonds by Hamersley Holdings Limited operates in pro tanto satisfaction of the above loans.

## 7. Provisions

|                           | Balance<br>1975 | Charged to<br>earnings | Expenditure<br>& transfers | Balance<br>1976 |
|---------------------------|-----------------|------------------------|----------------------------|-----------------|
|                           | \$000           | \$000                  | \$000                      | \$000           |
| <b>Hamersley Group</b>    |                 |                        |                            |                 |
| Long service leave        | 1 666           | 1 309                  | 110                        | 2 865           |
| Maintenance               | 15 633          | 12 516                 | 11 924                     | 16 225          |
| Withholding tax indemnity | 1 261           |                        |                            | 1 261           |
|                           | <u>18 560</u>   | <u>13 825</u>          | <u>12 034</u>              | <u>20 351</u>   |
| <b>Hamersley Holdings</b> |                 |                        |                            |                 |
| Withholding tax indemnity | 997             |                        |                            | 997             |

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Some of the above provisions include amounts which may fall due within twelve months but such amounts cannot be specifically ascertained.

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## 8. Creditors

|                                                      | Hamersley Holdings |               | Hamersley Group |               |
|------------------------------------------------------|--------------------|---------------|-----------------|---------------|
|                                                      | 1976               | 1975          | 1976            | 1975          |
|                                                      | \$000              | \$000         | \$000           | \$000         |
| Instalments on long term loans due within 12 months: |                    |               |                 |               |
| Debenture stock and other secured loans              |                    |               | 9 854           | 7 504         |
| Equipment and other loans — unsecured                | 9 854              | 7 504         | 4 174           | 3 787         |
| Trade creditors                                      |                    |               | 19 885          | 22 045        |
| Subsidiary companies                                 | 1 574              | 58            |                 |               |
| Other related corporations                           |                    |               | 710             | 644           |
| Other creditors and accrued liabilities:             |                    |               |                 |               |
| Secured                                              | 1 671              | 1 224         | 8 788           | 7 481         |
| Unsecured                                            | 7 198              | 6 709         | 19 593          | 13 341        |
|                                                      | <u>20 297</u>      | <u>15 495</u> | <u>63 004</u>   | <u>54 802</u> |

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**9. Property, plant and equipment**

|                                                     | Hamersley Group |         |
|-----------------------------------------------------|-----------------|---------|
|                                                     | 1976            | 1975    |
|                                                     | \$000           | \$000   |
| Freehold and leasehold land and buildings — at cost | 116 954         | 110 834 |
| Less: Accumulated depreciation                      | 33 212          | 27 518  |
|                                                     | 83 742          | 83 316  |
| Plant, machinery and equipment — at cost            | 622 044         | 594 866 |
| Less: Accumulated depreciation                      | 211 421         | 172 173 |
|                                                     | 410 623         | 422 693 |
| Mine properties — at cost                           | 24 609          | 24 609  |
| Less: Accumulated depreciation                      | 6 202           | 4 836   |
|                                                     | 18 407          | 19 773  |
| Capital works in progress — at cost                 | 22 308          | 24 100  |
|                                                     | 535 080         | 549 882 |

**10. Exploration and development**

The accumulated costs provided for to December 31, 1976 for expenditure not deemed abortive amount to \$18 510 844 (1975 \$16 525 965) and were incurred in respect of exploration and other studies carried out by subsidiary companies in the Pilbara area of Western Australia, the development of "Himet" (registered trade mark of Hamersley Iron Pty. Limited), and investigations relating to processes for upgrading fines and low grade ore

**11. Subsidiary companies**

|                                                                                              | Place of incorporation | Hamersley Holdings investment at cost |        |
|----------------------------------------------------------------------------------------------|------------------------|---------------------------------------|--------|
|                                                                                              |                        | 1976                                  | 1975   |
|                                                                                              |                        | \$000                                 | \$000  |
| <b>(a) Shares in subsidiary companies</b>                                                    |                        |                                       |        |
| Hamersley Iron Pty. Limited (100% owned)                                                     | Victoria               | 42 000                                | 42 000 |
| Mount Bruce Mining Pty. Limited (99.9% owned)                                                | Western Australia      | 10                                    | 10     |
| Hamersley Iron Finance N.V. (100% owned and carries on business in the Netherlands Antilles) | Netherlands Antilles   | 18                                    | 18     |
| Hamersley Exploration Pty. Limited (99.9% owned)                                             | Western Australia      | 1                                     | 1      |
| Himet Corporation Limited (99.9% owned)                                                      | Victoria               | 1                                     | 1      |
| Metallised Ores Limited (99.9% owned)                                                        | Western Australia      | 1                                     | 1      |
| Pilbara Harbour Services Pty. Limited (100% owned)                                           | Victoria               | 1 200                                 | 1 200  |
|                                                                                              |                        | 43 231                                | 43 231 |

(Hamersley Iron Pty. Limited has —

(i) a 99.9% interest in Hamersley Japan Limited, a company incorporated in Japan and which carries on business in Japan;

(ii) a 100% interest in Hamersley Europe Pty. Limited, a company incorporated in Victoria which carries on business at Melbourne and London, United Kingdom; and

(iii) a 60% interest in Northern Cross Chartering Limited A/S, a company incorporated in Norway and which carries on business in Norway.)

**(b) Amounts owing by subsidiary companies**

|         |         |
|---------|---------|
| 357 638 | 334 795 |
| 400 869 | 378 026 |

The amounts owing by subsidiary companies include \$259 012 997 (1975 \$236 170 319) being the onlending of monies borrowed by Hamersley Holdings Limited and which are repayable on the same terms and conditions.

**12. Investments**

|                                         | Hamersley Holdings |       | Hamersley Group |       |
|-----------------------------------------|--------------------|-------|-----------------|-------|
|                                         | 1976               | 1975  | 1976            | 1975  |
|                                         | \$000              | \$000 | \$000           | \$000 |
| Shares in unlisted companies at cost    | 265                | 265   | 265             | 265   |
| Shares in a related corporation at cost | 38                 | 38    | 38              | 38    |
|                                         | 303                | 303   | 303             | 303   |
| Less: Provision for possible loss       | 45                 | 255   | 45              | 255   |
|                                         | 258                | 48    | 258             | 48    |



### 13. Advances

|                                                    | Hamersley Holdings |              | Hamersley Group |               |
|----------------------------------------------------|--------------------|--------------|-----------------|---------------|
|                                                    | 1976               | 1975         | 1976            | 1975          |
|                                                    | \$000              | \$000        | \$000           | \$000         |
| The long term portion of advances comprises:       |                    |              |                 |               |
| The Rural and Industries Bank of Western Australia |                    |              | 15 473          | 13 268        |
| Government of Western Australia                    |                    |              | 5 057           | 5 698         |
| Bulk Shipping Associates Limited                   | 741                | 1 134        | 741             | 1 134         |
| Related corporation                                |                    |              | 410             | 463           |
| Other                                              |                    |              | 80              | 73            |
|                                                    | <u>741</u>         | <u>1 134</u> | <u>21 761</u>   | <u>20 636</u> |

The deposit with the Rural and Industries Bank of Western Australia is in connection with the provision of housing and services at Karratha. Hamersley Iron Pty. Limited currently has a commitment to pay annual lease rentals to the Bank of approximately \$1 023 000 until the year 1993. The deposit is repayable over the same period.

The advance to the Government of Western Australia was made in connection with the supply of water to the Dampier/Karratha area and is repayable by 1987.

The advance to Bulk Shipping Associates Limited relates to Hamersley's 50% interest in a bulk ore carrier.

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### 14. Stocks and stores

|                             | Hamersley Group |               |
|-----------------------------|-----------------|---------------|
|                             | 1976            | 1975          |
|                             | \$000           | \$000         |
| Ores and pellets            | 12 810          | 17 540        |
| Supply inventory and spares | 31 705          | 30 996        |
| Livestock                   | 138             | 188           |
|                             | <u>44 653</u>   | <u>48 724</u> |

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### 15. Debtors

|                                       | Hamersley Holdings |               | Hamersley Group |               |
|---------------------------------------|--------------------|---------------|-----------------|---------------|
|                                       | 1976               | 1975          | 1976            | 1975          |
|                                       | \$000              | \$000         | \$000           | \$000         |
| Trade debtors                         |                    |               | 27 187          | 24 442        |
| Subsidiary companies                  | 40 360             | 27 546        |                 |               |
| Other related corporations            |                    |               | 203             | 101           |
| Other debtors and payments in advance | 4                  | 2             | 9 073           | 5 782         |
|                                       | <u>40 364</u>      | <u>27 548</u> | <u>36 463</u>   | <u>30 325</u> |
| Less: Provision for doubtful debts    |                    |               |                 |               |
| Other debtors (Note 18)               |                    |               | 36              |               |
|                                       | <u>40 364</u>      | <u>27 548</u> | <u>36 427</u>   | <u>30 325</u> |

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### 16. Deferred revenue expenditure

The expenditure is stated at cost less amounts amortised. The balances unamortised comprise \$875 360 (1975 \$1 083 478) in respect of borrowing costs and \$1 339 921 (1975 \$251 396) being contributions for the erection of schools and other township facilities.

### 17. Exchange fluctuations — loans

|                                                   | Hamersley Holdings |       | Hamersley Group |              |
|---------------------------------------------------|--------------------|-------|-----------------|--------------|
|                                                   | 1976               | 1975  | 1976            | 1975         |
|                                                   | \$000              | \$000 | \$000           | \$000        |
| (a) Exchange loss                                 |                    |       |                 |              |
| The transfer to earnings comprises:               |                    |       |                 |              |
| Net realised loss                                 | 9                  |       | 165             | (2 426)      |
| Provision for possible future net exchange losses |                    |       | 10 470          | 1 738        |
|                                                   | <u>9</u>           |       | <u>10 635</u>   | <u>(688)</u> |
| (b) Exchange fluctuation                          |                    |       |                 |              |
| Net unrealised exchange losses                    |                    |       | 43 104          | 8 335        |
| Less: Provision charged against earnings          |                    |       | 12 207          | 1 738        |
|                                                   |                    |       | <u>30 897</u>   | <u>6 597</u> |

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### 18. Bad and doubtful debts

The bad and doubtful debts referred to in this Note relate only to "Other debtors". No charge or provision was required in respect of other classes of debtors.

|                                                                | Hamersley Group |       |
|----------------------------------------------------------------|-----------------|-------|
|                                                                | 1976            | 1975  |
|                                                                | \$000           | \$000 |
| (a) The charge against earnings comprises:                     |                 |       |
| Provision for doubtful debts                                   | 45              | 9     |
| (b) Bad debts written off against provision for doubtful debts | 9               | 26    |

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**19. Directors' emoluments**

The total of the emoluments received, or due and receivable (whether from the Company or from related corporations) by:

|                                                                                                                                                                                                                                                                                                        | 1976             |                                  | 1975             |                                  |    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|----------------------------------|------------------|----------------------------------|----|
|                                                                                                                                                                                                                                                                                                        | Company<br>\$000 | Related<br>Corporations<br>\$000 | Company<br>\$000 | Related<br>Corporations<br>\$000 |    |
| (a) Directors of the Company engaged in the full-time employment of the Company and its related corporations (including all bonuses and commissions received or receivable by them as employees but not including the amount received or receivable by them by way of fixed salary as employees) were: |                  | 13                               |                  | 36                               | 10 |
| and                                                                                                                                                                                                                                                                                                    |                  |                                  |                  |                                  |    |
| (b) other Directors of the Company were:                                                                                                                                                                                                                                                               |                  |                                  |                  |                                  |    |

No commissions for subscribing for, or agreeing to procure subscriptions for, any shares in or debentures of the Company or any related corporations were received or are due and receivable by any Director.

**20. Auditors' remuneration**

|                                                                     | Hamersley Holdings |               |    |
|---------------------------------------------------------------------|--------------------|---------------|----|
|                                                                     | 1976<br>\$000      | 1975<br>\$000 |    |
| Amount paid/payable to the auditors for:                            |                    |               | 20 |
| Auditing the accounts for the Company and the consolidated accounts | 3                  | 2             |    |
| Other services                                                      | 19                 | 11            |    |
|                                                                     | <u>22</u>          | <u>13</u>     |    |

No other benefits were received by the auditors from the Company.

**21. Contingent liabilities**

|                                                                                                                         | Hamersley Holdings |               | Hamersley Group |               |    |
|-------------------------------------------------------------------------------------------------------------------------|--------------------|---------------|-----------------|---------------|----|
|                                                                                                                         | 1976<br>\$000      | 1975<br>\$000 | 1976<br>\$000   | 1975<br>\$000 |    |
| There are contingent liabilities outstanding as follows:                                                                |                    |               |                 |               | 30 |
| Secured                                                                                                                 |                    |               |                 |               |    |
| Debenture Stock issued as security for borrowings of subsidiary companies (plus interest at varying rates)              | 166 354            | 144 898       |                 |               |    |
| Unsecured                                                                                                               |                    |               |                 |               |    |
| (i) Stamp duty in connection with registration of debenture trust deeds                                                 | 450                | 450           | 450             | 450           |    |
| (ii) Guarantee in respect of equipment loans made to a subsidiary company (plus interest at varying rates)              | 15 262             | 16 980        |                 |               | 40 |
| (iii) Guarantee given to Bank of Scotland for loan to Bulk Shipping Associates Limited                                  | 3 278              | 3 852         | 3 278           | 3 852         |    |
| (iv) Guarantee given to Rural and Industries Bank of Western Australia for loan to W.A. Fire Brigades Board             |                    |               | 120             |               |    |
| (v) Guarantee given to Andresens Bank for a revolving credit arrangement made to Northern Cross Chartering Limited A/S. |                    |               | 25              |               | 50 |

**22. Commitments**

Capital commitments not reflected in the accounts totalled approximately \$35 825 000 (1975 \$22 816 000).

**23. Ultimate holding company**

The ultimate holding company of the Company is The Rio Tinto-Zinc Corporation Limited (incorporated in England).

## 24. Estimates of debts receivable and liabilities payable calculated from respective balance sheet dates

|                                               | Hamersley Holdings |                | Hamersley Holdings and its guarantor subsidiary |                |
|-----------------------------------------------|--------------------|----------------|-------------------------------------------------|----------------|
|                                               | 1976               | 1975           | 1976                                            | 1975           |
|                                               | \$000              | \$000          | \$000                                           | \$000          |
| Debts Receivable:                             |                    |                |                                                 |                |
| not later than 2 years                        | 68 277             | 36 013         | 163 747                                         | 72 765         |
| later than 2 years but not later than 5 years | 90 449             | 79 602         | 5 309                                           | 4 672          |
| later than 5 years                            | 240 914            | 248 229        | 16 581                                          | 16 362         |
|                                               | <u>399 640</u>     | <u>363 844</u> | <u>185 637</u>                                  | <u>93 799</u>  |
| Liabilities Payable:                          |                    |                |                                                 |                |
| not later than 2 years                        | 64 510             | 33 440         | 178 352                                         | 102 032        |
| later than 2 years but not later than 5 years | 90 449             | 79 602         | 97 278                                          | 88 500         |
| later than 5 years                            | 144 596            | 151 519        | 142 869                                         | 150 552        |
|                                               | <u>299 555</u>     | <u>264 561</u> | <u>418 499</u>                                  | <u>341 084</u> |

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## 25. Employee service agreements

The Company and/or its subsidiaries are party to a total of 3 (1975 15) service agreements (as defined in Section 3 H (24) of the Stock Exchange Official List Requirements) and the maximum liability of the Company and its subsidiaries for termination benefits under these service agreements as at December 31, 1976 was \$4 000 (1975 \$20 000).

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## Statement by Directors

In the opinion of the Directors, the accompanying Accounts are drawn up so as to give a true and fair view of the state of the Company's affairs as at 31st December, 1976, and of its results for the year ended on that date.

Signed at Melbourne this 26th day of January, 1977, in accordance with a resolution of the Directors.

R. T. Madigan  
J. T. Ralph  
Directors.

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## Statement by Principal Accounting Officer

To the best of my knowledge and belief, the accompanying Accounts give a true and fair view of the matters required to be dealt with therein by Section 162 of the Companies Ordinance 1962-1974.

C. A. Watts  
General Manager—  
Finance and Administration  
Melbourne, 26th day of January, 1977.

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## Report of the Auditors to the Members

We report on the Accounts and Group Accounts set out on pages 16 to 25.

We have examined the Accounts and Auditors' Reports of those subsidiaries which have not been audited by us, namely:—

Hamersley Iron Finance N.V.  
Hamersley Japan Limited  
Northern Cross Chartering Limited A/S.

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We have received the information and explanations we required and are satisfied that the Accounts of the subsidiaries, all of which have been consolidated, are in form and content appropriate and proper for the purposes of the preparation of the Group Accounts. The audit reports on the Accounts of subsidiaries were not subject to any qualification or comment.

In our opinion, based on our audit and on our examination of the Accounts and Auditors' Reports of those subsidiaries audited by other auditors, the Accounts and Group Accounts are properly drawn up in accordance with the provisions of the Companies Ordinance 1962-1974, and so as to give a true and fair view of the state of affairs of the Company and of the Group as at 31st December, 1976 and their results for the year ended on that date, and the matters required by Section 162 of the Ordinance to be dealt with in the Accounts and Group Accounts.

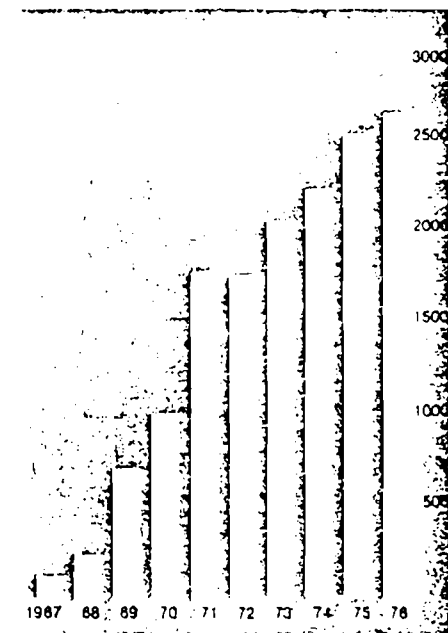
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In our opinion, the accounting records, other records and registers required by the Ordinance, or by the corresponding Laws of the other States, to be kept by the Company and those subsidiaries audited by us, have been properly kept in accordance with the provisions thereof.

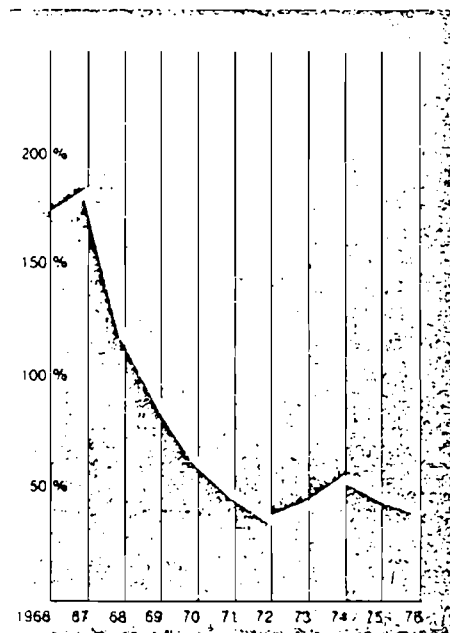
Coopers & Lybrand  
Chartered Accountants  
by A. Hilton  
Melbourne, 26th day of January, 1977

# Statistical summary

|                                               | 1976<br>\$000  | 1975<br>\$000  | 1974<br>\$000  | 1973<br>\$000  | 1972<br>\$000  | 1971<br>\$000  |
|-----------------------------------------------|----------------|----------------|----------------|----------------|----------------|----------------|
| <b>Funds used</b>                             |                |                |                |                |                |                |
| Capital and reserves                          | 259 357        | 240 694        | 233 422        | 221 051        | 209 834        | 175 083        |
| Future income tax                             | 107 238        | 108 603        | 112 657        | 105 636        | 100 837        | 79 190         |
| Exchange fluctuation                          | (30 897)       | (6 597)        | (2 208)        | 32 449         | 22 871         | 8 870          |
| Borrowings — long and short term              | 285 563        | 262 113        | 225 301        | 241 322        | 311 798        | 264 663        |
| Creditors and provisions                      | 154 865        | 98 703         | 72 290         | 57 219         | 51 959         | 60 383         |
| <b>Total</b>                                  | <b>776 126</b> | <b>703 516</b> | <b>641 462</b> | <b>657 677</b> | <b>697 299</b> | <b>588 189</b> |
| <b>Property, plant and equipment</b>          |                |                |                |                |                |                |
| Cost                                          | 785 915        | 754 409        | 715 176        | 678 472        | 645 080        | 582 164        |
| Net — after depreciation                      | 535 080        | 549 882        | 547 664        | 546 078        | 544 947        | 507 428        |
| <b>Turnover</b>                               |                |                |                |                |                |                |
| Shipped (000's wet tonnes)                    | 36 089         | 32 460         | 32 762         | 27 705         | 22 117         | 20 719         |
| Sales revenue                                 | 362 353        | 285 255        | 217 396        | 166 756        | 154 537        | 150 195        |
| <b>Earnings</b>                               |                |                |                |                |                |                |
| Before tax and outside shareholder's interest | 85 040         | 47 189         | 36 522         | 32 996         | 46 477         | 54 205         |
| After tax and outside shareholder's interest  | 45 422         | 26 709         | 23 480         | 22 888         | 24 829         | 29 019         |
| — per share                                   | 18.7c          | 11.0c          | 9.7c           | 9.4c           | 10.2c          | 13.2c          |
| — return on capital and reserves              | 17.5%          | 11.1%          | 10.1%          | 10.4%          | 11.8%          | 16.6%          |
| Dividend per fully paid 25c share             | 11c            | 8c             | 7c             | 7c             | 8c             | 10c            |
| Dividend paid/payable to shareholders         | 26 681         | 19 404         | 16 978         | 16 978         | 17 640         | 22 050         |
| <b>Due to governments</b>                     |                |                |                |                |                |                |
| Tax provided — current and future             | 39 696         | 20 527         | 13 042         | 10 108         | 21 648         | 25 186         |
| W.A. Government royalties                     | 20 394         | 16 126         | 14 022         | 10 744         | 9 500          | 9 361          |
| <b>Number of shareholders</b>                 | <b>27 870</b>  | <b>30 657</b>  | <b>31 716</b>  | <b>32 195</b>  | <b>32 540</b>  | <b>32 116</b>  |
| <b>Number of employees</b>                    | <b>4 391</b>   | <b>4 253</b>   | <b>3 908</b>   | <b>3 405</b>   | <b>2 630</b>   | <b>2 436</b>   |



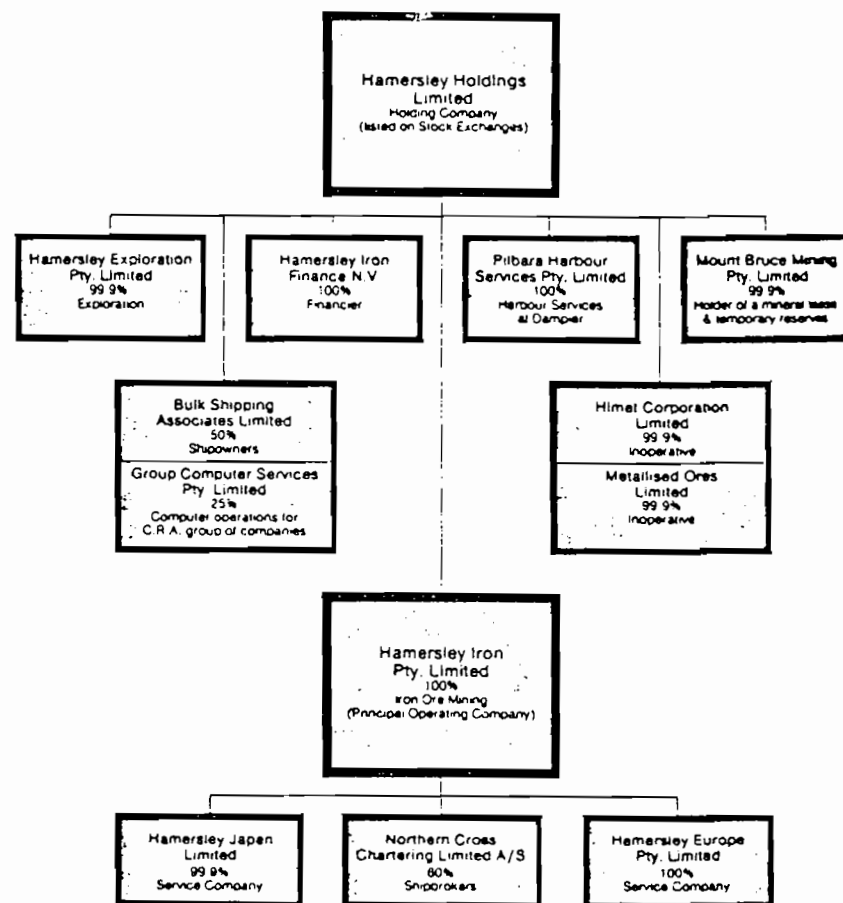
School enrolment (Damodar, Karratha, Tom Price, Paraburdoo)



Labour turnover rate %

EXHIBIT "6"—Annual Reports of Hamersley Holdings Limited for the years 1976, 1978, 1981 and 1982

| 1970<br>\$000 | 1969<br>\$000 | 1968<br>\$000 | 1967<br>\$000 |
|---------------|---------------|---------------|---------------|
| 79 139        | 120 475       | 96 844        | 80 074        |
| 54 004        | 33 036        | 10 971        | 3 256         |
| 76 990        | 122 442       | 132 985       | 112 142       |
| 35 216        | 21 883        | 19 461        | 12 766        |
| 45 349        | 297 836       | 260 261       | 208 238       |
| 91 746        | 285 975       | 244 719       | 187 741       |
| 37 575        | 250 636       | 224 917       | 179 405       |
| 17 030        | 13 267        | 9 221         | 5 255         |
| 28 737        | 108 925       | 74 769        | 42 155        |
| 48 133        | 45 695        | 25 292        | 12 404        |
| 27 164        | 23 630        | 16 770        | 9 148         |
| 12.3c         | 11.8c         | 8.4c          | 4.5c          |
| 15.2%         | 19.6%         | 17.3%         | 11.4%         |
| 5c            | —             | —             | —             |
| 11 025        | —             | —             | —             |
| 20 969        | 22 065        | 8 522         | 3 256         |
| 7 662         | 6 442         | 4 692         | 3 009         |
| 30 828        | 26 461        | 25 725        | 27 969        |
| 1 985         | 1 462         | 1 161         | 766           |





## Source and application of funds

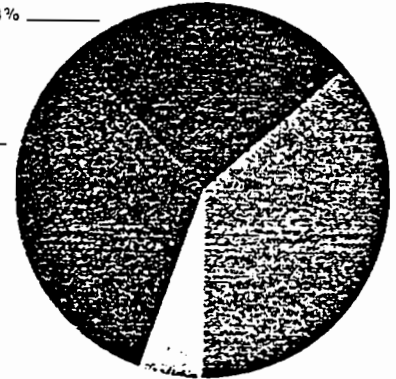
| Source of funds               | 1976    |       | 1975    |       |
|-------------------------------|---------|-------|---------|-------|
|                               | \$000   | \$000 | \$000   | \$000 |
| Net earnings                  | 45 422  |       | 26 709  |       |
| Add: Exchange losses/(gains)  | 10 635  |       | (688)   |       |
| Earnings from trading         | 56 057  |       | 26 021  |       |
| Provision for income tax      | 39 696  |       | 20 527  |       |
| Depreciation and amortisation | 49 733  |       | 44 876  |       |
| Long term borrowings          | —       |       | 49 791  |       |
| Other                         | 8 211   |       | 12 169  |       |
|                               | 153 697 |       | 153 384 |       |

Provision for income tax 25.8%

Depreciation and amortisation 32.4%

Other 5.3%

Earnings from trading 36.5%



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| Application of funds                         |         |         |
|----------------------------------------------|---------|---------|
| Expenditure on property, plant and equipment | 36 199  | 53 150  |
| Loan repayments                              | 11 473  | 16 680  |
| Increase in working capital                  | 81 369  | 56 725  |
| Dividends                                    | 19 404  | 19 404  |
| Other                                        | 5 252   | 7 425   |
|                                              | 153 697 | 153 384 |

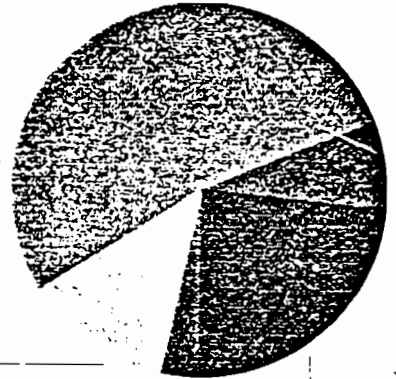
Loan repayments 7.5%

Increase in working capital 52.9%

Dividends 12.5%

Other 3.4%

Expenditure on property, plant and equipment 23.5%



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EXHIBIT "6"—Annual Reports of Hamersley Holdings Limited for the years 1976, 1978, 1981 and 1982

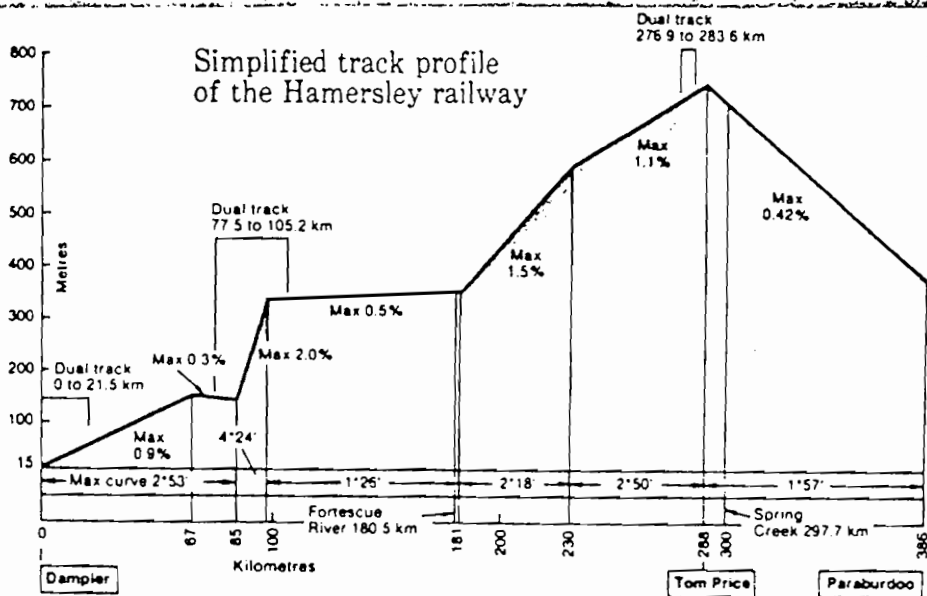
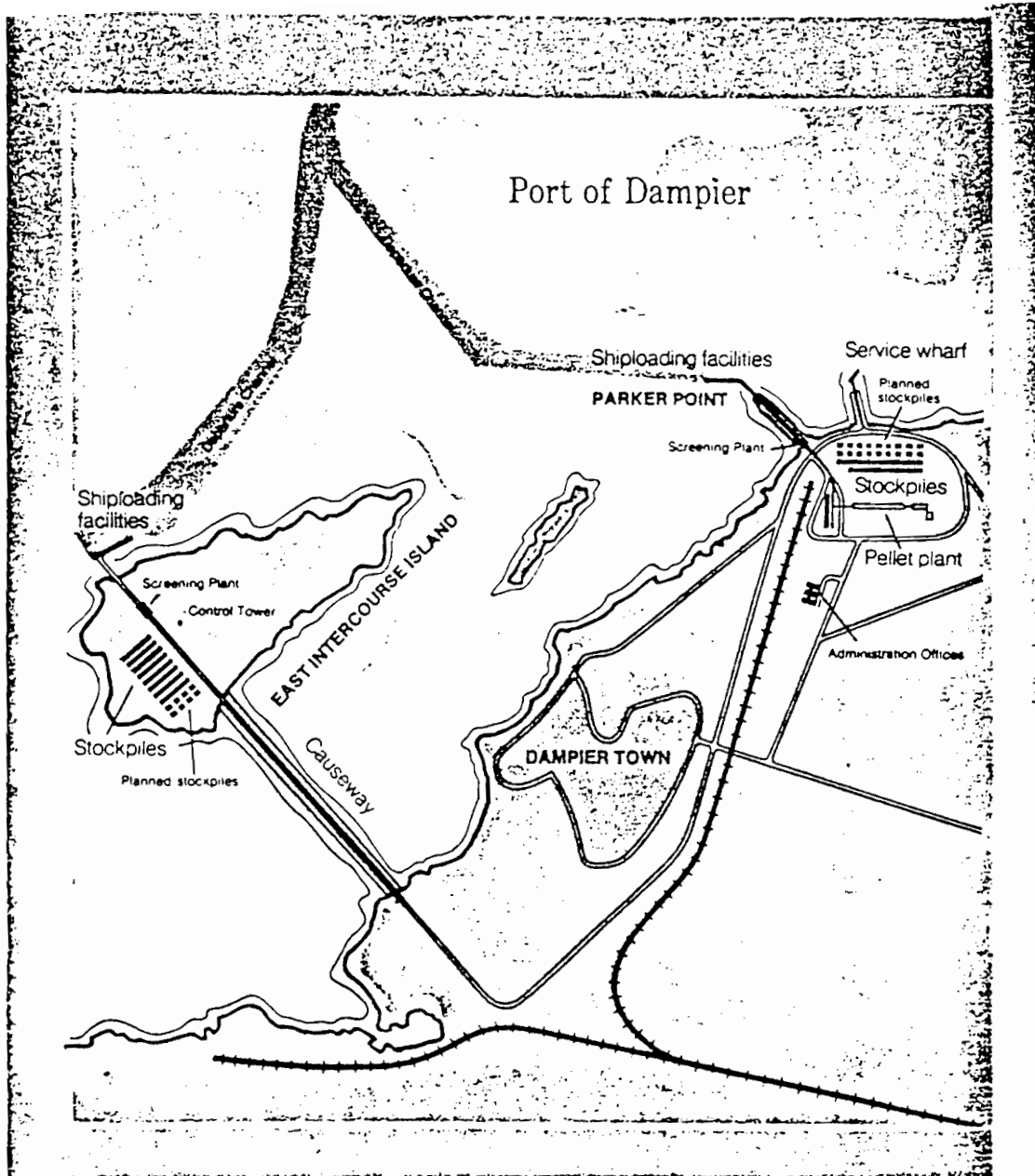


EXHIBIT "6"-Annual Reports of Hamersley Holdings Limited for the years 1976, 1978, 1981 and 1982

Hamersley Holdings Limited

Annual report 1978  
and notice of meeting to  
be held on April 6, 1979

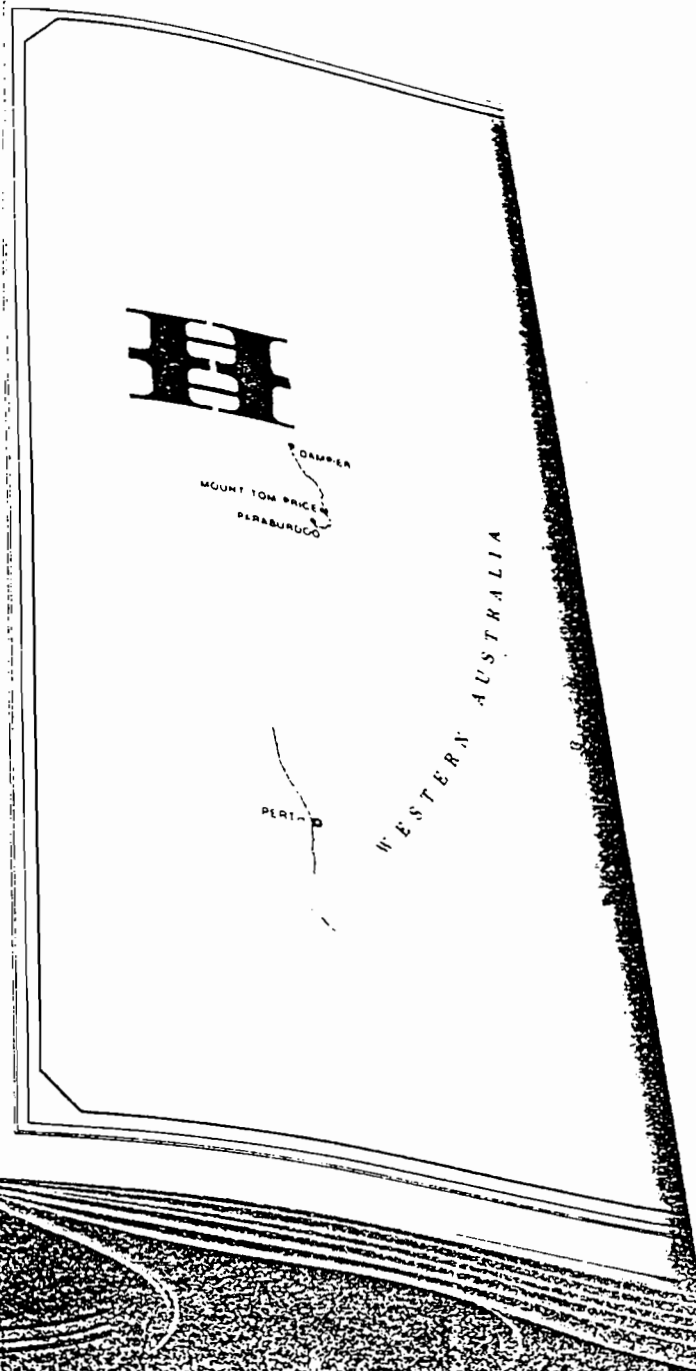
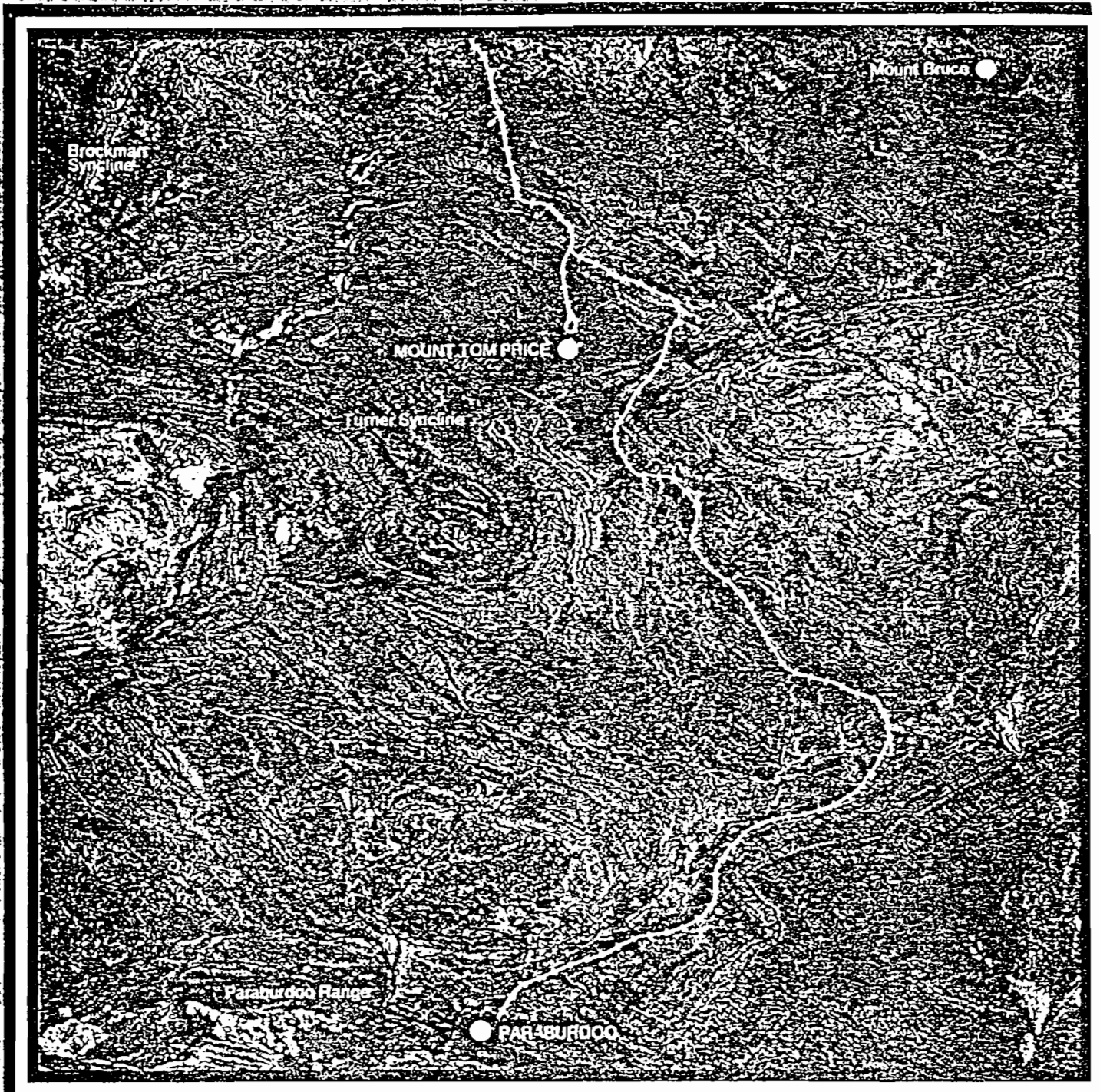


EXHIBIT "6"-Annual Reports of Hamersley Holdings Limited for the years 1976, 1978, 1981 and 1982



A satellite photograph of part of the Pilbara region, taken 500 miles above the earth's surface. This is a false colour composite and the various shades of green represent natural iron oxides. The photograph was prepared by the CSIRO as part of a project sponsored by mining companies through the Australian Mineral Industries Research Association. Cost: \$100,000 approx.

| Contents                        | Page |
|---------------------------------|------|
| Notice of meeting               | 1    |
| Directors                       | 2    |
| Year in brief 1978              | 3    |
| Chairman's statement            | 5    |
| Review of operations            | 7    |
| Directors' Report               | 14   |
| Statements of earnings          | 14   |
| Balance sheets                  | 18   |
| Source and application of funds | 19   |
| Notes on accounts               | 20   |
| Statistical summary             | 28   |
| Corporate Structure             | 29   |

In the report, all figures are production, shipment and sales figures are quoted in millions of tonnes.

1259

EXHIBIT "6" - Annual Reports of Hamersley Holdings Limited for the years 1976, 1978, 1981 and 1982

Hamersley operates open cut iron ore mines at Mount Tom Price and Paraburdoo in the Pilbara region of North West Australia. Ore from the mines is railed to the port of Dampier for export to world markets.

The first shipment of ore from Mount Tom Price left Dampier in August, 1966. Since 1965, when construction of the Hamersley project began, the Company has invested \$1 144 million in plant, equipment, port, railway, towns, water supplies, power and other facilities.

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Hamersley is now one of the world's major iron ore producers. Between 1966 and 1978, the Company has shipped over 280 million tonnes of ore and contributed about \$2 500 million to Australia's export income.

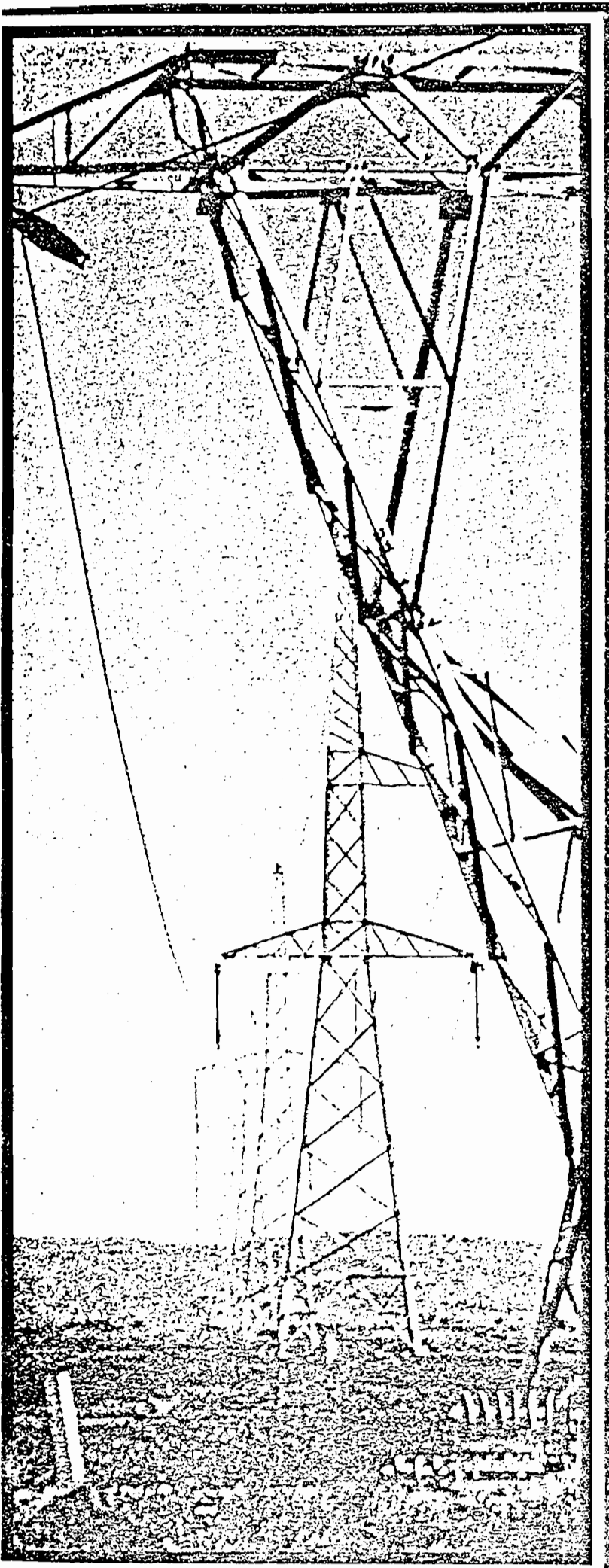
### Notice of meeting

The Annual General Meeting of Hamersley Holdings Limited will be held at 11:00 am on Friday, April 6, 1979 on the 24th floor of the CRA building, 95 Collins Street, Melbourne

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A separate notice of meeting and proxy form is enclosed. All shareholders are cordially invited to attend.

The closing date for the receipt of nominations for the office of director to be voted on at the Annual General Meeting is March 25, 1979.




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## Directors

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R. T. Madigan, OBE  
 Chairman of Directors  
 M. T. Anthony  
 T. Barlow  
 Sir Roderick Carnegie  
 Sir Frank Espie, OBE  
 R. A. Kjeliand  
 J. T. Ralph  
 C. C. Trumble  
 C. A. Watts  
 R. H. Harding  
 Alternate for J. T. Ralph  
 D. F. Pilz  
 Alternate for R. A. Kjeliand  
 J. T. Taylor  
 Alternate for M. T. Anthony

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### Secretaries

L. A. Warnick  
 R. M. Houston

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Managing Director —  
 Hamersley Iron Pty. Limited  
 T. Barlow

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### General Managers

I. F. Burston  
 Operations  
 J. K. Hamilton  
 Marketing  
 J. A. Innes  
 Engineering and Development  
 C. A. Watts  
 Finance and Administration

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Registered Office  
 78 Northbourne Avenue Canberra City

Principal Office  
 31 Spring Street Melbourne

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Share and/or loan  
 security registers  
 407  
 78 Northbourne Avenue Canberra City  
 VIC  
 84 Flinders Lane Melbourne  
 31 Spring Street Melbourne  
 NSW  
 200 Connel Street Sydney  
 WA  
 191 St. George's Terrace Perth  
 NEW YORK USA  
 111 Wall Street New York

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Stock Exchanges  
 Listed on exchanges in all  
 Australian States and New Zealand

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Bankers  
 Bank of New South Wales

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Auditors  
 Coopers & Lybrand

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Solicitors  
 Arthur Robinson & Co

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## Year in brief 1978

Earnings slumped in 1978 due to lower shipments, a less favourable exchange rate and cost inflation.

The drop in earnings was partially offset by investment allowance tax benefits.

The recession in the world steel industry continued to have an adverse effect on demand for iron ore. Shipments were also reduced by industrial disruptions.

Total volume of products shipped in 1978 fell by 6%. Production was down by 16% and stockpiles were diminished.

Dividends from 1978 earnings amounted to 9 cents a share compared with 16 cents in 1977.

| Statistics                                                                             | 1978          | 1977          |
|----------------------------------------------------------------------------------------|---------------|---------------|
| Consolidated net earnings                                                              | \$34 810 000  | \$57 840 000  |
| Net sales revenue                                                                      | \$359 468 000 | \$392 745 000 |
| W.A. Government royalties                                                              | \$19 206 000  | \$21 040 000  |
| Borrowings — long and short term                                                       | \$379 499 000 | \$340 700 000 |
| Interest paid, payable (net of interest capitalised<br>\$13 121 000, 1977 \$3 010 000) | \$17 165 000  | \$26 109 000  |
| Expenditure on property, plant and equipment                                           | \$198 430 000 | \$127 713 000 |
| Saleable ore produced (tonnes)                                                         | 29 445 000    | 34 867 000    |
| Ore shipped (tonnes)                                                                   | 31 244 000    | 33 118 000    |
| Net sales revenue per tonne shipped                                                    | \$11.41       | \$11.80       |
| Net earnings as a percentage of sales revenue                                          | 9.7           | 14.7          |
| Consolidated net earnings per share                                                    | 14.4c         | 23.8c         |
| Dividend per share                                                                     | 9c            | 16c           |

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## Chairman's statement

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Mr. J. H. ...  
Chairman

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### Drop in earnings

Earnings from operations slumped in 1978 to 33% of the previous year due principally to reduced shipments and an even more unfavourable exchange rate. Also, cost inflation was not compensated by an increase in prices. Investment allowance tax benefits of \$17.3 million inflated total earnings to 60% of 1977.

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### Steel recession continues

As predicted in the Supplementary Statement made to shareholders at the Annual General Meeting last April, the Company continued to operate at less than rated capacity through 1978 due principally to the prolonged recession in the world steel industry. However, it is doubtful whether the industrial climate would have allowed us to take advantage of a recovery even if one had eventuated. Iron ore demand from Japan and Western Europe was depressed with steel industries operating at less than 70% of capacity. However, Hamersley's shipments to Western Europe were higher than in the previous year and sales gains were made to People's Republic of China and South Korea. Total shipments of ore and pellets for the year were 5% less than the previous year, but Hamersley retained its 40% share of iron ore exports from Australia.

Inflation continues to have a significant adverse effect. While the average Hamersley price for iron ore sold to Japan is now 54% higher than it was 10 years ago, in money terms, prices in real terms based on Australian inflation rates have declined by 35%. On the other hand, FOB costs to the Japanese steel mills, in yen, dropped 7% over the same period.

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### Stoppages affect performance and capacity

Industrial disputation had a profound effect on Hamersley's performance in 1978, to the extent that our sales were limited more by strikes than by the depressed market place. The Hamersley operations are spread over several locations. During 1978, operations were subjected to 331 separate stoppages due to strikes in one or other of the locations. Over the past three years there has been an average of 21 strikes per month. Perhaps even more serious than loss of production is the loss of a reputation well earned by the Company and Australia in previous years.

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### Prices lag cost inflation

A price review of Japanese Contracts 1, 2 and 3 was effective from April 1 for a two year period. Price increases on Contracts 2 and 3 were more than offset by a reduction on Number 1. Prices to Western Europe were reduced slightly in 1978 compared with the previous year. It is expected that prices for 1979, which are currently being negotiated, will be increased. Japanese Contract Number 4, which currently has the highest price, is due for renegotiation early in 1979 and an increase will be sought to offset increasing costs. The containment of operating costs is a major objective of Management, but





1265

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Hamersley Holdings Limited for the  
years 1976, 1978, 1981 and 1982

## Review of operations

### Mining and treatment

#### Mining

Total production from the Mount Tom Price and Paraburdoo mines decreased from 34 867 000 tonnes in 1977 to 29 445 000 tonnes in 1978 reflecting a decision to slightly reduce production to meet market demand but more importantly the impact of increased industrial disruption during 1978.

Recovery of saleable ore from material mined also declined from 59% to 50% due to the accelerated development of the new 'Prongs' area at Mount Tom Price.

Saleable ore production at Mount Tom Price was 16 158 000 tonnes compared with 21 141 000 tonnes in 1977.

Production consisted of 8 345 000 tonnes of high grade lump, 7 415 000 tonnes of high grade fines and 398 000 tonnes of low grade fines. Total material movement in the mine was 32 898 000 tonnes.

Saleable ore production at Paraburdoo in 1978 was 13 287 000 tonnes compared with 13 726 000 tonnes in 1977.

Production consisted of 6 139 000 tonnes of high grade lump and 7 148 000 tonnes of high grade fines. Material mined was 26 379 000 tonnes.

During the year, advantage was taken of the lower levels of production to increase the proportion of Paraburdoo ore in total production from the 39% obtained in 1977 to 45% in 1978. This has the effect of extending the life of the Mount Tom Price orebody which is less than the expected life for Paraburdoo.



The ratio of fines to lump also continued to increase, largely due to the higher production of Paraburdoo ore.

At the end of 1978, a total of 5 341 000 tonnes of product was held in working and supplementary stockpiles, compared with 7 279 000 tonnes at the same time last year. The reduction reflects the lower levels of production and also the effects of industrial disruption.

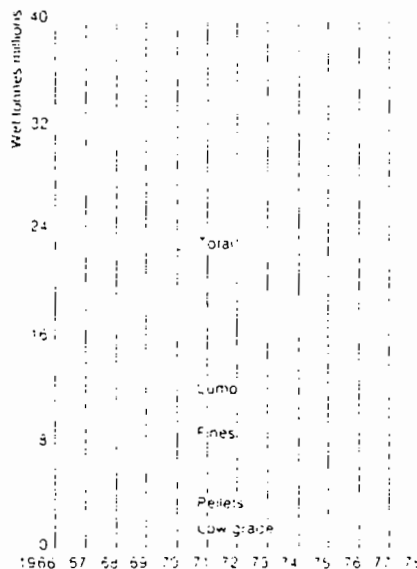
A new Marion electric shovel was commissioned at Mount Tom Price during 1978. Although the additional capacity will not be required in the immediate future, the shovel will allow greater flexibility in ore blending and quality control.

#### Pellets

Production for 1978 totalled 1 834 000 tonnes compared with 2 392 000 tonnes in 1977. An extended shutdown for maintenance, programmed for the year, took place from May to July.

The operating performance of the pellet plant continued to be satisfactory and plant reliability was maintained. This was largely the result of upgrade works and improvements in operating techniques and operator skills. In addition, computerised monitoring of plant operations contributed to improved performance of the plant.

Further research and development work aimed at improved pellet specification and more efficient use of fuel energy was carried out early in the year and is also reflected in the performance of the plant.



Supplies of iron ore

#### World steel production

|               | (million tonnes) |       |
|---------------|------------------|-------|
|               | 1978*            | 1977  |
| Japan         | 102.1            | 102.4 |
| EEC           | 132.4            | 126.1 |
| USA           | 123.8            | 113.2 |
| Rest of World | 354.2            | 330.6 |
| Total         | 712.5            | 672.3 |

\*preliminary



1266

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# Marketing and shipping

## Marketing

There was no significant recovery in the world steel industry in 1978 and current indications are that the situation will be much the same within the next twelve months. 1978 was the fourth successive year of recession and iron ore producers throughout the world continue to face a weak demand for their products.

World steel production totalled 712 million tonnes in 1978 compared with 672 million tonnes in 1977. Production in Eastern Europe, North America and some developing countries accounted for most of the 6% increase. Steel producers in Europe and Japan generally maintained 1977 production levels.

Hamersley's total shipments for the year were 31 244 000 tonnes, compared with 33 118 000 tonnes in 1977.

Shipments comprised 13 993 000 tonnes of high grade lump, 14 692 000 tonnes of high grade fines, 501 300 tonnes of low grade ore and 2 058 000 tonnes of pellets.

Sales to Japan accounted for approximately 55% of total shipments compared with about 70% in previous years. Japan's decline in market prominence was offset to some extent by increased sales to other countries. Expanding steel industries in the People's Republic of China and South Korea, for example, offer the potential for expanded sales of Hamersley products in the future.

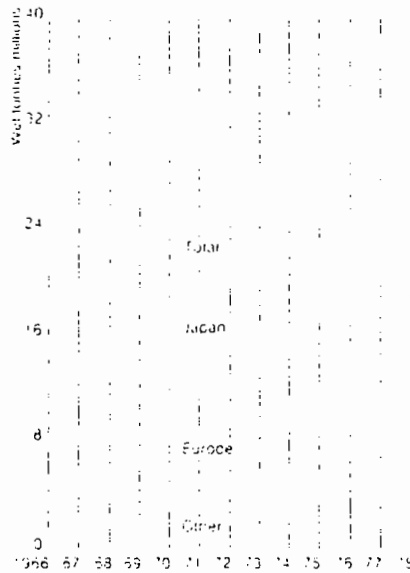
However, despite the continued decline in sales, Hamersley again accounted for approximately 40% of Australia's total iron ore exports.

During the year, Japanese steel mills exercised their option to take minimum contractual tonnages, although actual shipments were significantly below declared levels.

Average revenue per tonne of ore shipped declined from \$11.80 in 1977 to \$11.41. Lower prices on some contracts and an adverse exchange rate, exacerbated by a weakening of the US dollar, were among the factors which contributed to this situation.

During 1978, increased prices were negotiated for the Pellet Contract and Contracts Nos. 2 and 3. Prices for the latter are now equal to the reduced prices received for the No. 1 Contract. Contract No. 4 pricing is scheduled for negotiation in 1979.

It is anticipated that iron ore producers will face a difficult market situation during the coming year, despite recent



Shipments by product

indications of a slight improvement in the world steel industry. Furthermore, oversupply of iron ore is expected to continue into the 1980's.

Nevertheless, Hamersley remains confident of maintaining its position and will continue to explore vigorously an expansion of its markets.

## Shipping

The recession in world bulk shipping continued in 1978 and the main obstacle to recovery remained the depressed state of the steel industry. Surplus available carrier capacity peaked in mid 1978 and has since shown a substantial decline. As a consequence, the freight market became more sensitive to increased demand factors. This was illustrated towards the end of the year when tanker freight rates increased sharply due to unsettled conditions in Iran and an increase in oil inventories prior to the OPEC price change. This short lived recovery influenced combination carriers to seek employment in the oil trades, thus temporarily stimulating dry bulk freight rates.

Advantage was taken of the continuing low freight market to consolidate Hamersley's long term freight arrangements.

Bunker prices, a major factor in the cost of shipping, remained stable during the year as a result of oversupply. However, these prices are expected to rise in 1979.

Hamersley's shipping arrangements are designed to ensure that the company's requirements are met at the lowest possible cost.

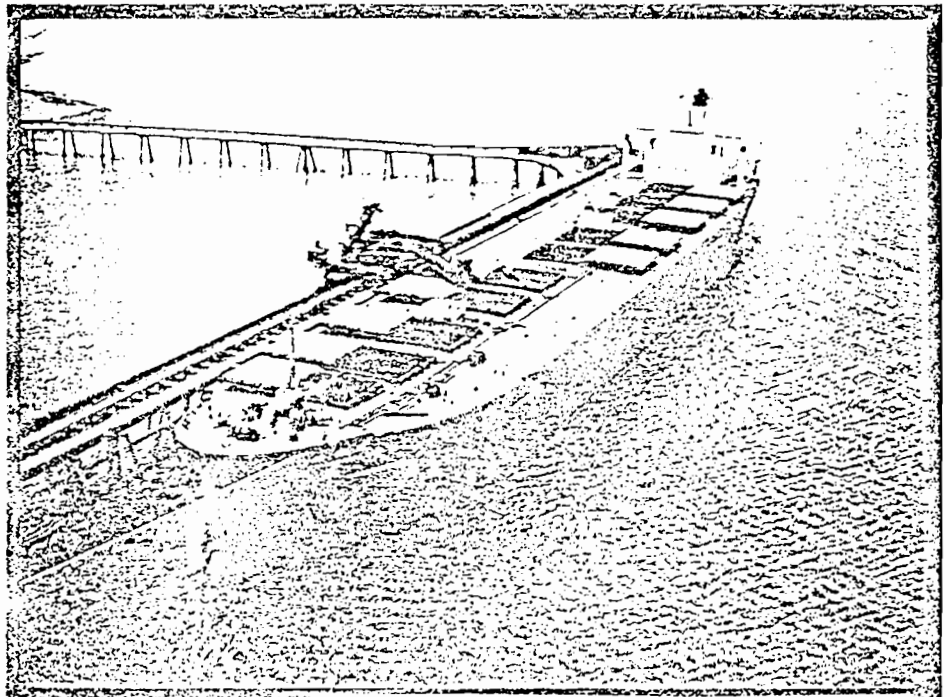


EXHIBIT "6"-Annual Reports of Hamersley Holdings Limited for the years 1976, 1978, 1981 and 1982

# Exploration, research and development

## Exploration

The search for iron ore resources and associated industrial minerals within development range of the existing Hamersley transport system continued throughout 1978.

During the year, the Western Australian Government granted to Group Companies additional temporary reserves in several locations including Mount Pynton, Turee Creek and within the Fortescue River Valley.

Assessment of the Turee Creek syncline, east of Paraburdoo, commenced during the year.

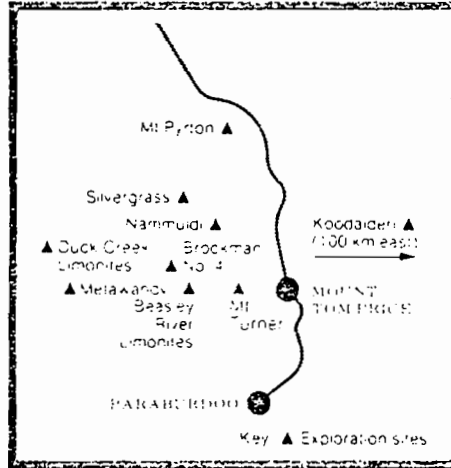
Study of existing temporary reserves also continued.

Representative bulk samples from the Nammuidi deposit underwent intensive metallurgical testing in the Dampier Technical Centre. Bulk samples from other current prospects were also tested.

Quantities of Marra Mamba ore and tertiary limonites have been identified in the locality of Mount Turner. However, final test results are not yet available.

The search for an additive source for the pellet plant continued as reserves of lime sand located close to Dampier are near depletion. Adequate reserves of potential feed have been identified adjacent to the railway within the Mount Tom Price mine area but metallurgical test work has yet to be carried out to ascertain whether the material is suitable.

Expenditure on exploration and evaluation of prospects over the last five years exceeds \$10 million.



Process optimisation continued within the Company's existing crushing, screening and pelletising operations. Particular attention was focused on introducing more sophisticated control systems into operating plants. Trials designed to assess the variability of lump and fines production ratios were carried out at Paraburdoo.

It is anticipated that improved control of pit and plant operations will be possible as

the result of on-stream analysis. Findings obtained from a two year pilot plant programme indicate that ore sampling from a moving belt can be as accurate as conventional sampling and analysis techniques. However, the method requires to be tested under rigorous site conditions.

Throughout the year, Operations Research personnel continued to study system capacity and ore grade variation. A computerised method of equipment allocation was developed. The new system will ensure more effective utilisation of equipment in relation to grade constraints. Analysis of port operations continued. A port simulation model was completed and will assist in rationalising berth usage.

Continued support was given to various research programmes being conducted through the Australian Mineral Industries Research Association — including the trial of a solar powered air conditioning unit. Close technical liaison was also maintained with the CSIRO.

Developments in the fields of geostatistics and geotechnics were examined to assess their potential.

In the latter part of the year, a centralised Laboratory Services group was formed to ensure more efficient use of resources.

Map of Exploration sites in Western Australia and the Hamersley transport system, with the aid of a reference map.

## Research and development

During the year, a number of important engineering projects were progressed as part of a continuing programme to modernise equipment and improve the efficiency of existing operations.

Major projects carried out during 1978 included upgrading of the railways workshop, preparation of a detailed development programme for the A-West orebody at Paraburdoo and commencement of construction of two additional track maintenance camps.

Metallurgical testwork associated with the evaluation of new ore sources continued at the Dampier Technical Centre and at other laboratories.

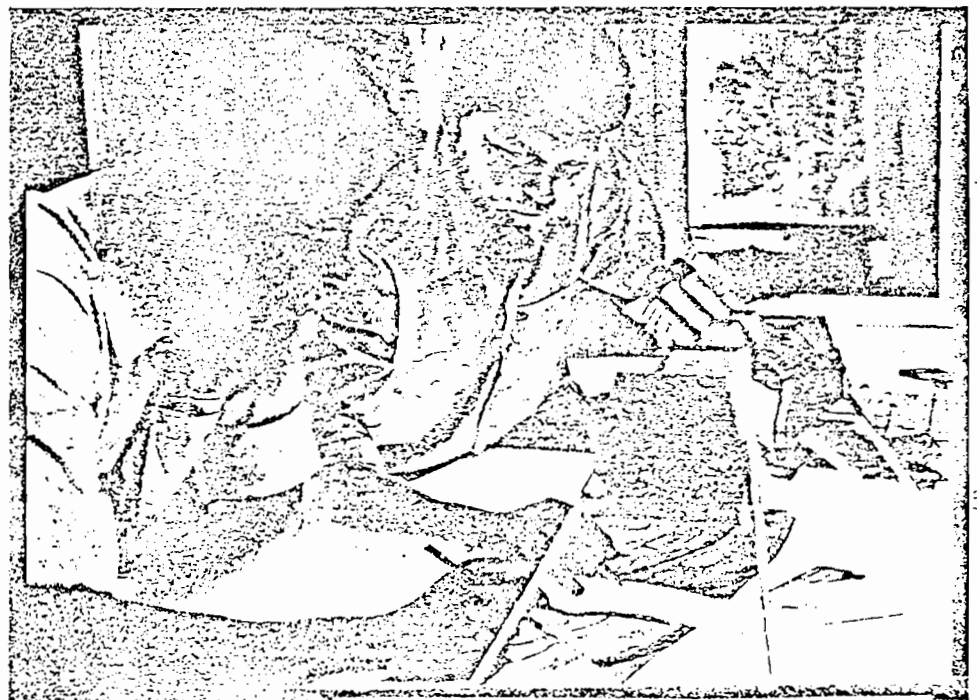


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# Towns, railways, port and power

## Towns

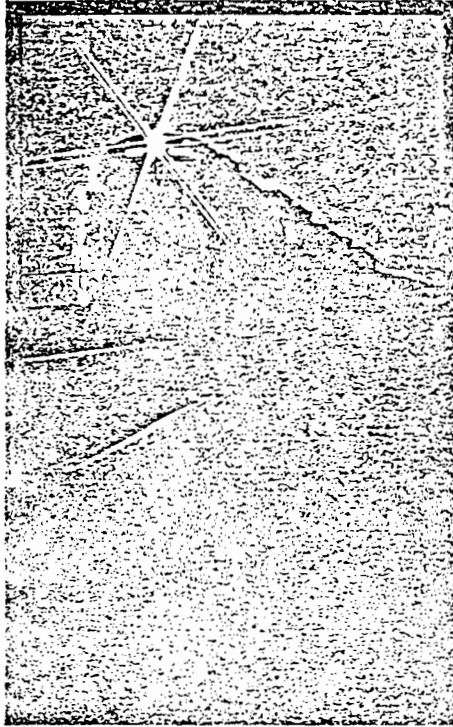
Construction of the new housing area at North West Tom Price was completed during the year. A feature of the new development is the 'village green' concept. The 209 houses have been built around a central park area in which the primary school and sports facilities are located. A modern, air conditioned community recreation complex has been built by the Shire of West Pilbara.

A ring road ensures that the vehicle traffic is kept to a minimum.

The railway bridge, incorporating separate vehicle and pedestrian lanes, provides direct access to the existing town area.

At Karratha, additional accommodation for married personnel was made available, including 69 homes and eight town houses. A new primary school was completed. Other private and commercial developments were also undertaken in the area.

Karratha is continuing to develop as an independent community. Although a significant proportion of the town's population is comprised of Hamersley personnel, the State Government and private developers are playing an increasing part in the town's growth.



## Railways

The railway system handled 4 379 mainline traffic movements in 1978. This was a gross haulage of 47 million tonnes with an iron ore payload of 29 million tonnes.

During the year, seven locomotives and 350 ore cars purchased as part of the expansion project were delivered and a number of the original Alco 626 series locomotives were retired from service. Extensive maintenance work was also carried out on existing ore cars.

The extensive track maintenance programme and detailed research carried out over recent years led to lower track maintenance costs in 1978.

Additional track maintenance equipment was commissioned during the year, including a rail grinder and track geometry measuring bar. The latter will be used in conjunction with a computer recently installed at the 7 Mile Workshop to improve maintenance scheduling.

As a result of the concrete sleeper testing programme carried out during 1977, it has been decided to replace worn timber sleepers with concrete. A tender for the new sleepers has been let and installation equipment ordered. An all-concrete sleeper track will largely eliminate sleeper replacement costs, reduce the volume of maintenance work and extend rail life.

Upgrading of the 7 Mile Workshop commenced in 1978. However, until work is completed in 1979, some disruption will be caused to locomotive availability.

Research into train dynamics continued with attention being focused on wheel and rail wear.

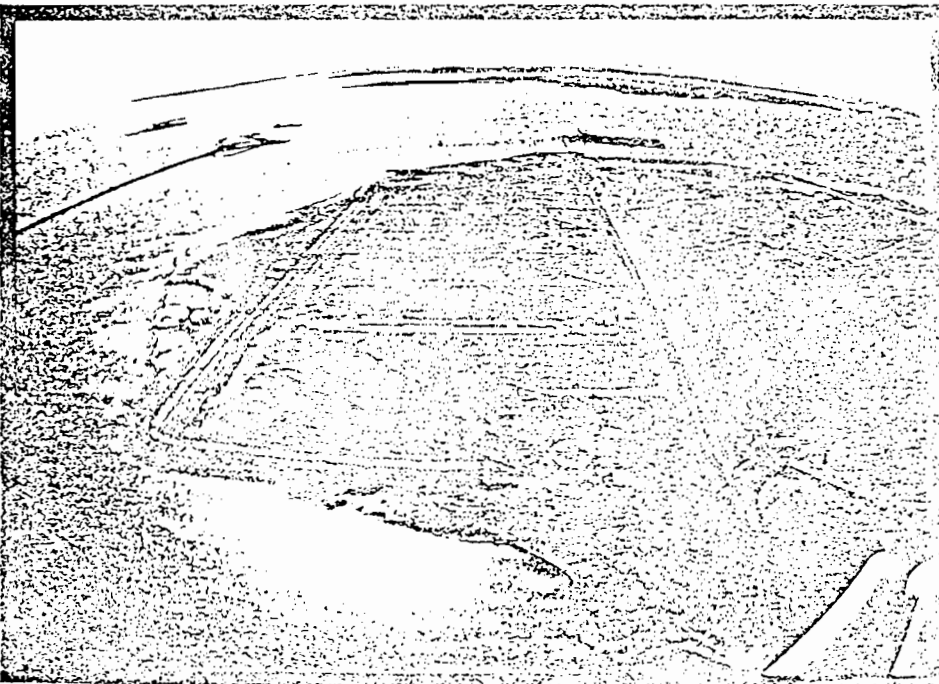
In September, Hamersley co-sponsored the first international Heavy Haul Railways Conference. Senior engineering and operational representatives from major railways throughout the world met in Perth to consider problems associated with heavy rail haulage.

## Port

During the year, 31 244 000 tonnes were shipped from Parker Point and East Intercourse Island in 410 ore carriers.

A total of seven cargo ships and 12 tankers discharged 2 381 tonnes of general cargo and 240 532 tonnes of fuel at the service wharf.

Several major projects were implemented at the port during 1978 to improve ship loading facilities. This work included upgrading of stockpiles and screening plants at Parker Point and East Intercourse Is and as well as



# Industrial relations and environment

Towns, railways, port and power continued

Improvements to the material handling systems at Parker Point. Extensions to the stockpiles at East Intercourse Island will minimise the necessity for temporary stockpiling to cover peak shipping periods.

In addition to its primary functions of port administration, towage and pilotage, Pilbara Harbour Services Pty. Limited also provided agency and general marine services.

## Power

Hamersley has invested about \$95 million in power facilities since operations commenced.

The Company currently operates a 120 megawatt steam turbine station at Dampier and diesel stations at Tom Price and Paraburdoo. The Tom Price plant is scheduled to be closed in 1979 and power requirements for the Tom Price town and mine will be supplied from Dampier via a 220 kV transmission line completed during 1978. This transmission line will enable an integrated power generation and distribution system to be introduced, co-ordinating power supply and reducing costs.

During the year, the State Energy Commission of Western Australia began



Operational surgery on the Dampier Power Station.

installing a 20 megawatt gas turbine in the Dampier Power Station. This unit will help meet the increased demand for power in the Karratha area.

## Industrial relations

During 1978, the labour turnover rate declined from 31.7% in 1977 to 26.5%. This trend has been evident for some years reflecting the continuing maturity of the Hamersley towns and the depressed employment prospects elsewhere in Australia.

Although the expansion project continued without significant industrial disputation, frequent industrial activity seriously affected Hamersley's general operations throughout 1978.

The number of manhours lost due to strike action reached a record level of 366,405 (or 6.64% of the total number of production hours), compared with 264,276 in 1977.

Of the 381 strikes which occurred during the year, 45 of the stoppages resulted in loss of time in significant sections of the workforce for two days or more, 15 disputes continued for more than seven days.

This is a highly unsatisfactory situation and the reasons for it are both complex and numerous. Towards the end of the year some signs were evident of a recognition by the workforce of a need for improved co-operation. Such improved co-operation is essential if the industry is to avoid permanently alienating its overseas customers, whose custom generates employment in the Company.

Pilbara Harbour Services Pty. Limited



Alan Maxwell, General Superintendent Engineer, Hamersley, in the control room of the new Dampier Power Station.



EXHIBIT "6"-Annual Reports of Hamersley Holdings Limited for the years 1976, 1978, 1981 and 1982

## Expansion programme

### Industrial relations and environment continued

The Western Australian Government has commissioned a complete review of the State's industrial law. The Company looks to this review to provide a new framework within which industrial relations can be improved.

### Training and welfare

Throughout 1978, attention continued to be focused on career development.

The Company recruited 11 graduates for its Graduate Development Programme and currently 33 young people are involved in the scheme. This programme is designed to give graduates experience in different areas of Hamersley's operation. Usually four assignments are allocated based on the graduate's training and his or her professional interests.

During the year, the Company engaged 33 new apprentices and 17 new professional and commercial trainees bringing the number of apprentices and trainees employed to 135.

Supervisor training continued to be developed following the introduction of formal courses in 1977.

Operator training was also expanded. A number of special courses were implemented, designed to enhance employee skills and assist the individual to cope with changing work functions.

While the overall safety record remained unsatisfactory during 1978, there was a trend towards reduced accident frequency. Training programmes designed to promote safe working practices were continued during the year.

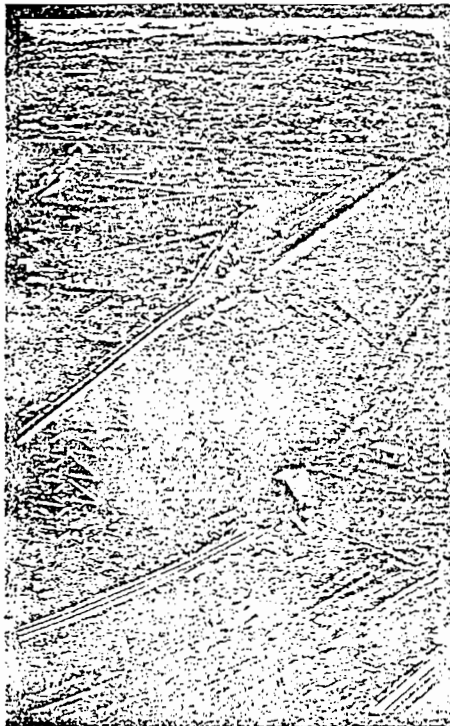
### Environment

The study of plant rehabilitation continued throughout 1978. Investigations again covered establishment and maintenance of native vegetation on land disturbed by mining and areas affected by incorrect grazing management and the natural forces of erosion.

Maintenance of the experimental orchards at Paraburdoo and Dampier also continued. The growth of tropical fruit and nut trees is being assessed.

In the work environment, research into dust control was maintained. Activities included a large scale trial of improved ore conditioning prior to loading at the mine sites.

A data bank was also developed to facilitate more efficient analysis of dust monitoring results.



New washer and train at Dampier, at Mount Tom Price.

The concentrator plant is planned to be fully operational by April, 1979. Dry commissioning is scheduled to commence at the end of January, 1979. Recruitment and training of plant personnel commenced during 1978.

No serious industrial problems were experienced during the year and overall progress has been satisfactory. All work is expected to be completed on schedule and within budget.

The benefits to be derived by Hamersley from the programme will be evident in the future. In the meantime, however, Hamersley has provided a significant boost to the economy, particularly in the engineering and construction industries of Western Australia.

Managing Director, Hamersley Iron Pty. Limited  
February 13, 1979.

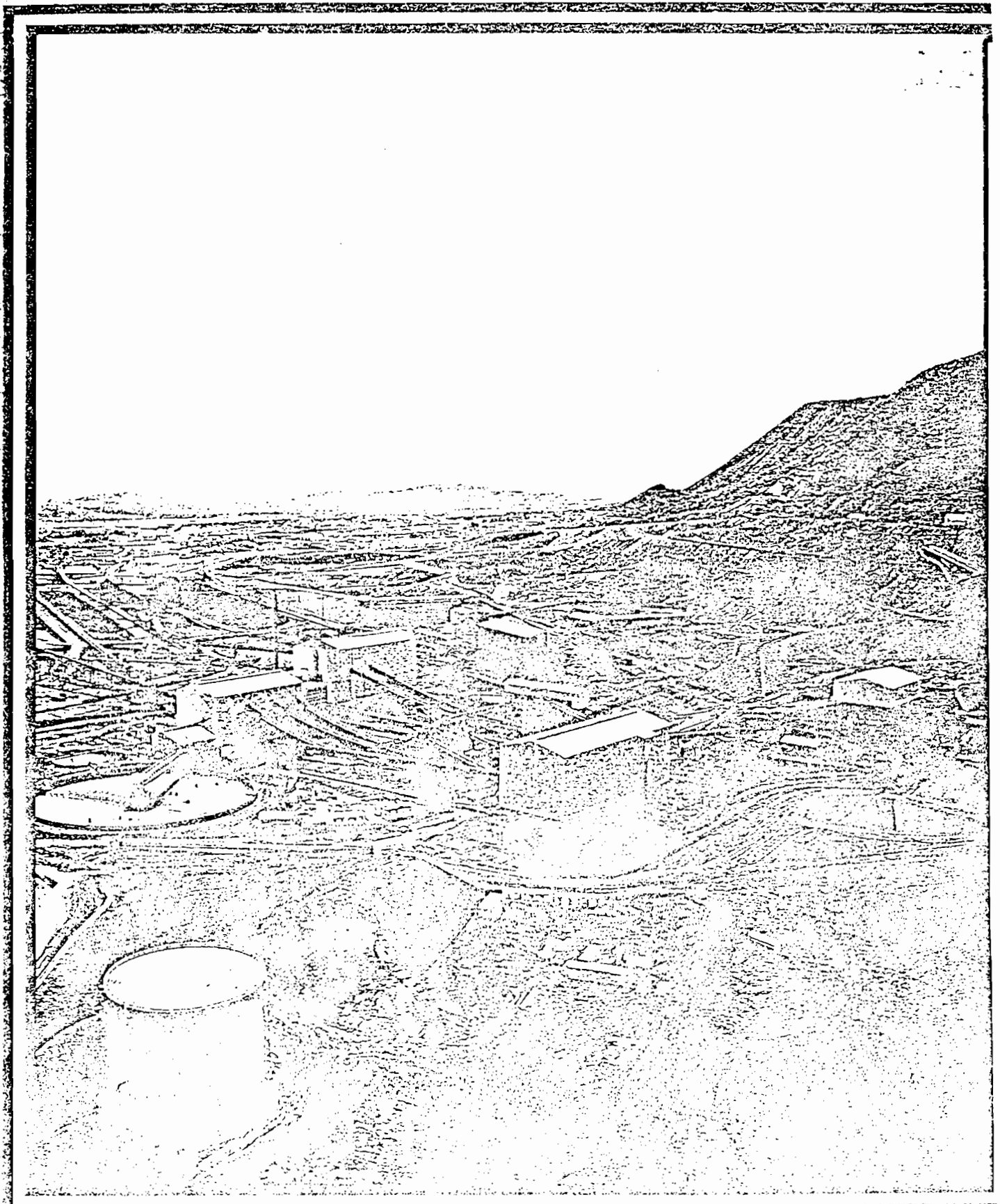
### Expansion programme

Work on the expansion programme continued through 1978. Major segments of the project were completed during the year, including construction of additional housing at Tom Price and Karratha, installation of the power transmission line from Dampier to Paraburdoo and improvements to the port screening plants.

At Mount Tom Price, construction of the concentrator plant and upgrading of the lines handling system were virtually completed by the end of the year. The new Mine Operations Centre and extended workshop facilities were also completed.

Upgrading of stockpile and loading facilities at the port also scheduled to be finished early in 1979.





The concentrator plant at Mount Tom Price.

Foreground (from left) water storage, screening plant, secondary and tertiary crushers.

Centre (from left) sumps thickener, coarse concentration plant, fines concentration plant.

EXHIBIT "6"-Annual Reports of  
Hammersley Holdings Limited for the  
years 1976, 1978, 1981 and 1982

# Directors' report

Hamersley Holdings Limited  
(Incorporated in the Australian Capital Territory)

Your Directors have pleasure in presenting the Annual Report and Group Accounts of Hamersley Holdings Limited ("the Company") and its subsidiaries for the year ended December 31, 1978 ("the financial year").

## Directors

At the date of this Report, the following are Directors of the Company:

| Director                                      | Shareholdings in the Company and in related corporations as shown in the Register of Directors' Shareholdings at January 21, 1979 |       |       |       |
|-----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|-------|-------|-------|
|                                               | HHL                                                                                                                               | BCL   | GRA   | VKL   |
| R. T. Madigan<br>(Chairman)                   | 5 579                                                                                                                             | 159   | 784   |       |
| M. T. Anthony                                 |                                                                                                                                   |       |       |       |
| T. Barrow                                     | 5 781                                                                                                                             | 2 145 | 3 940 |       |
| Sir Frederick Carnegie                        | 1 100                                                                                                                             | 5 300 | 6 000 | 1 000 |
| Sir Frank Esbri                               |                                                                                                                                   |       |       | 1 500 |
| R. A. Kelland                                 |                                                                                                                                   |       |       |       |
| J. T. Raich                                   |                                                                                                                                   | 114   | 476   |       |
| C. O. Trumble                                 |                                                                                                                                   |       |       |       |
| C. A. Watts                                   |                                                                                                                                   |       |       |       |
| R. H. Harding<br>(Alternate for J. T. Raich)  | 1 267                                                                                                                             | 335   | 1 400 | 1 000 |
| D. F. Pilz<br>(Alternate for R. A. Kelland)   |                                                                                                                                   |       |       |       |
| J. T. Taylor<br>(Alternate for M. T. Anthony) |                                                                                                                                   |       |       |       |

A. shares in the related corporations:  
HHL - Hamersley Holdings Limited  
BCL - Boulders Coalfield Limited  
GRA - Gungahlin Resources Limited  
VKL - Mary Kathleen Coalfield Limited

## Activities

The principal activities of the corporations in the Group during the financial year were mining, transport, processing and shipping of iron ore, exploration for mineral deposits, holding of temporary reserves for iron ore deposits, servicing of sales contracts, provision of tug, harbour and ship agency services, engineering and consultancy, participation in shipping ventures, raising of finance for such purposes and the investment of surplus funds. During the financial year, no significant change occurred in the nature of the activities of any of the corporations in the Group.

EXHIBIT "5"-Annual Reports of Hamersley Holdings Limited for the years 1976, 1978, 1981 and 1982

## Revenue and net earnings

Net sales revenue of the Group decreased by 8.5% from \$392 745 000 in 1977 to \$359 468 000 in 1978 due to lower tonnage shipped and a less favourable average exchange rate of the Australian dollar for the US dollar.

Consolidated net earnings for 1978 amounted to \$34 810 000 (1977 \$57 840 000) after providing \$12 312 000 (1977 \$50 231 000) for income tax and provision for exchange losses on future repayments of loans in foreign currencies of \$16 327 000 (1977 \$10 145 000). The tax benefits from investment Allowance and Trading Stock Valuation included in consolidated net earnings amounted to \$17 654 000 (1977 \$4 626 000).

The consolidated net earnings result has been determined according to historical accounting methods of current cost accounting principles were applied to reflect the effects of inflation on replacement costs of plant and other fixed assets the result would have been significantly lower.

The contribution of each corporation in the Group to the consolidated net earnings was as follows:

|                                      | 1978     | 1977     |
|--------------------------------------|----------|----------|
|                                      | \$000    | \$000    |
| Hamersley Holdings Limited           | 290      | 354      |
| Hamersley Iron Pty Limited           | 33 780   | 56 734   |
| Hamersley Exploration Pty Limited    |          |          |
| Mount Bruce Mining Pty Limited       | 1        | 59       |
| Hamersley Europe Pty Limited         | 4        | 15       |
| Pilbara Harbour Services Pty Limited | 650      | 455      |
| Himet Corporation Limited            |          |          |
| Metallised Ores Limited              |          |          |
| Hamersley Iron Finance N.V.          |          |          |
| Hamersley Japan Limited              | 49       | 24       |
| Northern Cross Charters Limited A.S. | 46       | (16)     |
|                                      | \$34 810 | \$57 840 |

## Subsidiaries

No subsidiaries were acquired or disposed of during the financial year.

## Reserves and provisions

**Hamersley Holdings Limited**  
The following movement occurred in reserves during the financial year:

|                             |          |
|-----------------------------|----------|
| Reserve                     |          |
| Equity in associate company |          |
| —transfers from             | \$ 3 000 |

**Hamersley Iron Pty Limited**  
A comprehensive review of all provisions and programmes relating thereto was made at the end of the financial year. The following material movements occurred in reserves and provisions during the financial year:

|                         |            |
|-------------------------|------------|
| Reserve                 |            |
| Trading Stock Valuation |            |
| —transfers to           | \$ 676 000 |

|                           |              |
|---------------------------|--------------|
| Provisions                |              |
| (a) Maintenance and other |              |
| —net transfers from       | \$ 3 198 000 |
| (b) Long service leave    |              |
| —net transfers to         | \$ 592 000   |

(c) Possible future net exchange losses

—net transfers to \$12 846 000

(d) Exploration and development

—net transfers to \$ 2 414 000

**Pilbara Harbour Services Pty Limited**  
The following material movements occurred in provisions during the financial year:

|                    |           |
|--------------------|-----------|
| Long service leave |           |
| —transfers to      | \$ 16 000 |
| Doubtful debts     |           |
| —transfers from    | \$ 5 000  |

**Hamersley Japan Limited**  
The following material movement occurred in provisions during the financial year:

|                    |           |
|--------------------|-----------|
| Long service leave |           |
| —transfers to      | \$ 31 000 |

There were no other material movements in reserves or provisions in any corporation in the Group during the financial year.

## Shares and debentures

On February 28, 1978, the Company issued floating rate and 9 1/4% Series J Security Stock due 1980 and 1983 respectively of nominal value \$1 000 000 to secure a loan for the purchase of mine equipment.

\$3 300 000 of 10 1/2% Australian Debenture stock due 1988 was issued pursuant to a letter of offer dated 8th May, 1978, to holders of the Company's 6 1/2% Australian Debenture Stock maturing 31st May, 1978. The net proceeds were for general corporate purposes.

On November 9, 1978, the Company issued floating rate Series O United States Security Stock due 1988 of nominal value US\$60 000 000. The net proceeds were to provide part of the total funds required for the expansion of the annual product production of Hamersley Iron Pty Limited to 48 million tonnes.

During the period, no other issues of shares or debentures were made by any corporation in the Group.



**Dividends**

A final dividend for 1977 of 8 cents per share was declared on January 24, 1978, and was paid in May, 1978. This dividend was mentioned in the last Report. An interim dividend for 1978 of 4 cents per share was declared on July 28, 1978, and was paid on November 3, 1978.

A final dividend for 1978 of 5 cents per share was declared on January 25, 1979, and is payable on May 3, 1979.

**Additional information**

(a) So far as debts owing to the Company are concerned, the Directors of the Company (before the Statement of Earnings for the financial year and Balance Sheet as at the end of the financial year were made up) took reasonable steps to ascertain the action taken in relation to the writing off of bad debts and to cause all known bad debts to be written off and adequate provision to be made for doubtful debts.

(b) The Directors of the Company are not aware of any circumstances which would render the amount written off for bad debts, or the amount of the provision for doubtful debts, in any corporation in the Group, inadequate to any substantial extent.

(c) The Directors of the Company (before the Statement of Earnings for the financial year and Balance Sheet as at the end of the financial year were made up) took reasonable steps to ascertain whether any current assets of the Company were unlikely to realise, in the ordinary course of business, their value as shown in the accounting records of the Company and were satisfied that such assets would so realise that value.

(d) The Directors of the Company are not aware of any circumstances which would render the values attributed to current assets in the Group Accounts for the financial year misleading or inappropriate.

(e) There does not exist at the date of this Report either

(i) any charge on the assets of any corporation in the Group; or

(ii) any contingent liability of any corporation in the Group which has arisen since the end of the financial year.

(f) In the opinion of the Directors of the Company, no contingent or other liability of any corporation in the Group has become enforceable or is likely to become

enforceable during 1979 which will or may affect the ability of the corporation to meet its obligations as and when they fall due.

(g) The Directors of the Company are not aware of any circumstances not otherwise dealt with in this Report or the Group Accounts for the financial year, which would render any amount stated in these Group Accounts misleading.

(h) The results of the Group and of any corporation in the Group during the financial year have not been substantially affected by any item, transaction or event of a material and unusual nature except as mentioned in this Report.

(i) Between December 31, 1978, and the date of this Report no item, transaction or event of a material and unusual nature has occurred which, in the opinion of the Directors of the Company, is likely to affect substantially the results of the operations of any corporation in the Group for the period ending December 31, 1979.

(j) (i) As at January 31, 1979, there were 24 002 ordinary shareholders who held all the Company's issued capital on which the voting rights are one vote for each share held.

(ii) As at January 31, 1979, the twenty largest holders of the ordinary shares of the Company held a total of 92.01% of the issued ordinary shares of the Company. Of this figure 54% (130 977 000 shares) is held by Conzinc Riotinto of Australia Limited, 95 Collins Street, Melbourne, Victoria, in which the following companies have a substantial interest:

CRA Holdings Pty Limited,  
95 Collins Street,  
Melbourne, Victoria

RTZ Australian Holdings Limited, and  
The Rio Tinto-Zinc Corporation Limited,  
both of 6 St. James's Square, London

and 28.32% (68 679 750 shares) is held by Kaiser Steel Corporation, 300 Lakeside Drive, Oakland, California, in which the trustees of Henry J. Kaiser Family Foundation of 300 Lakeside Drive, Oakland, California, have a substantial interest.

(iii) As at January 31, 1979, the distribution of the ordinary shares of the Company (which comprise the total issued capital of the Company) was:

| No. of Shares   | No. of Shareholders |
|-----------------|---------------------|
| 1 - 1 000       | 20 411              |
| 1 001 - 5 000   | 3 221               |
| 5 001 - 10 000  | 200                 |
| 10 001 and over | 170                 |
| <b>Total</b>    | <b>24 002</b>       |

(k) Since December 31, 1977, certain of the Directors of the Company have received, or become entitled to receive, benefits as follows, namely: Mr. R. T. Madigan, Mr. D. S. Stewart (to April 7, 1978), Mr. T. Barlow, Sir Roderick Carnegie, Sir Frank Espie, Mr. J. T. Ralph, Mr. R. H. Harding and Mr. C. A. Watts, each of whom is or was engaged in the full-time employment of the Company and/or its related corporations and has received, or become entitled to receive, in connection with that employment, his fixed salary and normal superannuation, medical and other benefits relating to such employment. Save as aforesaid and save as to any pro rata payment of, or entitlement to, emoluments such as are included in the Group Accounts for the financial year, since the end of the previous financial year no Director of the Company has received, or become entitled to receive, a benefit (other than a benefit included in the aggregate amount of Directors' emoluments shown in the Group Accounts for the financial year, or the fixed salary of a full-time employee of the Company) by reason of a contract made by the Company or a related corporation with the Director, or with a firm of which he is a member, or with a company in which he has a substantial financial interest.

(l) The Company is a company of the kind specified in the Schedule to the Order dated July 21, 1978, made by the Acting Registrar of Companies in the Australian Capital Territory in respect of classes of companies relating to the "rounding off" of amounts in accounts and directors' reports, and the amounts set out in this Report and accompanying Group Accounts have been rounded off in accordance with that Order.

Signed this 10th day of February, 1979, in accordance with a resolution of the Directors

*R. Thradisan*  
Chairman

*[Signature]*  
Director

Statements of earnings

Notes on pages 20 to 27 inclusive form part of these statements and are to be read in conjunction therewith.

For years ended December 31

| Hamersley Holdings        |        |      | Hamersley Group |         |
|---------------------------|--------|------|-----------------|---------|
| 1978                      | 1977   |      | 1978            | 1977    |
| \$000                     | \$000  | Note | \$000           | \$000   |
| <b>Income</b>             |        |      |                 |         |
| 29 278                    | 28 232 |      | 359 468         | 392 745 |
| 22 480                    | 39 257 |      |                 |         |
| 796                       | 753    |      | 7 123           | 22 034  |
| 52 554                    | 68 242 |      | 366 591         | 414 779 |
| <b>Costs and expenses</b> |        |      |                 |         |
| 400                       | 311    |      | 230 027         | 217 177 |
|                           |        |      | 51 513          | 49 014  |
|                           |        |      | 3 187           | 3 525   |
|                           |        |      | 1 259           | 1 017   |
| 10 480                    | 10 407 |      |                 |         |
| 18 798                    | 17 825 |      | 17 165          | 26 109  |
| (36)                      | 73     |      | 16 285          | 10 216  |
| 29 642                    | 28 616 |      | 319 436         | 307 058 |
| 22 912                    | 39 626 |      | 47 155          | 107 721 |
| 150                       | 194    |      |                 |         |
| 150                       | 194    |      | 934             | 46 154  |
| 22 762                    | 39 432 |      | 11 378          | 4 127   |
|                           |        |      | 12 312          | 50 281  |
| (3)                       | 389    |      | 34 843          | 57 440  |
| 22 759                    | 39 821 |      |                 |         |
|                           |        |      | (30)            | 11      |
| (3)                       | 389    |      | (3)             | 389     |
| 22 759                    | 39 821 |      | 34 810          | 57 840  |
|                           |        |      |                 |         |
| (3)                       | 389    |      | 676             | 583     |
| 22 762                    | 39 432 |      | (3)             | 389     |
| 13 757                    | 13 133 |      | 34 137          | 56 868  |
|                           |        |      |                 |         |
| 9 702                     | 19 404 |      | 137 988         | 119 928 |
| 12 128                    | 19 404 |      |                 |         |
| 21 830                    | 38 808 |      |                 |         |
| 14 689                    | 13 757 |      | 9 702           | 19 404  |
|                           |        |      | 12 128          | 19 404  |
|                           |        |      | 21 830          | 38 808  |
|                           |        |      | 150 295         | 137 988 |

EXHIBIT "6"-Annual Reports of Hamersley Holdings Limited for the years 1976, 1978, 1981 and 1982

Balance sheets

Notes on pages 20 to 27 inclusive form part of these statements and are to be read in conjunction therewith

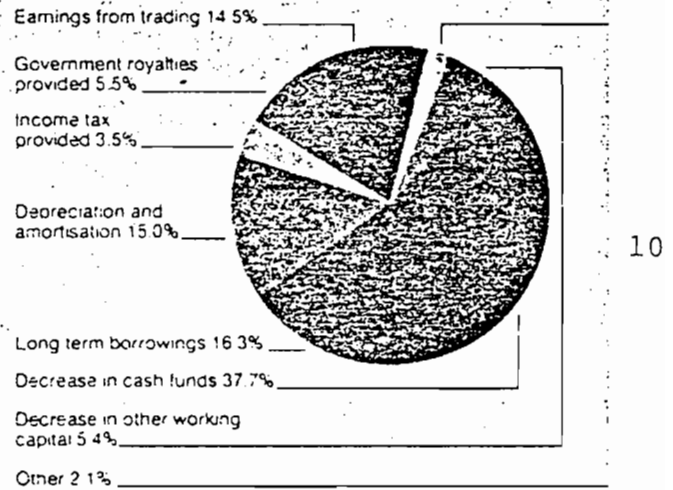
At December 31

| Hamersley Holdings |         |                                         | Hamersley Group |         |
|--------------------|---------|-----------------------------------------|-----------------|---------|
| 1978               | 1977    |                                         | 1978            | 1977    |
| \$000              | \$000   | Note                                    | \$000           | \$000   |
|                    |         | <b>Capital and reserves</b>             |                 |         |
| 60 637             | 60 637  | Ordinary shares                         | 60 637          | 60 637  |
| 68 425             | 68 425  | Share premium                           | 68 425          | 68 425  |
| 374                | 374     | Capital reserve                         | 374             | 374     |
|                    |         | Trading stock valuation reserve         | 2 145           | 1 469   |
| 386                | 389     | Equity in associate company reserve     | 386             | 389     |
| 14 689             | 13 757  | Retained earnings                       | 150 295         | 137 988 |
| 144 511            | 143 582 |                                         | 282 262         | 269 282 |
|                    |         | Outside shareholder's interest          | (91)            | (122)   |
| 144 511            | 143 582 |                                         | 282 171         | 269 160 |
|                    |         | Future income tax                       | 128 597         | 117 218 |
|                    |         | Deferred liabilities                    |                 |         |
|                    |         | (Maturing later than one year)          |                 |         |
| 211 162            | 153 903 | Debenture stock and other secured loans | 312 171         | 299 360 |
| 103 641            | 148 507 | Equipment and other loans — unsecured   | 3 595           | 7 516   |
| 314 803            | 302 410 |                                         | 315 766         | 306 876 |
|                    |         | Provisions                              | 10 952          | 13 510  |
|                    |         | Current liabilities                     |                 |         |
| 51                 |         | Bank overdraft — unsecured              | 3 369           | 4 268   |
| 84 766             | 39 117  | Creditors                               | 144 630         | 99 783  |
| 12 128             | 19 404  | Dividend payable                        | 12 128          | 19 404  |
| 287                | 280     | Income tax                              | 23 806          | 88 384  |
| 97 232             | 58 801  |                                         | 183 933         | 211 839 |
| 556 546            | 504 793 |                                         | 921 419         | 918 603 |
|                    |         | <b>Total funds</b>                      |                 |         |
|                    |         | These funds were represented by:        |                 |         |
|                    |         | Fixed assets                            |                 |         |
|                    |         | Property, plant and equipment           | 757 537         | 611 738 |
| 453 608            | 441 216 | Exploration and development             |                 |         |
| 644                | 647     | Subsidiary companies                    |                 |         |
| 705                | 668     | Investments                             | 644             | 647     |
|                    |         | Advances                                | 22 874          | 21 362  |
|                    |         | Current assets                          |                 |         |
|                    |         | Stocks and stores                       | 54 055          | 64 876  |
| 100 629            | 61 135  | Debtors                                 | 40 770          | 38 705  |
| 960                | 1 075   | Short term deposits                     | 19 625          | 151 975 |
|                    | 2       | Cash and bank balances                  | 6 393           | 7 088   |
| 101 589            | 62 262  |                                         | 120 843         | 262 644 |
|                    |         | Deferred revenue expenditure            | 4 676           | 3 242   |
|                    |         | Exchange fluctuation                    | 14 845          | 13 970  |
| 556 546            | 504 793 | <b>Total assets</b>                     | 921 419         | 918 603 |

EXHIBIT "5"—Annual Reports of Hamersley Holdings Limited for the years 1976, 1978, 1981 and 1982

## Source and application of funds

| Source of funds                   | 1978   |         | 1977   |         |
|-----------------------------------|--------|---------|--------|---------|
|                                   | \$000  | \$000   | \$000  | \$000   |
| Net earnings                      | 34 810 |         | 57 840 |         |
| Add: Exchange losses              | 16 285 |         | 10 216 |         |
| Earnings from trading             |        | 51 095  |        | 68 056  |
| Government royalties provided     |        | 19 206  |        | 21 040  |
| Income tax provided               |        | 12 312  |        | 50 281  |
| Depreciation and amortisation     |        | 52 772  |        | 50 031  |
| Long term borrowings              |        | 57 393  |        | 73 600  |
| Decrease in cash funds            |        | 132 146 |        |         |
| Decrease in other working capital |        | 19 898  |        |         |
| Other                             |        | 7 581   |        | 6 536   |
|                                   |        | 352 403 |        | 269 544 |



| Application of funds                         |         |         |
|----------------------------------------------|---------|---------|
| Expenditure on property, plant and equipment | 198 430 | 127 713 |
| Loan repayments                              | 30 794  | 16 682  |
| Increase in working capital                  |         | 27 298  |
| Government royalties paid                    | 18 898  | 21 222  |
| Income tax paid                              | 65 519  | 26 641  |
| Dividends                                    | 29 106  | 36 383  |
| Other                                        | 9 656   | 13 605  |
|                                              | 352 403 | 269 544 |

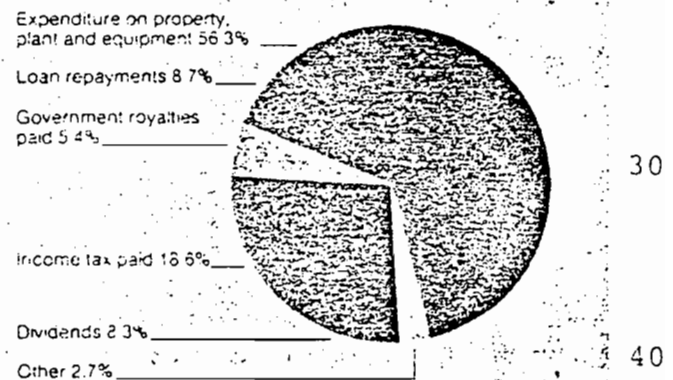


EXHIBIT "6"-Annual Reports of Hamersley Holdings Limited for the years 1976, 1978, 1981 and 1982

## Notes on accounts

December 31, 1978

### note 1. Summary of accounting policies

The principal accounting policies set out below are consistent with those adopted in the previous year, unless otherwise stated. These policies are applied on the basis of the historical cost convention and have not been adjusted to take account of current costs of specific assets or their impact on the operating results.

- (a) **Consolidation of subsidiaries**  
Conventional consolidation principles are applied to the accounts of the subsidiary companies listed in Note 12.
- (b) **Consolidation of associate**  
Equity accounting is applied to the investment in Bulk Shipping Associates Limited in which Hamersley Holdings Limited holds 50% of the issued capital.
- (c) **Income tax**  
The provisions for current and future income tax are calculated on earnings before tax. Certain items of expense, principally depreciation, are claimed for tax purposes in periods different from those for accounting purposes. The resulting tax differences are reported as future income tax.
- (d) **Foreign exchange**  
Monetary assets and liabilities, (and contingent liabilities — Note 22) in foreign currencies have been converted to Australian currency at the rates of exchange ruling at balance date. All other amounts in foreign currencies have been converted at the appropriate rate of exchange at the date of the relevant transactions. Possible future unrealised exchange losses on foreign currency borrowings are being provided against over the period of the related borrowings.
- (e) **Depreciation of property, plant and equipment**  
Depreciation is provided on the straight line method by charges against income at rates based on the estimated useful life of the respective assets. Major new plant and facilities are usually depreciated on a basis pro rata with production, until such time as the plant is capable of operating at full design capacity. Generally, assets are fully depreciated over the shorter of their economic lives or twenty years.
- (f) **Maintenance and repairs**  
Maintenance and repair costs including minor renewals are charged against earnings as incurred. Provisions are raised in respect of periodic overhauls of major operating plant the cycle of which extends beyond one financial year.
- (g) **Stock valuations**  
Stocks of ores and pellets are valued at cost, cost being direct materials and labour. Costs are determined at standards using the weighted average basis, the standards being fixed having regard to normal anticipated levels of activity. Stores stocks are valued at cost less allowance for obsolescence.
- (h) **Deferred revenue expenditure**  
Where material expenditure is incurred, the benefit from which extends over a period of years, the costs incurred are amortised over the period in which the benefit will be derived, or five years, whichever is less.
- (i) **Exploration and development expenditure**  
Expenditure on exploration, development and research is fully provided against or written off as incurred.
- (j) **Capitalisation of interest**  
Interest on funds borrowed for major capital projects is capitalised as cost of project until commencement of operations.

### 2. Earnings before tax

Earnings before tax were arrived at after charging and crediting the following items:

|                                                                        | Hamersley Holdings |        | Hamersley Group |        |
|------------------------------------------------------------------------|--------------------|--------|-----------------|--------|
|                                                                        | 1978               | 1977   | 1978            | 1977   |
| Charges                                                                | \$000              | \$000  | \$000           | \$000  |
| Interest paid/payable:                                                 |                    |        |                 |        |
| (Group is net of interest capitalised, \$13 121 000; 1977 \$3 010 000) | 29 278             | 28 232 | 17 165          | 26 109 |
| Provisions for future liabilities (Note 8)                             |                    |        | 3 080           | 7 691  |
| Auditors' remuneration (Note 21)                                       | 25                 | 26     |                 |        |
| Loss on sale of fixed assets                                           |                    |        | 353             | 42     |
| Credits                                                                |                    |        |                 |        |
| Interest on short term deposits                                        | 162                | 126    | 6 679           | 21 177 |
| Profit on sale of fixed assets                                         |                    |        | 677             | 327    |
| Provisions no longer required (Note 3)                                 |                    |        | 112             | 3 354  |
| Dividend from unlisted company                                         |                    |        | 1               |        |



notes continued

**note 3 Income tax**

(a) Taxation on earnings for the year comprises:

|                                              | Hamersley Group |        |
|----------------------------------------------|-----------------|--------|
|                                              | 1978            | 1977   |
|                                              | \$000           | \$000  |
| Current                                      | 950             | 45 604 |
| Under/(over) provision in previous year      | (16)            | 550    |
|                                              | 934             | 46 154 |
| Future                                       | 11 274          | 4 677  |
| Transfer (to)/from provision for current tax | 104             | (550)  |
|                                              | 11 378          | 4 127  |

(b) The current tax charge for 1978 is reduced by:

- (i) Investment allowance \$17 307 000 (1977 — \$4 358 000)
- (ii) Trading stock valuation adjustment \$347 000 (1977 — \$268 000)

(c) The following major items caused the charge for current income tax to vary from that prima facie payable on reported earnings:

|                                    | Hamersley Group |          |
|------------------------------------|-----------------|----------|
|                                    | 1978            | 1977     |
|                                    | \$000           | \$000    |
| Permanent differences:             |                 |          |
| Investment and other allowances    | 37 624          | 9 475    |
| Net exchange losses                | (16 362)        | (10 419) |
| Non allowable depreciation         | (1 507)         | (1 299)  |
| Trading stock valuation adjustment | 754             | 583      |
| Other                              | 92              | 3        |
|                                    | 20 601          | (1 657)  |
| Timing differences:                |                 |          |
| Provisions                         | 5               | (102)    |
| Losses carried forward             | 76              | (16)     |
| Other                              | 1               |          |
|                                    | 82              | (118)    |
|                                    | 20 683          | (1 775)  |
| Net tax effect                     | 9 517           | (818)    |

(d) The effective rate of income tax for Hamersley Holdings Limited is negligible as the majority of its taxable earnings comprises repayable dividends.

**4. Capital**

(a) Authorised capital

The authorised capital of the Company comprises 300 000 000 ordinary shares of 25 cents each: \$75 000 000 (1977 \$75 000 000).

(b) Issued capital

The issued capital of the Company is 242 550 000 ordinary shares of 25 cents each fully paid: \$60 637 500 (1977 \$60 637 500).

**5. Movements in reserves**

|                                         | Hamersley Holdings |       | Hamersley Group |       |
|-----------------------------------------|--------------------|-------|-----------------|-------|
|                                         | 1978               | 1977  | 1978            | 1977  |
|                                         | \$000              | \$000 | \$000           | \$000 |
| (a) Trading stock valuation reserve     |                    |       |                 |       |
| Balance from previous year              |                    |       | 1 469           | 886   |
| Trading stock valuation adjustment      |                    |       | 754             | 583   |
| Adjustment relating to prior year       |                    |       | (78)            |       |
|                                         |                    |       | 2 145           | 1 469 |
| (b) Equity in associate company reserve |                    |       |                 |       |
| Balance from previous year              | 389                |       | 389             |       |
| Movement as per statement of earnings   | (3)                | 389   | (3)             | 389   |
|                                         | 386                | 389   | 386             | 389   |

**note 6. Debenture stock and other secured loans**

The following debenture stock and secured loans are secured by fixed and floating charges covering substantially all the assets of Hamersley Holdings Limited and Hamersley Iron Pty. Limited. The Trust Deeds under which the debenture stock was issued place restrictions on the dividend policy of both these companies.

|                                        | Hamersley Holdings |         | Hamersley Group |         |
|----------------------------------------|--------------------|---------|-----------------|---------|
|                                        | 1978               | 1977    | 1978            | 1977    |
|                                        | \$000              | \$000   | \$000           | \$000   |
| Australian Stock due 1995              | 64 976             | 74 959  | 64 976          | 74 959  |
| Guaranteed Debentures due 1985         |                    |         | 11 288          | 12 251  |
| Guaranteed Debentures due 1986         |                    |         | 12 590          | 13 563  |
| Guaranteed Bearer Notes due 1979       |                    |         | 6 555           | 11 496  |
| Guaranteed Bearer Notes due 1979       |                    |         | 42 540          | 34 691  |
| Guaranteed Bearer Bonds due 1987       |                    |         | 42 571          | 41 434  |
| Guaranteed Debentures due 1987         |                    |         | 17 800          | 19 032  |
| Guaranteed Debentures due 1982         |                    |         | 25 527          | 26 951  |
| Series C United States Stock due 1990  | 26 048             | 26 251  | 26 048          | 26 251  |
| Secured Debentures due 1992            | 33 863             | 35 002  | 33 863          | 35 002  |
| Secured Notes due 1984                 | 31 605             | 33 427  | 31 605          | 33 427  |
| Canadian Equipment Loan due 1983       | 5 004              |         | 5 004           |         |
| Series D United States Stock due 1982  | 52 097             |         | 52 097          |         |
|                                        | 213 593            | 169 639 | 372 464         | 329 057 |
| Less: Instalments due within 12 months | 2 431              | 15 736  | 60 293          | 29 697  |
|                                        | 211 162            | 153 903 | 312 171         | 299 360 |

| Description                                         | Amount Outstanding December 31 1978 | Security                              | Interest rate                           | Repayable between |
|-----------------------------------------------------|-------------------------------------|---------------------------------------|-----------------------------------------|-------------------|
| <b>Issued by Hamersley Holdings Limited</b>         |                                     |                                       |                                         |                   |
| Secured Notes due 1984                              | US\$36 400 000                      | Series I Security stock               | 3 1/4%                                  | 1990 to 1984      |
| Secured Debentures due 1992                         | US\$39 000 000                      | Series H Security stock               | 9 1/4%                                  | 1980 to 1992      |
| Australian stock due 1995                           | A\$64 976 000                       |                                       | Rates varied between 7 1/4% and 10 1/4% | 1980 to 1995      |
| Series C United States Stock due 1990               | US\$30 000 000                      | Series C United States Security stock | 11%                                     | 1981 to 1990      |
| Canadian Equipment Loan - Series A Advance due 1980 | CS\$ 374 925                        | Series J Security stock               | Floating                                | 1980              |
| - Series B Advance due 1983                         | CS\$ 499 693                        | Series J Security stock               | 9 1/4%                                  | 1980 to 1983      |
| Series D United States Stock due 1982               | US\$60 000 000                      | Series D United States Security stock | Floating                                | 1982 to 1982      |
| <b>Issued by Hamersley Iron Finance N.V.</b>        |                                     |                                       |                                         |                   |
| Guaranteed Bearer Notes due 1979                    | D.Fl. 16 000 000                    | Series C Security stock               | 6 1/4%                                  | 1979              |
| Guaranteed Bearer Notes due 1979                    | Sw.Fr. 30 000 000                   | Series D Security stock               | 6 1/4%                                  | 1979              |
| Guaranteed Debentures due 1982                      | US\$29 400 000                      | Series G Security stock               | 10%                                     | 1979 to 1982      |
| Guaranteed Debentures due 1985                      | US\$13 000 000                      | Series A Security stock               | 9 1/4%                                  | 1979 to 1985      |
| Guaranteed Debentures due 1986                      | US\$14 500 000                      | Series B Security stock               | 9%                                      | 1979 to 1986      |
| Guaranteed Bearer Bonds due 1987                    | DM90 000 000                        | Series E Security stock               | 6 1/4%                                  | 1979 to 1987      |
| Guaranteed Debentures due 1987                      | US\$20 500 000                      | Series F Security stock               | 8%                                      | 1979 to 1987      |

note 7 - Equipment and other loans - unsecured

|                                        | Hamersley Group |        |
|----------------------------------------|-----------------|--------|
|                                        | 1978            | 1977   |
|                                        | \$000           | \$000  |
| Equipment loans - Banks                | 2 453           | 4 120  |
| - Other institutions                   | 4 053           | 6 804  |
| Other loans                            | 529             | 719    |
|                                        | 7 035           | 11 643 |
| Less: Instalments due within 12 months | 3 440           | 4 127  |
|                                        | 3 595           | 7 516  |

These loans are repayable over periods of up to five years. The interest rates vary between 6% and 8% per annum.

|                                        | Hamersley Holdings |         |
|----------------------------------------|--------------------|---------|
|                                        | 1978               | 1977    |
|                                        | \$000              | \$000   |
| (a) Banks                              | 23 878             | 25 814  |
| (b) Subsidiary companies               |                    |         |
| (i) Hamersley Iron Finance N.V.        | 134 992            | 133 604 |
| (ii) Hamersley Iron Pty. Limited       | 2 633              | 3 050   |
|                                        | 161 503            | 162 468 |
| Less: Instalments due within 12 months | 57 862             | 13 961  |
|                                        | 103 641            | 148 507 |

The loans in (a) above represent moneys deposited with the banks by Hamersley Iron Finance N.V. and, together with the loans in (b) (i), represent the borrowings under the Guaranteed Debentures, Notes and Bonds referred to in Note 6 above. Repayment of these Debentures, Notes and Bonds by Hamersley Holdings Limited operates in pro tanto satisfaction of the above loans.

8. Provisions

|                       | Balance 1977 | Charged to earnings | Expenditure & transfers | Balance 1978 |
|-----------------------|--------------|---------------------|-------------------------|--------------|
|                       | \$000        | \$000               | \$000                   | \$000        |
| Hamersley Group       |              |                     |                         |              |
| Long service leave    | 2 777        | 984                 | 346                     | 3 415        |
| Maintenance and other | 10 733       | 2 096               | 5 292                   | 7 537        |
|                       | 13 510       | 3 080               | 5 638                   | 10 952       |

Some of the above provisions include amounts which may fall due within twelve months but such amounts cannot be specifically ascertained.

9. Creditors

|                                                     | Hamersley Holdings |        | Hamersley Group |        |
|-----------------------------------------------------|--------------------|--------|-----------------|--------|
|                                                     | 1978               | 1977   | 1978            | 1977   |
|                                                     | \$000              | \$000  | \$000           | \$000  |
| Instalments on long term loans due within 12 months |                    |        |                 |        |
| Debenture stock and other secured loans             | 2 431              | 15 736 | 60 293          | 29 697 |
| Equipment and other loans - unsecured               | 1 737              | 1 750  | 3 440           | 4 127  |
| Short term loans                                    | 15 000             |        | 15 000          |        |
| Trade creditors                                     |                    |        | 14 256          | 14 296 |
| Subsidiary companies                                | 56 265             | 13 277 |                 |        |
| Other related corporations                          |                    |        | 2 556           | 1 933  |
| Other creditors and accrued liabilities:            |                    |        |                 |        |
| Secured                                             | 2 429              | 1 513  | 9 151           | 8 286  |
| Unsecured                                           | 6 904              | 6 841  | 39 934          | 41 444 |
|                                                     | 84 766             | 39 117 | 144 630         | 99 783 |

10. Property, plant and equipment

|                                                     | Hamersley Group |         |
|-----------------------------------------------------|-----------------|---------|
|                                                     | 1978            | 1977    |
|                                                     | \$000           | \$000   |
| Freehold and leasehold land and buildings - at cost | 156 876         | 121 112 |
| Less: Accumulated depreciation                      | 45 864          | 39 096  |
|                                                     | 110 012         | 82 016  |
| Plant, machinery and equipment - at cost            | 743 746         | 656 500 |
| Less: Accumulated depreciation                      | 259 375         | 250 734 |
|                                                     | 484 371         | 405 766 |
| Mine properties - at cost                           | 24 509          | 24 509  |
| Less: Accumulated depreciation                      | 8 391           | 7 568   |
|                                                     | 15 718          | 17 041  |
| Capital works in progress - at cost                 | 172 436         | 106 915 |
|                                                     | 757 537         | 611 738 |

note 11. Exploration and development

The accumulated costs provided for to December 31, 1978 for expenditure not deemed abortive amount to \$22,487,985 (1977 \$20,073,431) and were incurred in respect of exploration and other studies carried out by subsidiary companies in Western Australia, and the development of "Himet" (registered trade mark of Hamersley Iron Pty. Limited).

12. Subsidiary companies

|                                                                                                                                                           | Place of incorporation | Hamersley Holdings investment at cost |         |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|---------------------------------------|---------|
|                                                                                                                                                           |                        | 1978                                  | 1977    |
|                                                                                                                                                           |                        | \$000                                 | \$000   |
| (a) Shares in subsidiary companies                                                                                                                        |                        |                                       |         |
| Hamersley Iron Pty. Limited (100% owned)                                                                                                                  | Victoria               | 42 000                                | 42 000  |
| Mount Bruce Mining Pty. Limited (99.9% owned)                                                                                                             | Western Australia      | 10                                    | 10      |
| Hamersley Iron Finance N.V. (100% owned and carries on business in the Netherlands Antilles)                                                              | Netherlands Antilles   | 18                                    | 18      |
| Hamersley Exploration Pty. Limited (99.9% owned)                                                                                                          | Western Australia      | 1                                     | 1       |
| Himet Corporation Limited (99.9% owned)                                                                                                                   | Victoria               | 1                                     | 1       |
| Metallised Ores Limited (99.9% owned)                                                                                                                     | Western Australia      | 1                                     | 1       |
| Piibara Harbour Services Pty. Limited (100% owned)                                                                                                        | Victoria               | 1 200                                 | 1 200   |
|                                                                                                                                                           |                        | 43 231                                | 43 231  |
| (Hamersley Iron Pty. Limited has —                                                                                                                        |                        |                                       |         |
| (i) a 99.9% interest in Hamersley Japan Limited, a company incorporated in Japan and which carries on business in Japan;                                  |                        |                                       |         |
| (ii) a 100% interest in Hamersley Europe Pty. Limited, a company incorporated in Victoria which carries on business at Melbourne and London, England; and |                        |                                       |         |
| (iii) a 60% interest in Northern Cross Chartering Limited A/S, a company incorporated in Norway and which carries on business in Norway.)                 |                        |                                       |         |
| (b) Amounts owing by subsidiary companies                                                                                                                 |                        | 410 377                               | 397 965 |
|                                                                                                                                                           |                        | 453 608                               | 441 215 |

The amounts owing by subsidiary companies include \$312,170,516 (1977 \$299,359,551) being the outstanding of monies borrowed by Hamersley Holdings Limited and which are repayable on the same terms and conditions.

|                                         | Hamersley Holdings |        |
|-----------------------------------------|--------------------|--------|
|                                         | 1978               | 1977   |
|                                         | \$000              | \$000  |
| (c) Dividends from subsidiary companies |                    |        |
| Hamersley Iron Pty. Limited             | 21 830             | 38 908 |
| Piibara Harbour Services Pty. Limited   | 650                | 449    |
|                                         | 22 480             | 39 257 |

13. Investments

|                                                                   | Hamersley Holdings |       | Hamersley Group |       |
|-------------------------------------------------------------------|--------------------|-------|-----------------|-------|
|                                                                   | 1978               | 1977  | 1978            | 1977  |
|                                                                   | \$000              | \$000 | \$000           | \$000 |
| Associate                                                         |                    |       |                 |       |
| Shares in unlisted company, at cost                               | 11                 | 11    | 11              | 11    |
| Add: Equity in retained earnings                                  | 366                | 389   | 366             | 389   |
| Shares in unlisted company at directors' valuation at end of year | 397                | 400   | 397             | 400   |
| Other                                                             |                    |       |                 |       |
| Shares in unlisted companies, at cost                             | 254                | 254   | 254             | 254   |
| Shares in related corporation, at cost                            | 38                 | 39    | 38              | 38    |
|                                                                   | 292                | 292   | 292             | 292   |
| Less: Provision for possible losses                               | 45                 | 45    | 45              | 45    |
|                                                                   | 247                | 247   | 247             | 247   |
|                                                                   | 644                | 647   | 644             | 647   |

notes continued

note 14. Advances

|                                                    | Hamersley Holdings |       | Hamersley Group |        |
|----------------------------------------------------|--------------------|-------|-----------------|--------|
|                                                    | 1978               | 1977  | 1978            | 1977   |
|                                                    | \$000              | \$000 | \$000           | \$000  |
| The long term portion of advances comprises:       |                    |       |                 |        |
| The Rural and Industries Bank of Western Australia |                    |       | 18 033          | 15 847 |
| Government of Western Australia                    |                    |       | 3 774           | 4 415  |
| Bulk Shipping Associates Limited                   | 705                | 668   | 705             | 668    |
| Related corporation                                |                    |       | 211             | 312    |
| Other                                              |                    |       | 151             | 120    |
|                                                    | 705                | 668   | 22 874          | 21 362 |

The deposit with The Rural and Industries Bank of Western Australia is in connection with the provision of housing and services at Karratha. Hamersley Iron Pty. Limited currently has a commitment to pay annual lease rentals to the Bank of approximately \$1 336 000 until the year 1993. The deposit is repayable over the same period.

The advance to the Government of Western Australia was made in connection with the supply of water to the Dampier/Karratha area and is repayable by 1987.

The advance to Bulk Shipping Associates Limited relates to Hamersley's 50% interest in a bulk ore carrier.

15. Stocks and stores

|                         | Hamersley Group |        |
|-------------------------|-----------------|--------|
|                         | 1978            | 1977   |
|                         | \$000           | \$000  |
| Ores and pellets        | 16 140          | 23 129 |
| Stores including spares | 37 365          | 41 630 |
| Livestock               | 50              | 68     |
|                         | 54 055          | 64 876 |

16. Debtors

|                                              | Hamersley Holdings |        | Hamersley Group |        |
|----------------------------------------------|--------------------|--------|-----------------|--------|
|                                              | 1978               | 1977   | 1978            | 1977   |
|                                              | \$000              | \$000  | \$000           | \$000  |
| Trade debtors                                |                    |        | 32 466          | 28 572 |
| Subsidiary companies                         | 100 619            | 61 175 |                 |        |
| Other related corporations                   |                    |        | 220             | 421    |
| Other debtors and payments in advance        | 10                 | 10     | 8 099           | 9 732  |
|                                              | 100 629            | 61 195 | 40 785          | 38 725 |
| Less: Provision for doubtful debts (Note 19) |                    |        | 15              | 20     |
|                                              | 100 629            | 61 195 | 40 770          | 38 705 |

17. Deferred revenue expenditure

The expenditure is stated at cost less amounts amortised. The balances unamortised comprise \$2 233 985 (1977 \$2 209 739) in respect of costs of borrowings and \$2 442 182 (1977 \$1 032 713) being contributions for the erection of schools and other township facilities.

18. Exchange fluctuations — loans and advances

|                                                                      | Hamersley Holdings |       | Hamersley Group |        |
|----------------------------------------------------------------------|--------------------|-------|-----------------|--------|
|                                                                      | 1978               | 1977  | 1978            | 1977   |
|                                                                      | \$000              | \$000 | \$000           | \$000  |
| (a) Exchange loss                                                    |                    |       |                 |        |
| Realised losses on repayment of overseas borrowings                  |                    |       | 3 481           | 2 169  |
| Loss (gain) on other monetary items                                  | (38)               | 73    | (42)            | 71     |
| Provision for possible future net exchange losses on loan repayments |                    |       | 12 346          | 7 976  |
|                                                                      | (38)               | 73    | 16 235          | 10 216 |
| (b) Exchange fluctuation                                             |                    |       |                 |        |
| Net unamortised exchange losses                                      |                    |       | 47 675          | 39 154 |
| Less: Provision charged against earnings                             |                    |       | 33 030          | 20 184 |
|                                                                      |                    |       | 14 645          | 18 970 |

**note 19. Bad and doubtful debts**

|                                                                                          | Hamersley Group |       |
|------------------------------------------------------------------------------------------|-----------------|-------|
|                                                                                          | 1978            | 1977  |
|                                                                                          | \$000           | \$000 |
| (a) Amounts set aside during the year to provision for doubtful debts are in respect of: |                 |       |
| Trade debtors                                                                            |                 | 20    |
| Other debtors                                                                            |                 | (20)  |
| Net charge against earnings                                                              |                 |       |
| (b) Bad debts written off against the provision accounts                                 |                 |       |
| Other debtors                                                                            | 5               | 16    |

**20. Directors' emoluments**

The total of the emoluments received, or due and receivable (whether from the Company or from related corporations) by:

|                                                                                                                                                                                                                                                                                                        | 1978    |                      | 1977    |                      |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|----------------------|---------|----------------------|
|                                                                                                                                                                                                                                                                                                        | Company | Related Corporations | Company | Related Corporations |
|                                                                                                                                                                                                                                                                                                        | \$000   | \$000                | \$000   | \$000                |
| (a) Directors of the Company engaged in the full-time employment of the Company and its related corporations (including all bonuses and commissions received or receivable by them as employees but not including the amount received or receivable by them by way of fixed salary as employees) were: |         |                      |         | 83                   |
| and                                                                                                                                                                                                                                                                                                    |         |                      |         |                      |
| (b) other Directors of the Company were:                                                                                                                                                                                                                                                               |         |                      |         |                      |

No commissions for subscribing for, or agreeing to procure subscriptions for, any shares in or debentures of the Company or any related corporations were received or are due and receivable by any Director.

**21 Auditors' remuneration**

|                                                                     | Hamersley Holdings |       |
|---------------------------------------------------------------------|--------------------|-------|
|                                                                     | 1978               | 1977  |
|                                                                     | \$000              | \$000 |
| Amount paid/payable to the auditors for:                            |                    |       |
| Auditing the accounts for the Company and the consolidated accounts | 11                 | 8     |
| Other services                                                      | 14                 | 19    |
|                                                                     | 25                 | 26    |

No other benefits were received by the auditors from the Company.

**22. Contingent liabilities**

|                                                                                                                 | Hamersley Holdings |         | Hamersley Group |       |
|-----------------------------------------------------------------------------------------------------------------|--------------------|---------|-----------------|-------|
|                                                                                                                 | 1978               | 1977    | 1978            | 1977  |
|                                                                                                                 | \$000              | \$000   | \$000           | \$000 |
| There are contingent liabilities outstanding as follows:                                                        |                    |         |                 |       |
| <b>Secured</b>                                                                                                  |                    |         |                 |       |
| Debenture Stock issued as security for borrowings of subsidiary companies (plus interest at varying rates)      | 158 370            | 159 418 |                 |       |
| <b>Unsecured</b>                                                                                                |                    |         |                 |       |
| (i) Stamp duty in connection with registration of debenture trust deeds                                         | 700                | 450     | 700             | 450   |
| (ii) Guarantee in respect of equipment loans made to a subsidiary company (plus interest at varying rates)      | 6 506              | 10 335  |                 |       |
| (iii) Guarantee given to Bank of Scotland for loan to Bulk Shipping Associates Limited                          | 2 111              | 3 003   | 2 111           | 3 003 |
| (iv) Guarantee given to Andresens Bank for overdraft facilities given to Northern Cross Chartering Limited A/S. |                    |         | 52              | 24    |

**23. Commitments**

Capital commitments not reflected in the accounts totaled approximately \$29 521 000 (1977 \$101 958 000).

**24. Ultimate holding company**

The ultimate holding company of the Company is The Rio Tinto-Zinc Corporation Limited (Incorporated in England).

note 25. Estimates of debts receivable and liabilities payable calculated from respective balance sheet dates

|                                               | Hamersley Holdings |                | Hamersley Holdings and its guarantor subsidiary |                |
|-----------------------------------------------|--------------------|----------------|-------------------------------------------------|----------------|
|                                               | 1978               | 1977           | 1978                                            | 1977           |
|                                               | \$000              | \$000          | \$000                                           | \$000          |
| Debts Receivable:                             |                    |                |                                                 |                |
| not later than 2 years                        | 127 586            | 113 361        | 61 477                                          | 192 311        |
| later than 2 years but not later than 5 years | 118 417            | 89 597         | 7 904                                           | 5 433          |
| later than 5 years                            | 266 670            | 257 956        | 14 408                                          | 15 350         |
|                                               | <u>512 673</u>     | <u>460 914</u> | <u>83 789</u>                                   | <u>213 594</u> |
| Liabilities Payable:                          |                    |                |                                                 |                |
| not later than 2 years                        | 123 228            | 109 902        | 209 470                                         | 264 906        |
| later than 2 years but not later than 5 years | 119 618            | 39 597         | 118 659                                         | 93 016         |
| later than 5 years                            | 169 189            | 161 711        | 169 432                                         | 159 091        |
|                                               | <u>412 035</u>     | <u>361 210</u> | <u>497 561</u>                                  | <u>517 012</u> |

26. Employee service agreements

The Company and/or its subsidiaries are party to a total of 7 (1977: 5) service agreements (as defined in Section 3 H (24) of the Australian Associated Stock Exchanges Official List Requirements) and the maximum potential liability of the Company and its subsidiaries for termination benefits under these service agreements as at December 31, 1978 was \$16 360 (1977: \$9 000).

Report of the Auditors to the Members

We report on the Accounts and Group Accounts set out on pages 17 and 18, and pages 20 to 27 which have been prepared under the historical cost convention described in Note 1.

We have examined the Accounts and Auditors' Reports of those subsidiaries which have not been audited by us, namely: Hamersley Iron Finance N.V., Hamersley Japan Limited, Northern Cross Chartering Limited A/S.

We have received the information and explanations we required and are satisfied that the Accounts of the subsidiaries, all of which have been consolidated, are in form and content appropriate and proper for the purposes of the preparation of the Group Accounts. The Audit Reports on the Accounts of the subsidiaries were not subject to any qualification or comment.

In our opinion, the Accounts and Group Accounts are properly drawn up in accordance with the provisions of the Companies Ordinance 1962-1976, and so as to give a true and fair view of the state of affairs of the Company and of the Group as at December 31, 1978 and the results for the year ended on that date, and the matters required by Section 162 of the Ordinance to be dealt with in the Accounts and Group Accounts.

In our opinion, the accounting records, other records and registers required by the Ordinance, or by the corresponding laws of the other States or Territories of the Commonwealth, to be kept by the Company and those subsidiaries audited by us, have been properly kept in accordance with the provisions thereof.

Coopers & Lybrand  
Chartered Accountants  
by A. Hilton  
Melbourne, 13th day of February, 1979.

Statement by Directors

In the opinion of the Directors, the accompanying Accounts and Group Accounts are drawn up so as to give true and fair views respectively of —

- (a) the results of the Company and of the Group for the financial year ended December 31, 1978, and
  - (b) the state of affairs of the Company and of the Group as at that date —
- so far as they concern members of the Company.

Signed at Melbourne this 13th day of February, 1979, in accordance with a resolution of the Directors.

R. T. Madigan  
T. Barlow  
Directors

Statement by Principal Accounting Officer

To the best of my knowledge and belief, the accompanying Accounts and Group Accounts give a true and fair view of the matters required to be dealt with therein by Section 162 of the Companies Ordinance 1962.

C. A. Watts  
General Manager —  
Finance and Administration  
Melbourne, 13th day of February, 1979.

|                                               | 1978<br>\$000  | 1977<br>\$000  | 1976<br>\$000  | 1975<br>\$000  | 1974<br>\$000  | 1973<br>\$000  | 1972<br>\$000  | 1971<br>\$000  | 1970<br>\$000  | 1969<br>\$000  |
|-----------------------------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| <b>Funds used</b>                             |                |                |                |                |                |                |                |                |                |                |
| Capital and reserves                          | 282 171        | 269 160        | 250 139        | 240 594        | 233 422        | 221 051        | 209 834        | 175 083        | 179 139        | 120 475        |
| Future income tax                             | 128 597        | 117 218        | 113 211        | 108 603        | 112 657        | 105 636        | 100 837        | 79 190         | 54 004         | 33 036         |
| Exchange fluctuation                          | (14 845)       | (18 970)       | (30 897)       | (6 597)        | (2 208)        | 32 449         | 22 871         | 3 870          |                |                |
| Borrowings — long and short term              | 379 499        | 340 700        | 285 563        | 262 113        | 225 301        | 241 322        | 311 798        | 264 663        | 176 990        | 122 442        |
| Creditors and provisions                      | 131 152        | 191 525        | 158 110        | 98 703         | 72 290         | 57 219         | 51 959         | 60 383         | 35 216         | 21 883         |
| <b>Total</b>                                  | <b>906 574</b> | <b>899 633</b> | <b>776 126</b> | <b>703 516</b> | <b>641 462</b> | <b>657 677</b> | <b>697 299</b> | <b>588 189</b> | <b>445 349</b> | <b>297 836</b> |
| <b>Property, plant and equipment</b>          |                |                |                |                |                |                |                |                |                |                |
| Cost                                          | 1 102 667      | 909 136        | 785 915        | 754 409        | 715 176        | 678 472        | 645 080        | 582 164        | 391 746        | 285 975        |
| Net — after depreciation                      | 757 537        | 611 738        | 535 080        | 549 862        | 547 664        | 546 078        | 544 947        | 507 428        | 337 575        | 250 636        |
| <b>Turnover</b>                               |                |                |                |                |                |                |                |                |                |                |
| Shipped (000's tonnes)                        | 31 244         | 33 118         | 36 089         | 32 460         | 32 762         | 27 705         | 22 117         | 20 719         | 17 030         | 13 267         |
| Sales revenue                                 | 359 468        | 392 745        | 362 353        | 285 255        | 217 396        | 166 756        | 154 537        | 150 195        | 128 737        | 108 925        |
| <b>Earnings</b>                               |                |                |                |                |                |                |                |                |                |                |
| Before tax and outside shareholder's interest | 47 155         | 107 721        | 85 040         | 47 189         | 36 522         | 32 996         | 46 477         | 54 205         | 48 133         | 45 695         |
| After tax and outside shareholder's interest  | 34 810         | 57 840         | 42 289         | 26 709         | 23 480         | 22 888         | 24 829         | 29 019         | 27 164         | 23 630         |
| — per share                                   | 14.4c          | 23.8c          | 17.4c          | 11.0c          | 9.7c           | 9.4c           | 10.2c          | 13.2c          | 12.3c          | 11.8c          |
| — return on capital and reserves              | 12.3%          | 21.5%          | 16.9%          | 11.1%          | 10.1%          | 10.4%          | 11.8%          | 15.6%          | 15.2%          | 19.6%          |
| Dividend per share                            | 9c             | 16c            | 11c            | 8c             | 7c             | 7c             | 8c             | 10c            | 5c             |                |
| Dividend paid/payable to shareholders         | 21 830         | 38 808         | 26 581         | 19 404         | 16 978         | 16 978         | 17 640         | 22 050         | 11 025         |                |
| <b>Due to governments</b>                     |                |                |                |                |                |                |                |                |                |                |
| Tax provided — current and future             | 12 312         | 50 281         | 42 929         | 20 527         | 13 042         | 10 108         | 21 648         | 25 196         | 20 969         | 22 065         |
| W.A. Government royalties                     | 19 206         | 21 040         | 20 394         | 16 125         | 14 022         | 10 744         | 9 500          | 9 361          | 7 662          | 6 442          |
| Number of shareholders                        | 24 002         | 25 851         | 27 870         | 30 657         | 31 716         | 32 195         | 32 540         | 32 115         | 30 828         | 26 461         |
| Number of employees                           | 4 336          | 4 484          | 4 391          | 4 253          | 3 908          | 3 405          | 2 630          | 2 436          | 1 985          | 1 462          |

Capital Expenditure 1965-1975\*

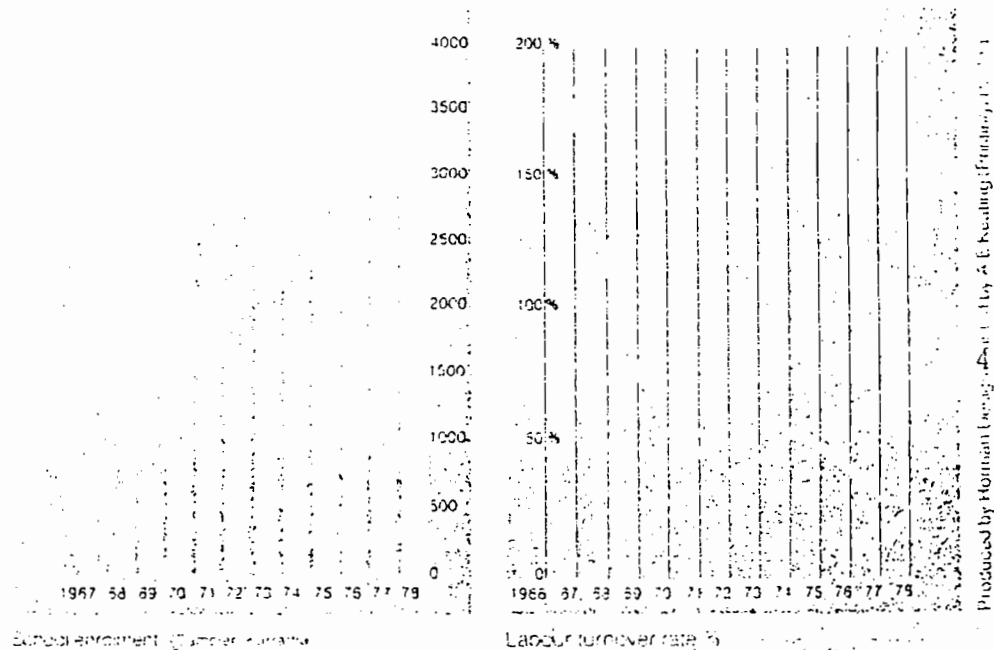
|                           | \$m          |
|---------------------------|--------------|
| Plant and Equipment       | 503          |
| Social Infrastructure     | 233          |
| Industrial Infrastructure | 358          |
| <b>Total</b>              | <b>1 144</b> |

\*Including Karratha developments and Midstream water supply expenditures

Housing and population

|            | Company owned |                 | Total population |
|------------|---------------|-----------------|------------------|
|            | Houses        | Single quarters |                  |
| Dampier    | 513*          | 646             | 2 783            |
| Karratha   | 737*          |                 | 5 825            |
| Tom Price  | 948*          | 559             | 4 400            |
| Paraburdoo | 573           | 392             | 2 239            |
|            | <b>2 771</b>  | <b>1 597</b>    | <b>15 027</b>    |

\* including flats and town houses.



Capital expenditure (\$m) (1965-1975)

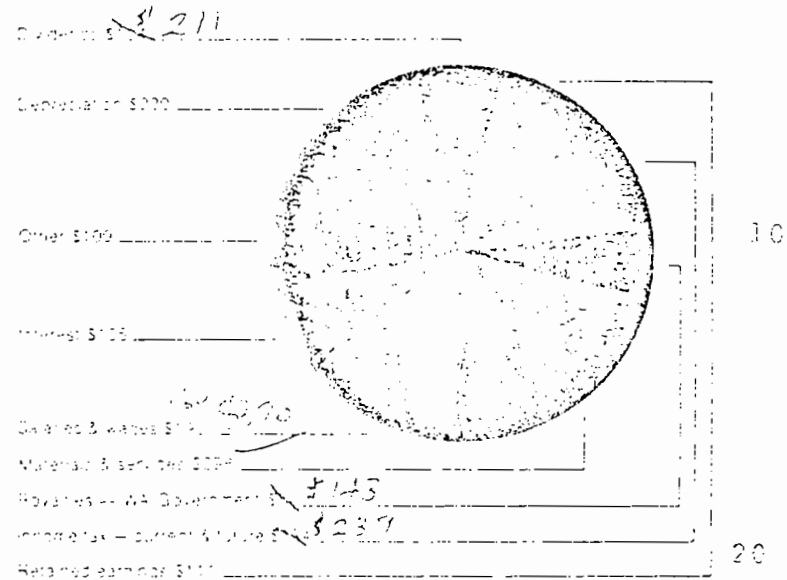
Labour turnover rate % (1966-1979)

EXHIBIT "6"—Annual Reports of  
Hamersley Holdings Limited for the  
years 1976, 1978, 1981 and 1982

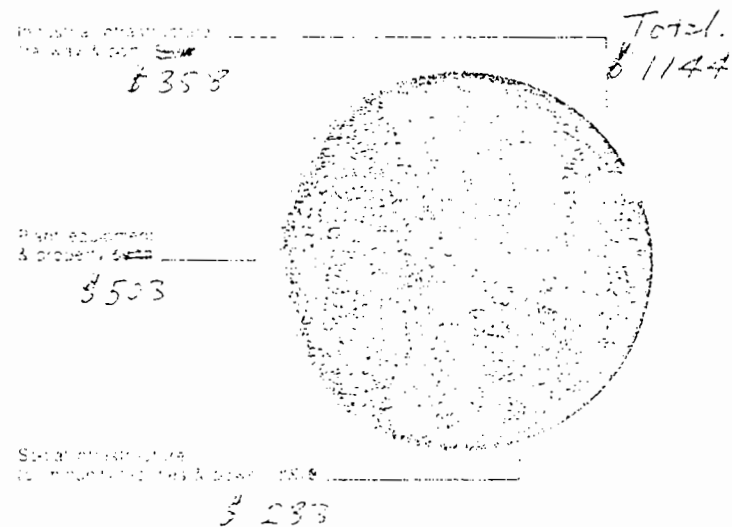


| 1970<br>\$000 | 1969<br>\$000 | 1968<br>\$000 | 1967<br>\$000 | 1966<br>\$000 |
|---------------|---------------|---------------|---------------|---------------|
| 179 139       | 120 476       | 95 844        | 60 074        | 423           |
| 54 004        | 33 036        | 10 971        | 3 266         | —             |
| 176 990       | 122 442       | 102 969       | 112 142       | 129 087       |
| 35 216        | 21 883        | 19 467        | 12 766        | 6 349         |
| 445 349       | 297 436       | 260 361       | 208 238       | 137 283       |
| 391 746       | 266 876       | 244 719       | 167 741       | 128 213       |
| 337 575       | 250 636       | 224 817       | 149 406       | 128 537       |
| 17 030        | 13 287        | 9 221         | 8 336         | 781           |
| 128 737       | 108 915       | 74 769        | 49 168        | 6 142         |
| 48 103        | 45 036        | 38 280        | 12 424        | 558           |
| 27 164        | 22 810        | 19 770        | 9 198         | 503           |
| 12 30         | 1 80          | 3 40          | 4 56          | —             |
| 15 275        | 19 675        | 17 071        | 11 441        | —             |
| 50            | —             | —             | —             | —             |
| 11 025        | —             | —             | —             | —             |
| 20 669        | 20 086        | 8 622         | 3 066         | —             |
| 7 662         | 6 442         | 4 292         | 3 076         | 442           |
| 30 826        | 26 491        | 25 788        | 27 669        | 2             |
| 1 935         | 1 482         | 1 181         | 766           | 492           |

Distribution of Hamersley's revenues 1966-1975 (\$ millions)

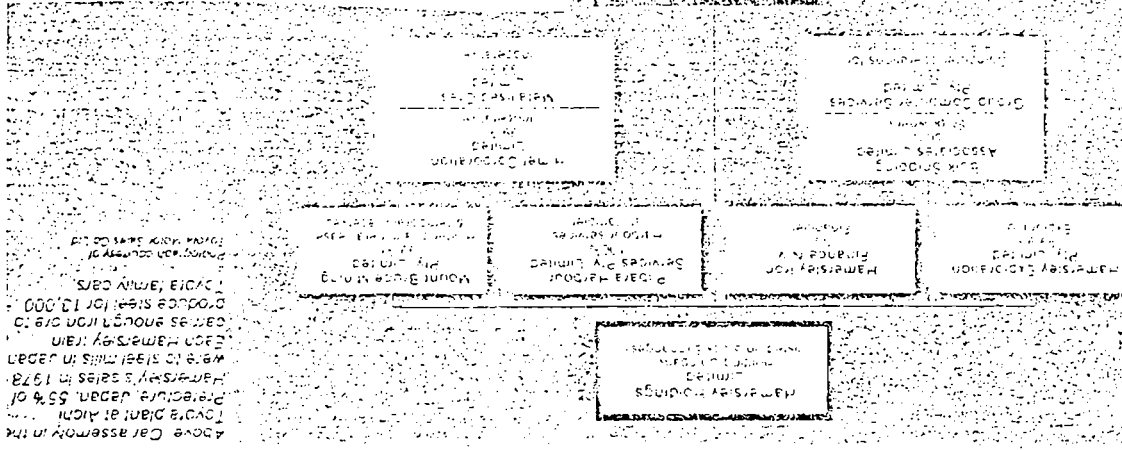


1973  
Distribution of capital expenditures 1965-1975 (\$ millions)

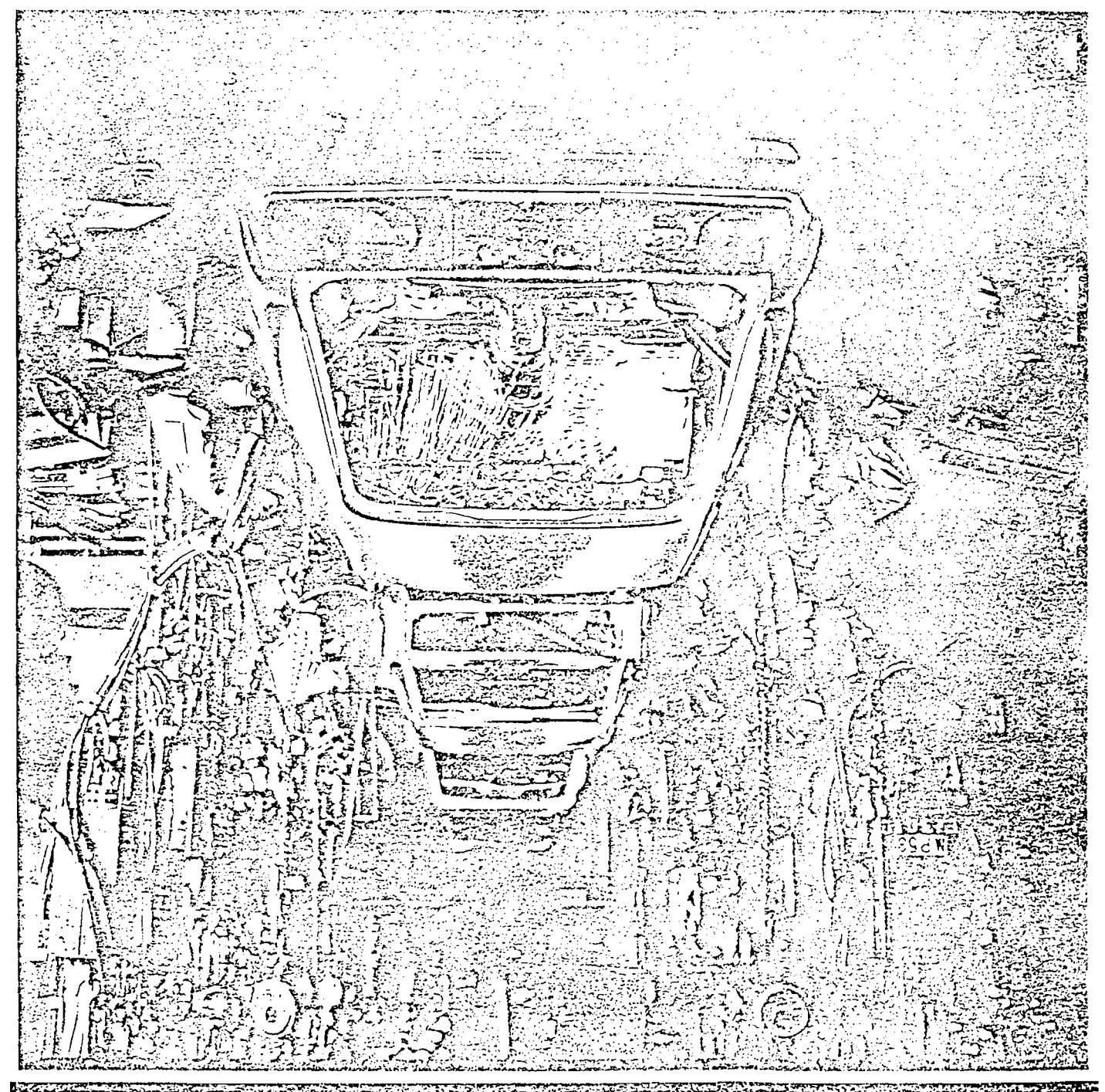


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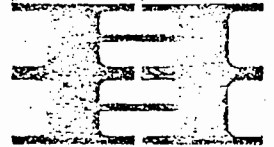
EXHIBIT "B" - Annual Reports of Hamersley Holdings Limited for the Years 1976, 1978, 1981 and 1982



Corporate Structure  
Hamersley Holdings Limited  
and subsidiary companies



# HAMERSLEY HOLDINGS LIMITED



## ANNUAL REPORT 1981

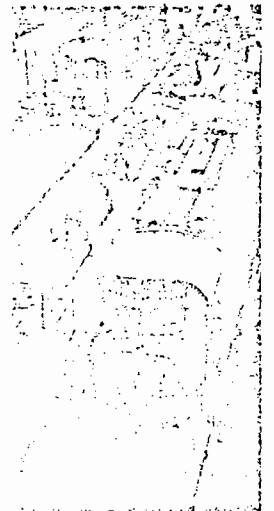
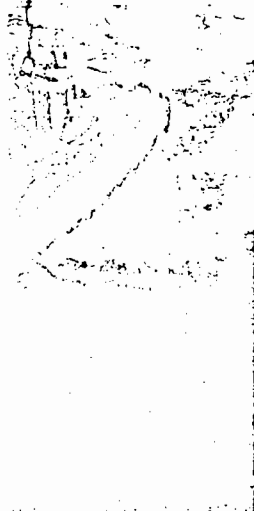
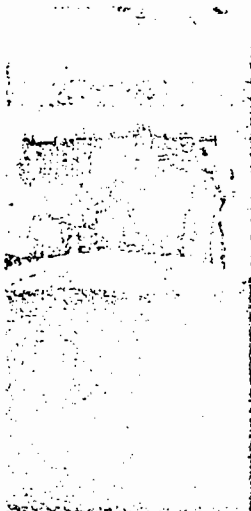
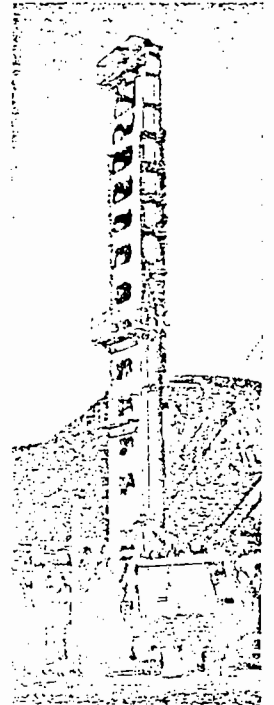
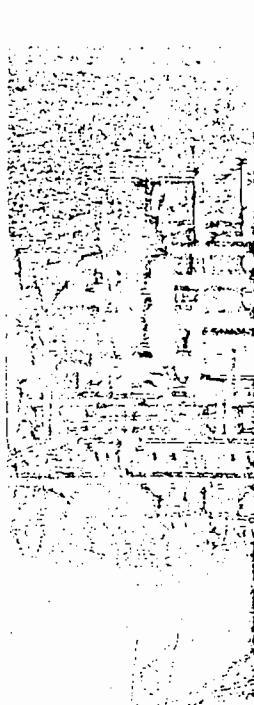


EXHIBIT "6" - Annual Reports of Hamersley Holdings Limited for the years 1976, 1978, 1981 and 1982

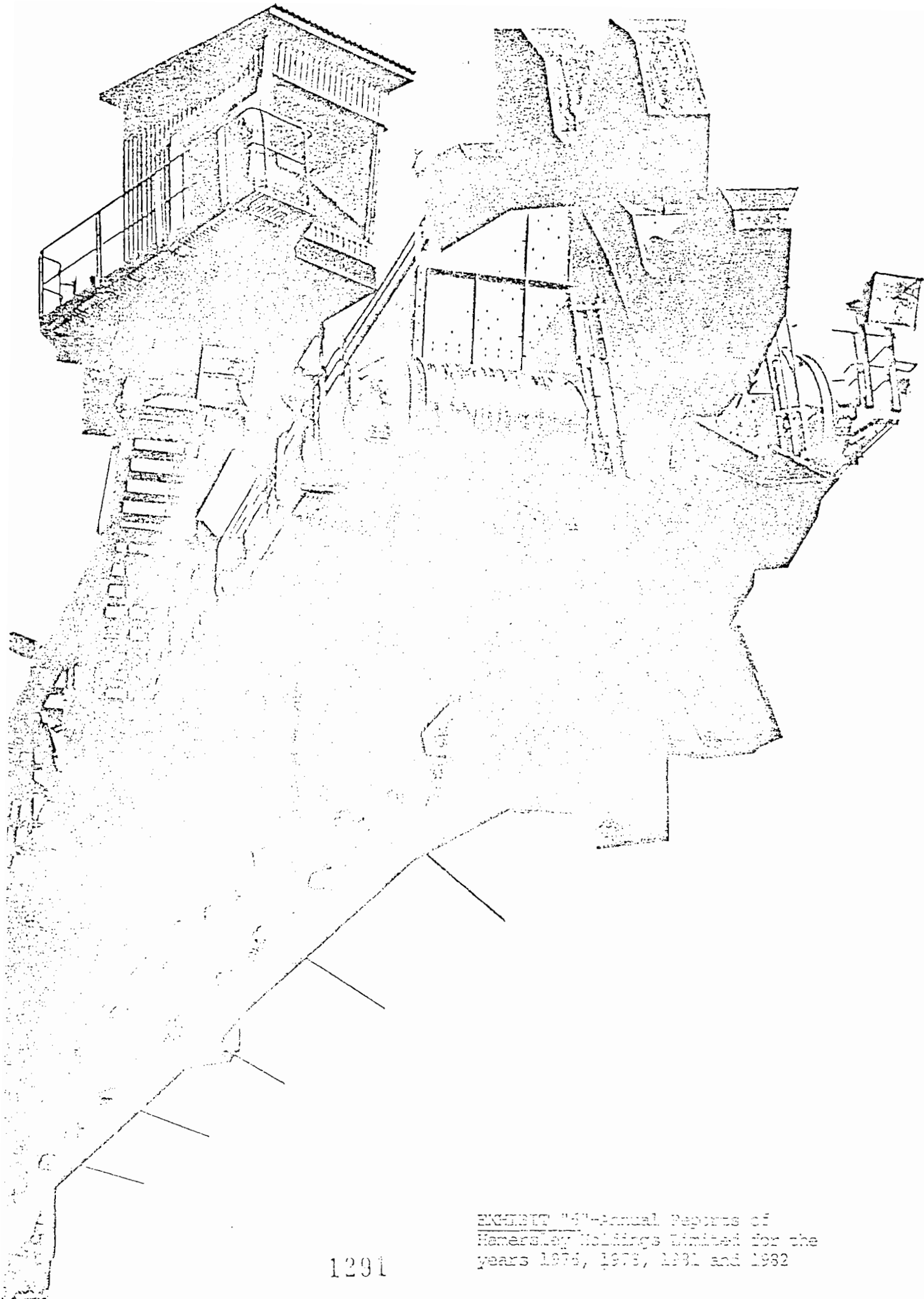


EXHIBIT "6"-Annual Reports of  
Hamersley Holidays Limited for the  
years 1976, 1978, 1981 and 1982

# Hamersley Holdings Limited

## Directors

T. Barlow (Chairman of Directors)  
I. F. Burston  
J.T. Ralph

## Secretaries

J. R. Wood  
R. M. Houston

## Registered Office

Level 4, 24 Marcus Clarke Street,  
Canberra City

## Principal Office

55 Collins Street Melbourne  
Tel: (03) 658 3333

## Share and/or Loan Security Registers

ACT  
Level 4, 24 Marcus Clarke Street,  
Canberra City  
VIC

84 Flinders Lane Melbourne  
55 Collins Street Melbourne  
NSW

60 Margaret Street Sydney  
WA

191 St George's Terrace Perth  
NEW YORK USA  
111 Wall Street New York

## Stock Exchanges

Australian Debenture Stock  
Listed on Exchanges in  
all Australian States

## Bankers

Bank of New South Wales

## Auditors

Coopers & Lybrand

## Solicitors

Arthur Robinson & Co

## Notice of meeting

The Annual General Meeting of Hamersley Holdings Limited will be held at 11.00 am on Friday, April 2, 1982 on the 34th floor of the ANZ Tower, 55 Collins Street, Melbourne

A separate notice of meeting and proxy form is enclosed. All shareholders are cordially invited to attend

The closing date for the receipt of nominations for the office of director to be voted on at the Annual General Meeting is March 21, 1982

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## Contents

|                                 |        |
|---------------------------------|--------|
| Notice of meeting               | page 1 |
| Chairman's statement            | 2      |
| Review of operations            | 3      |
| Directors' report               | 6      |
| Statements of earnings          | 8      |
| Balance sheets                  | 9      |
| Notes on accounts               | 10     |
| Source and application of funds | 16     |

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# Chairman's statement

## Performance disappointing

Earnings for 1981 of \$17.2 million were clearly disappointing with a fall of 69.9% from last year's profit of \$57.2 million. This represents a return on shareholders' funds of only 2.3%. The performance downturn was principally due to two factors. There was firstly a massive 25.3% reduction in sales. In part a reduction was inevitable given the poor condition of the major economies around the world and consequent depressed state of the steel industries in the majority of countries to which the Company supplies iron ore.

A second factor compounding the situation was the poor industrial disputation record at the operations. This limited the ability of the Company at times to meet even the reduced demands of its customers.

## Stoppages prejudicing exports

For some years the Company has expressed deep concern at the loss of reputation as a reliable supplier. Australia is gaining in its export markets because of its strike record. While there is some truth in the contention commercial opportunism lies behind the criticism, regrettably evidence is emerging that potential customers are turning their backs on Australia.

Management is devoting a great deal of time and attention to ameliorating the industrial relations climate in the Pilbara, without which we will be increasingly competitively disadvantaged in all markets.

## Sales margins being eroded

Despite a breathing space provided by a slow-down in fuel/oil price escalation, unit cost of production rose substantially as a result of wage increases, depressed sales and the all too frequent interruption of production. The net effect was an erosion of already tight sales margins.

Obviously, the present rises in the cost of production must be contained if the Company's long term future is to be secured. Operating cost containment is accordingly a priority objective of Management.

## Expectation on prices

Present indications are that prices for iron ore products will rise in 1982 reflecting some recognition by steelmakers of the problems confronting the iron ore industry worldwide.

These increases will need to be viewed against the background that for some years past ore price rises have fallen substantially short of cost inflation. A large increase in percentage terms will only partially redress the imbalance.

## Outlook

Throughout 1982, with no significant steel market recovery envisaged, Hamersley sales will remain at a depressed level, well below the capacity of installed facilities.

## Shareholding

In April 1981 CRA Limited made a takeover offer for all shares in the Company not held by it at the time. At the expiry of the offer CRA Limited and its subsidiary, Conzinc Mining Limited, held approximately 93% of the issued shares of the Company.

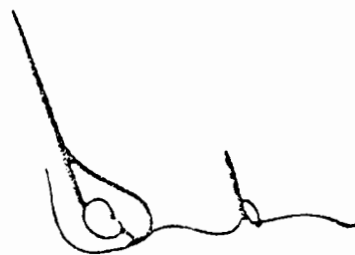
## Board changes

Since the last Annual General Meeting, Sir Russel Madigan, Sir Roderick Carnegie and Mr. C. A. Watts have resigned from the Board. Mr. Ian Burston, formerly General Manager of Operations for Hamersley Iron has been appointed a Director of the Company.

Sir Russel was involved with Hamersley from its inception and was the inspiration behind its development and growth into a major world producer of iron ore. He was initially commercial director of the Company becoming managing director in 1965. He became chairman in 1972.

His contribution to not only the Company's record of growth, but also to the wider issues of Japan/Australia trade and relations was substantial. The Company will continue to benefit from his initiatives well into the future.

On behalf of Hamersley staff and my fellow Directors I would like to thank Sir Russel, Sir Roderick and Colin Watts for their untiring efforts on the Company's behalf over the years.



T. Barlow  
Chairman  
15th February 1982

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# Review of operations

## Marketing

Continuing depression in the world steel industry was reflected in Hamersley's 1981 shipments of 29.1 million tonnes compared with 38.8 million tonnes in 1980. World steel production totalled 720 million tonnes in 1981, a slight increase from 713 million tonnes in 1980. Of particular concern to the Company was the fall in crude steel production from 112 million tonnes in 1980 to 102 million tonnes in 1981 in the Japanese steel industry.

The shipment rate was at depressed levels throughout the year and totalled 13.2 million tonnes of high grade lump and 15.9 million tonnes of high grade fines.

Price increases averaging 3.8% across the board were agreed with Japanese mills. The increases achieved were far below those required to cover cost inflation and restore Hamersley's viability, particularly in the light of depressed tonnage levels. Further price increases will be required to ensure the long term viability of the Company.

Sales to Japan decreased significantly and actual shipments represented only 66.0% of the minimum base contractual tonnages. 1981 was the fifth consecutive year of deliveries below contracted minimum tonnages and underservicing of contracts remains a major problem. Matters are worsened by high fixed cost operation and rapidly installed to service base contracts is penalised by continuing shipments of tonnage shipped to the Japanese mills.

European shipments declined in the last quarter. Sales in Asian markets other than Japan were steady and generally in accordance with long term contracts.

The outlook for 1982 prices was very little change over 1981 and this year the major world economies will require significant improvement before recovery in the steel industry can be envisaged.

In the light of the currently depressed state of the Japanese steel industry and likely future requirements for iron ore, substantial excess capacity remains a feature of the industry. Premature opening of a new mine will only serve to exacerbate existing problems of excess capacity and depressed prices.

## Shipping

Depressed world trading conditions were reflected in an average of 17 charter orders during the year and a sharp reduction in the number of vessels during the second half of the year.

## Mining and processing

Total saleable output from Tom Price and Paraburdoo mines was 112.2 million

tonnes compared with 38.8 million tonnes in 1980. The reduction was due primarily to a crushing incidence of industrial strike activity.

Recovery of saleable ore from material mined decreased marginally to 53.0%. The reversal was due to increased emphasis on development at Paraburdoo and on high grade ore treatment to balance the concentrator shortfall at Tom Price. When the concentrator is brought up to capacity in 1982, recovery will increase significantly.

Output of saleable ore from the Tom Price mine was 18.0 million tonnes (including 3.6 million tonnes from the concentrator) compared with 24.6 million tonnes in 1980. Production included 13.0 million tonnes of high grade lump. Total material mined was 33.8 million tonnes.

Paraburdoo saleable production totalled 11.2 million tonnes compared with 14.9 million tonnes in 1980.

Production of high grade lump was 5.4 million tonnes. Total material mined was 21.3 million tonnes. Development of the 4 West prebody is now well advanced and production of high grade ore has commenced from that prebody.

Saleable production in stocks at the beginning of 1981 totalled 7.8 million tonnes. This rising increase to 9.1 million tonnes at the end of the year.

Operational performance of both third and crushing and screening plants was satisfactory with no impact from strikes and industrial limitations.

Modification and reconstruction of the 2 crushing and screening plants at Tom Price was completed during the year and commenced in December. These works will now give the increased flexibility to the Tom Price operation.

A further 100,000 tonnes of high grade ore were added to the 100,000 tonnes of high grade ore stockpile during the year. These stocks are growing to be increasingly reliable and excess capacity in the entire Tom Price 100,000 tonnes of high grade lump and 1983.

## Concentrator

The plant contributed 2.6 million tonnes of saleable ore to total production in 1981. This compared 2.4 million tonnes of high grade lump and 1.2 million tonnes of high grade fines.

Five pre-body plants to be installed to boost the overall plant throughput rate as did the performance of the washing and screening plant since the 1981 operation, ore types. Modifications to increase the capacity of plants are in progress and are scheduled for completion during 1982.

Operating and maintenance techniques and procedures are now well established with evident benefits. Metallurgical control of the process is satisfactorily advanced and it is expected that by mid 1982, concentrator performance will permit optimum exploitation of the Tom Price orebody.

## Rail

The rail system handled 4,700 mainline traffic movements during the year. Gross haulage totalled 46.7 million tonnes with an iron ore payload of 29.2 million tonnes. This was a significant reduction with respect to 1980 levels and was a measure of the impact of lower ore demand and industrial disputes.

During the first three quarters, operations were scheduled to achieve nine trains per day. Reduced haulage demand necessitated withdrawal to an eight train programme in the final quarter.

Six locomotives were rebuilt and returned to service during the year.

Operating, maintenance and repair procedures were consolidated in 1981 giving rise to significant efficiencies and improved availability of locomotives and ore cars.

The Marisa 8811 integrated track laying machine successfully completed the second year of the sleeper replacement programme. Over 126 km of track have now been converted to concrete sleepers with 1,600,000 tonnes of concrete sleepers having been laid to date.

The machine track remains in excellent condition and rail induced effects were minimal. Continued emphasis on system integrity has maintained the railway as a reliable performance unit.

Due to the current outlook in the iron ore industry, rail electrification proposals have been reviewed.

## Port

The performance of the market was well reflected in port throughput with 28.7 million tonnes of ore being shipped from the loading berths at East Intercoastal wharf at Parker Point compared with 28.9 million tonnes in 1980. The total number of vessels loaded was 278.

The surge wharf accommodated the discharge of 151,846 tonnes of fuel from 600 containers. Fuel storage was held at 200,000 tonnes throughput 1981.

Despite the proximity of three cyclones, storm surges and other weather delays

## Review of operations

were minimal. At Parker Point the car dumper underwent the second stage of a major rehabilitation programme thereby concluding the capital works associated with the 45 million tonnes per annum project upgrade.

Modifications to the East Intercourse Island shiploading circuits, including lightening of the shiploader boom, will improve the productivity of that berth. These modifications are scheduled for completion during 1982.

An incremental upgrade of the capacity of Parker Point is approximately half way to completion. The expansion, made necessary by the trend toward larger ships, will enable the Parker Point berth to handle vessels of nominal 140 000 DWT capacity. The scope of the project includes dredging the loading basin at the berth and deepening and widening the departure channel. Navigational aids will be enhanced. Breasting and mooring dolphins will be strengthened to accommodate the heavier ships. Existing loading rates will be maintained and the shiploader boom will be extended to permit loading of the larger vessels. Additionally, the travel of the shiploader will be extended to improve hatch coverage during loading operations. Operational techniques and efficiencies will be improved by upgraded access and shiphandling equipment.

The scheduled completion date for the expansion works is currently estimated for the second quarter of 1982.

Port administration, towage and pilotage services continued to be provided by Pilbara Harbour Services Pty Limited.

Activity associated with the development of the North-West Shelf natural gas project has had little or no effect on the operation of the port.

## Pellet plant

The plant remained on a care and maintenance basis for the duration of 1981.

## Power

The system grid was expanded in March when the Burrup Peninsula distribution line was connected to the SECWA Karratha feeder.

Against the background of the increasing cost of energy every opportunity is being taken to improve energy efficiency in operation and town areas. Generating efficiency was maintained at a high level throughout 1981. The posted price of oil ex Singapore appears to be stabilising but is subject to exchange rate variations of the US dollar.

Investigations have continued into future power generation requirements and negotiations are still in progress with the State Energy Commission and others on the supply of natural gas for power generation.

The general downturn of industrial activity in the Pilbara iron ore industry has contributed to postponement of State Government plans for a high voltage DC link with the south of the State and the integration of power systems within the Pilbara.

## Occupational health

The Occupational Health Department, which was first established in 1980, successfully completed its first full year of service to Hamersley's operations. Education and training programmes relating to occupational health and safety are being vigorously pursued. Employee acceptance is most encouraging.

A mobile audiometric testing laboratory was commissioned during 1981 and subsequently the first total hearing survey covering Hamersley's 4 000 employees was completed.

The identification, purchase and disposal of potentially dangerous and hazardous materials is now centrally controlled by this department.

## Research and development

The metallurgical evaluation programme involving the testing of samples of ores from various locations within the Company's tenements, continued.

Collaborative and sponsored research projects involving CSIRO, AMIRA and various universities included the quality requirements for high grade pellets for direct reduction, other aspects of the direct reduction of iron ores, development of energy efficient housing designs and air conditioning, degradation of iron ores during handling and the relationship between mineralogical properties and processing behaviour of iron ores.

Detailed studies continued into the feasibility of recommissioning the Dampier pellet plant to produce high grade pellets and also for a direct reduction plant at Dampier. A potential market for pellets appears to be developing in the South East Asian region where Hamersley's geographical proximity would provide significant freight advantages. The price of natural gas and an assured market for the product continue to be the major drawbacks affecting the feasibility of a direct reduction operation at Dampier. Engineering studies have been undertaken to determine the feasibility

of deepening the shipping departure channel by dredging. Evaluation of the manoeuvring characteristics of large vessels (up to 250 000 DWT) in the wind, wave and current conditions existing in the port are continuing.

Computer based simulation models involving the use of operations research techniques have been developed. These permit the optimisation of the productivity of existing mining and transport systems. Models completed to date include stockyard operations, pit operations, rail traffic and shipping operations.

In-plant investigations continued into the optimisation of the crushing, screening and beneficiation processes used within the operation.

## Exploration

Extension of the previous general aeromagnetic survey of the Pilbara was carried out in the south-central sector. Additional gravity surveys were completed within the Brockman Syncline and over prospective sections of the Turner Syncline and the Paracurdoo Range. A comprehensive geophysical logging programme for boreholes was conducted in major deposit areas to provide basic data for interpretation and to distinguish types.

An integrated geological-geophysical approach to defining potential areas of mineralization was continued with further development of geophysical interpretation techniques and more detailed investigations into the structural, sedimentological and geomorphological aspects of major deposits and areas of exploration potential.

Evaluation of Marra Mamba and Brockman iron formation mineralization within the Brockman No. 4 environs continued during 1981. This work has increased the probable reserves of medium grade Marra Mamba ore and indicated substantial additional reserves of medium grade Brockman ore of higher phosphorus content.

Scout drilling programmes were carried out on a number of prospects around the Brockman Syncline, along the Western Paracurdoo Range, and in the north-central region adjacent to the railway. Detailed geological mapping of the Brockman Syncline and known areas of mineralization continued throughout the year.

At the mines, ore tonnages scout drilled in previous years were firm up by additional drilling. Shaft sinking to obtain bulk samples has contributed to the Company's knowledge and understanding of the behaviour of the ores during mining, concentration,



## Review of operations

sintering and in the blast furnace.

### Supply and services

The procurement of capital equipment, operating materials and consumables, off-site repair and other services during the year entailed the negotiation and administration of over 40 000 orders and some 145 contracts with an aggregate, annualised value in excess of \$150 million. Some 1.7 000 tonnes of general freight was transported from Perth to sites (excluding fuel and explosives).

Actions initiated to protect the Company against major supply disruptions and rapid price increases in the event of a sudden surge in demand for goods and services included entering into longer term contracts for a range of strategic goods and services, placing increasing emphasis on investigation into identifying alternative supply sources and products, the economic analysis of labour and material cost inputs, and the up-grading of equipment specification and quality assurance standards for high technology equipment and materials.

The Company participated in a number of submissions to the Industries Assistance Commission during the year.

### Environment

Current capital works programmes for control and collection of dust emissions were completed. Work continued on monitoring the effectiveness of dust control and collection equipment.

An update of the survey of noise sources within Hamersley's operations was commissioned late in the year. This survey seeks to further identify nuisance areas so that operational practices and/or engineering works that remove or abate the nuisance can be progressed.

Planning and design of restoration of mined areas and waste dumps continued. During 1982 it is proposed to restore mined areas on the Company's worked out limestone leases.

### Towns

The Company announced early in November the Hamersley Home Ownership Plan which will enable its employees to own their own homes in the towns of Dampier, Karratha, Tom Price and Paraburdoo. Houses under the Plan will be sold to employees with payments over a fifteen year period. The Plan will provide Hamersley employees with the opportunity to become more directly and more

permanently involved in the development and potential of the Pilbara. The Home Ownership Plan is a further important step in the process of normalization of the Company towns in this region.

Discussions are continuing with the Shires of Roebourne and West Pilbara with respect to their taking up a greater role in the management and provision of community services. This will enable the communities in the Pilbara to develop with the same status as other towns in Western Australia. This programme will include making land available for non-Company residential, commercial and light industrial requirements.

Normalization of Company towns is a complex issue, requiring detailed negotiations, co-operation and goodwill from all parties concerned.

During the year, direct satellite ABC Television was introduced to Tom Price and Paraburdoo by way of earth stations installed by Telecom Australia at the Company's cost. The relevant Federal authorities have assumed the cost of operating these facilities.

Two commercial television operators have applied for a licence for the Pilbara. If successful, this will introduce commercial television to Karratha and Dampier. At present, with the Company's support, commercial television is operating in Tom Price and Paraburdoo.

The towns of Tom Price and Paraburdoo have been connected by a sealed all-weather road, which has led to increased social and recreational activities between the towns.

Increased Federal Government activity in the Company's towns is evident with additional Telecom houses being built in North West Tom Price. The Prime Minister has announced that a platoon of the Pilbara Regiment will be raised in Tom Price.

Business confidence in the future of the Pilbara region is being demonstrated by the increasing investment by commercial and private enterprise, not only in Karratha but in the inland towns of Tom Price and Paraburdoo.

### Industrial relations

The first half of the year saw a marked increase in industrial activity causing lost time. The most disturbing feature was that a significant part of the time lost resulted from inter-union problems over which the Company had no control. Strikes during the year resulted in the loss of 13.6% of available hours. Of these lost hours, 50% were attributable to demarcation disputes.

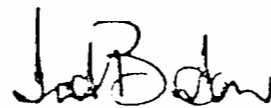
During March, the Management issued procedures designed to create a more

positive attitude towards industrial relations across the Company's operations. Front line supervision at the shop floor level has, as a result, become more involved in handling difficulties and problems.

Western Australian industrial Commission activity with respect to the industry has thus been significant throughout the year because of the large number of issues referred to it for resolution.

The considerable investment in time and effort towards improving the industrial relations climate has resulted in a decreasing incidence of lost time towards the end of the year. It is hoped that a more stable and responsible attitude is emerging.

Negotiations for a new industrial contract have been slow in developing and were still in progress at year's end.



I. F. Burston  
Managing Director  
Hamersley Iron Pty. Limited  
15th February, 1982

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# Directors' report

## Hamersley Holdings Limited

(Incorporated in the Australian Capital Territory)

Your Directors have pleasure in presenting the Annual Report and Group Accounts of Hamersley Holdings Limited ("the Company") and its subsidiaries for the year ended December 31, 1981 ("the financial year").

### Directors

At the date of this Report, the following are Directors of the Company

| Director      | Shareholdings in the Company and in related corporates as shown in the Register of Directors' Shareholdings at January 31, 1982 |        |
|---------------|---------------------------------------------------------------------------------------------------------------------------------|--------|
|               | HHL                                                                                                                             | CRA    |
| T. Barlow     | 3,217                                                                                                                           | 17,542 |
| J. T. Ralch   | 171                                                                                                                             | 587    |
| J. F. Burston |                                                                                                                                 |        |

All shareholdings are held beneficially.  
HHL — Hamersley Holdings Limited  
BCL — Bougainville Copper Limited  
CRA — CRA Limited

### Activities

The principal activities of the corporations in the Group during the financial year were mining, transport, and shipping of iron ore, exploration for mineral deposits, including of temporary reserves for iron ore deposits, servicing of sales contracts, provision of tug, harbour and ship agency services, ship broking and consultancy, participation in striping ventures, raising of finance for such purposes and investment of surplus funds. During the financial year, no significant change occurred in the nature of the activities of any of the corporations in the Group.

### Revenue

Net sales revenue of the Group decreased by 18% from \$648,098,000 in 1980 to \$449,420,000 in 1981 due to a decrease in total tonnage shipped.

### Earnings

Consolidated net earnings were \$17,221,000 for the year 1980, \$67,127,000.

The contribution of each corporation in the Group to the consolidated net earnings was as follows:

|                                       | 1981   | 1980   |
|---------------------------------------|--------|--------|
|                                       | \$000  | \$'000 |
| Hamersley Holdings Limited            | 1560   | 583    |
| Hamersley Iron Pty. Limited           | 14,385 | 58,215 |
| Hamersley Exploration Pty. Limited    |        |        |
| Mount Bruce Mining Pty. Limited       | (49)   | (17)   |
| Hamersley Europe Pty. Limited         | 70     | 46     |
| Pilbara Harbour Services Pty. Limited | 659    | 1,039  |
| Hilmet Corporation Limited            |        |        |
| Metalsid Ores Limited                 |        |        |
| Hamersley Iron Finance N.V.           |        |        |
| Hamersley Japan Limited               | 22     | 29     |
| Northern Cross Drilling Limited A.S.  | 74     | 10     |
|                                       | 17,221 | 67,127 |

### Subsidiaries

No subsidiaries were acquired or disposed of during the financial year.

### Reserves and provisions

A comprehensive review of all provisions and contingencies relating thereto was made at the end of the financial year.

The following material movements occurred in reserves and provisions during the financial year:

|                                     |                                       |
|-------------------------------------|---------------------------------------|
| Hamersley Holdings Limited          | Pilbara Harbour Services Pty. Limited |
| Equity in Associate Company Reserve | Long Service Leave Provisions         |
| — transfer to \$413,000             | — net transfers \$7,000               |
| Hamersley Iron Pty. Limited         | Maintenance and Other Provisions      |
| Maintenance and Other Provisions    | — net transfer \$1,330,000            |
| — net transfer from \$116,200       |                                       |
| Long Service Leave Provisions       | Hamersley Japan Limited               |
| — net transfer to \$1,281,000       | Long Service Leave Provisions         |
| Exchange Loss Provisions            | — net transfer to \$24,000            |
| — net transfer to \$1,661,000       |                                       |

There were no other material movements in reserves or provisions which are reflected in the Group accounts for the financial year.

EXHIBIT "5"—Annual Reports of Hamersley Holdings Limited for the years 1976, 1978, 1980 and 1982



## Shares and debentures

No issues of shares or debentures were made by any corporation in the Group during the financial year.

During the financial year the Company negotiated alterations to the terms of issue of its series "K" security stock (created March 1979) to provide more flexibility in the management of its loan funds. As a result of the alterations the series "K" stock certificate issued in 1979 was cancelled on January 29, 1982 and a new series "K" stock certificate was issued on the same date to secure the same amount: (US\$25 000 000).

## Dividends

A final dividend for 1980 of 7 cents per share was declared by the Company on January 28, 1981, and was paid on May 7, 1981. This dividend was mentioned in the last Report.

The Company did not declare an interim dividend for 1981.

A final dividend for 1981 of 5 cents per share was declared on February 3, 1982, and is payable on May 6, 1982.

## Additional information

(a) So far as debts owing to the Company are concerned, the Directors of the Company (before the Statement of Earnings for the financial year and Balance Sheet as at the end of the financial year) were made up took reasonable steps to ascertain the action taken in relation to the writing off of bad debts and to cause all doubtful debts to be written off and adequate provision to be made for doubtful debts.

(b) The Directors of the Company were not aware of any circumstances which would render the amount written off for bad debts, or the amount of the provision for doubtful debts, in any corporation in the Group, inadequate to any substantial extent.

(c) The Directors of the Company (before the Statement of Earnings for the financial year and Balance Sheet as at the end of the financial year) were made up took reasonable steps to ascertain whether any current assets of the Company were intended to realise their ordinary course of business, their value as shown in the accounting records of the Company, and were satisfied that such assets would realise their value.

(d) The Directors of the Company were not aware of any circumstances which would render the values attributed to current assets in the Group Accounts for the financial year misleading or inadequate.

(e) Except as otherwise stated in this Report there does not exist at the date of this Report either —

(i) any charge on the assets of any corporation in the Group, or  
(ii) any contingent liability of any corporation in the Group which has arisen since the end of the financial year.

(f) In the opinion of the Directors of the Company, no contingent or other liability of any corporation in the Group has become enforceable or is likely to become enforceable during 1982 which will or may affect the ability of the corporation to meet its obligations as and when they fall due.

(g) The Directors of the Company are not aware of any circumstances, nor otherwise dealt with in this Report or the Group Accounts for the financial year, which would render any amount stated in these Group Accounts misleading.

(h) The results of the Group and of any corporation in the Group during the financial year have not been substantially affected by any item, transaction or event of a material and unusual nature except as mentioned in this Report.

(i) Between December 31, 1981, and the date of this Report no item, transaction or event of a material and unusual nature has occurred which, in the opinion of the Directors of the Company, is likely to affect substantially the results of the operations of any corporation in the Group for the period ending December 31, 1982.

(j) — As at January 27, 1980, there were 316 ordinary shares held or held as if the Company's issued capital or which the voting rights are one vote for each share held.

(k) — As at January 27, 1982, the twenty largest holders of the ordinary shares of the Company held a total of 94.30% of the issued ordinary shares of the Company. Of this total 66.41%

158 834 987 shares are held by CRA Limited, 58 Collins Street, Melbourne, Victoria, in which the following companies have a substantial interest: C.R.A. Holdings Pty. Limited, 65 Collins Street, Melbourne, Victoria;

R.T.Z. Australian Holdings Limited and The Rio Tinto Zinc Corporation Limited, both of 6 St. James's Square, London,

and 28 32% of 28 674 100 shares are held by Conynco Mining Limited, 6a Collins Street, Melbourne, Victoria, in which the following companies have a substantial interest:

C.R.A. Services Limited and CRA Limited, both of 65 Collins Street, Melbourne, Victoria.

(l) — As at January 27, 1982, the distribution of the ordinary shares of the Company (which comprise the total issued capital of the Company) was

| No. of Shares   | No. of Shareholders |
|-----------------|---------------------|
| 1 — 1 000       | 761                 |
| 1 001 — 5 000   | 44                  |
| 5 001 — 10 000  | 1                   |
| 10 001 and over | 10                  |
| <b>Total</b>    | <b>816</b>          |

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(k) Since December 31, 1980, Sir Russel Madigan, Sir Rodenick Carnegie Messrs T. Barlow, F. Burston, J.T. Peilon and C.A. Watts, each of whom is or was a Director of the Company and is or was engaged in the full-time employment of the Company and/or its related corporations, has received, or become entitled to receive, in connection with that employment, his fixed salary and normal superannuation, medical and other benefits relating to such employment. Save as aforesaid and save as to any pro rata payment of, or entitlement to, emoluments such as are included in the Group Accounts for the financial year, since December 31, 1980 no Director of the Company has received, or become entitled to receive, a benefit (other than a benefit included in the aggregate amount of Directors' emoluments shown in the Group Accounts for the financial year, or the fixed salary of a full-time employee of the Company, by reason of a contract made by the Company or a related corporation with the Director, or with a company in which he has a substantial financial interest.

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(l) The Company is a company of the kind specified in the Schedule to the Order dated August 3, 1981, made by the Acting Registrar of Companies in the Australian Capital Territory in respect of claims of creditors as relating to the winding up of, or amounts in accounts and documents reports, and the amounts set out in this Report and accompanying Group Accounts have been founded on in accordance with that Order.

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Signed this 15th day of February, 1982, in accordance with the resolution of the Directors.

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Chairman

Director

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Hamersley Holdings Limited and subsidiary companies

**Balance sheets**

At December 31

Notes on pages 10 to 15 inclusive form part of these statements and are to be read in conjunction therewith

| Hamersley Holdings |         |                                           | Hamersley Group |           |
|--------------------|---------|-------------------------------------------|-----------------|-----------|
| 1981               | 1980    |                                           | 1981            | 1980      |
| \$000              | \$000   | Note                                      | \$000           | \$000     |
|                    |         | <b>Capital and reserves</b>               |                 |           |
| 60 637             | 60 637  | Ordinary shares 4                         | 60 637          | 60 637    |
| 68 799             | 68 799  | Capital reserves 5                        | 497 295         | 497 295   |
| 464                | 51      | Equity in associate company reserve 7     | 464             | 51        |
| 20 156             | 13 350  | Retained earnings                         | 187 231         | 132 601   |
| 150 056            | 147 837 |                                           | 745 677         | 740 584   |
|                    |         | Outside shareholder's interest            | (4)             | (53)      |
| 150 056            | 147 837 |                                           | 745 673         | 740 531   |
|                    |         | Future income tax 3                       | 158 982         | 142 406   |
|                    |         | Deferred liabilities                      |                 |           |
|                    |         | (Maturing later than one year)            |                 |           |
| 162 641            | 166 854 | Debenture stock and other secured loans 3 | 207 246         | 239 360   |
| 44 605             | 72 506  | Equipment and other loans — unsecured 3   | 332             | 1 136     |
| 207 246            | 239 360 |                                           | 207 578         | 240 496   |
|                    |         | Provisions 10                             | 13 607          | 12 370    |
|                    |         | Current liabilities                       |                 |           |
|                    |         | Bank overdraft — unsecured                | 9 081           | 8 238     |
| 47 467             | 25 243  | Creditors 11                              | 102 531         | 94 913    |
| 12 128             | 16 978  | Dividend payable                          | 12 128          | 16 978    |
| 218                | 224     | Income tax                                | 40 791          | 36 301    |
| 59 813             | 45 445  |                                           | 164 531         | 156 430   |
| 417 115            | 432 642 | <b>Total funds</b>                        | 1 290 371       | 1 292 231 |
|                    |         | These funds were represented by           |                 |           |
|                    |         | Fixed assets                              |                 |           |
|                    |         | Property, plant and equipment 12          | 1 099 603       | 1 124 758 |
| 250 477            | 282 531 | Subsidiary companies 14                   |                 |           |
| 474                | 99      | Investments 16                            | 474             | 99        |
| 1 470              | 1 108   | Advances 17                               | 17 170          | 19 129    |
|                    |         | Current assets                            |                 |           |
|                    |         | Stocks and stores 13                      | 87 966          | 91 416    |
| 164 693            | 148 844 | Debtors 18                                | 36 439          | 39 494    |
|                    |         | Short term deposits 20                    | 38 062          | 5 690     |
| 11                 |         | Cash and bank balances                    | 453             | 12 618    |
| 164 694            | 148 844 |                                           | 162 930         | 149 148   |
|                    |         | Deferred expenditure 31                   | 7 897           | 2 014     |
|                    |         | Exchange fluctuation 22                   | 2 307           | (2 947)   |
| 417 115            | 432 642 | <b>Total assets</b>                       | 1 290 371       | 1 292 231 |

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EXHIBIT "5" - Annual Reports of Hamersley Holdings Limited for the years 1978, 1979, 1981 and 1982

Notes on accounts

December 31, 1981

Note 1. Summary of accounting policies

The accounting principles adopted by the holding company and its subsidiaries are in accord with the accounting standards required by the Australian accounting profession and/or by law and are consistent with those adopted in the previous year unless otherwise stated.

- (a) **Historical cost convention**  
The accounts have been prepared primarily on the basis of historical costs and do not take into account changing monetary values or, except where stated, current valuations of non-current assets. (Refer Notes 12 and 13)
- (b) **Consolidation of subsidiaries**  
Conventional consolidation principles are applied to the accounts of the subsidiary companies listed in Note 14
- (c) **Consolidation of associates**  
Equity accounting is applied in respect of the group interest in earnings and reserves of associates being those companies in which the Hamersley group's equity shareholding is from 20% to 50%, together with participation in commercial and policy decisions. Equity in earnings and reserves of associates is usually only recognised to the extent of tangible asset backing 10
- (d) **Income tax**  
The provisions for current and future income tax are calculated on earnings before tax, after allowing for permanent differences. Certain items of expense, principally depreciation, are claimed for tax purposes in periods different from those for accounting purposes. The resulting tax differences are reported as future income tax.
- (e) **Foreign exchange**  
Monetary assets and liabilities (and contingent liabilities - Note 25) in foreign currencies have been converted to Australian currency at the rates of exchange ruling at balance date. All other amounts in foreign currencies have been converted at the appropriate rate of exchange at the date of the relevant transactions. Possible future unrealised exchange losses and gains on foreign currency borrowings are being provided against over the remaining period of the related borrowings. 20
- (f) **Depreciation of property, plant and equipment**  
The annual charge for depreciation is determined by dividing the written down value of individual assets by the lesser of their remaining economic useful life or 20 years.
- (g) **Maintenance and repairs**  
Maintenance and repair costs, including minor renewals, are charged against earnings as incurred. Provisions are raised in respect of period overhauls of major operating plants, the bulk of which extends beyond one financial year.
- (h) **Stock valuations**  
Stocks of ores and pellets are valued at the lower of cost or net realisable value. Costs, being direct materials and labour, are determined at standards using annual averages, the standards being based upon actual levels of activity adjusted for abnormal influences. Stores stocks are valued at cost less allowance for obsolescence.
- (i) **Exploration expenditure**  
Expenditures on exploration, evaluation or research of individual projects is written off as incurred. However, when a project reaches the stage where future expenditures are expected to be recovered through development or sale, all subsequent expenditures are capitalised. Projects for which expenditure is carried forward as an asset are subject to annual review and written down to estimated realisable value if a permanent diminution in value is considered to have occurred. 30
- (j) **Development expenditure**  
Development expenditure in the initial establishment of access to mineral reserves, together with capitalised exploration and evaluation expenditure in respect of that project, is carried forward as part of the cost of the mine property and amortised over the shorter of the mine life or twenty years. Subsequent development expenditure is charged against earnings as incurred, except when such expenditure results in significant future benefits, when it is carried forward as an asset and amortised over the lesser of the period of the benefit or 20 years.
- (k) **Capitalisation of interest**  
Interest on funds borrowed for major capital projects is capitalised as a project cost until commencement of operations. 40

Note 2. Earnings before tax

| Earnings before tax, with arrival of after charging and crediting the following items | Hamersley Holdings |        | Hamersley Group |        |
|---------------------------------------------------------------------------------------|--------------------|--------|-----------------|--------|
|                                                                                       | 1981               | 1980   | 1981            | 1980   |
| Charges                                                                               | \$000              | \$'000 | \$000           | \$'000 |
| Interest on borrowings                                                                |                    |        |                 |        |
| - Subsidiary                                                                          | 4 623              | 5 800  |                 |        |
| - Other borrowings                                                                    | 22 560             | 26 973 | 27 767          | 32 739 |
| Provision for future liabilities (Note 10)                                            |                    |        | 2 503           | 2 992  |
| Accruals (refer Note 14)                                                              | 34                 | 40     | 150             | 181    |
| Government subsidies                                                                  |                    |        | 25 202          | 29 180 |
| Loss on sale of fixed assets                                                          |                    |        | 1 700           | 1 177  |
| Credits                                                                               |                    |        |                 |        |
| Interest on short term deposits                                                       |                    |        |                 |        |
| - Related companies                                                                   |                    |        | 1 593           |        |
| - Other                                                                               |                    |        | 1 136           | 4 076  |
| Profit on sale of fixed assets                                                        |                    |        | 1 229           | 424    |
| Provision still on credit in related corporation                                      | 49                 |        | 48              |        |
| Dividend from related company                                                         | 1                  | 1      | 1               | 1      |

Note 3. Income tax

| (a) Taxation on earnings for the period, no value of adjustments in respect of prior years' provisions | Hamersley Group |               |
|--------------------------------------------------------------------------------------------------------|-----------------|---------------|
|                                                                                                        | 1981            | 1980          |
| Current                                                                                                | 5 730           | 43 027        |
| Future                                                                                                 | 16 577          | 19 540        |
| <b>TOTAL</b>                                                                                           | <b>22 307</b>   | <b>62 567</b> |

ENCHIBTT "5"-Annual Reports of Hamersley Holdings Limited for the years 1976, 1978, 1981 and 1982

## Notes on accounts

(b) Movement in future tax during the year was as follows

|                                | Hamersley Group |         |
|--------------------------------|-----------------|---------|
|                                | 1991            | 1990    |
|                                | \$000           | \$000   |
| Balance from the previous year | 142 406         | 120 566 |
| Net movement during year       | 16 577          | 19 800  |
|                                | 158 983         | 140 366 |

(c) Prima facie tax reconciliation

The following major items caused the charge for income tax to vary from that prima facie payable for the year ending at rates varying from 46% to 66%

|                                                                            | Hamersley Group |          |
|----------------------------------------------------------------------------|-----------------|----------|
|                                                                            | 1991            | 1990     |
|                                                                            | \$000           | \$000    |
| Permanent differences                                                      |                 |          |
| Investment and other allowances                                            | 6 113           | 5 106    |
| Net exchange losses                                                        | (1 543)         | 180      |
| Non allowable depreciation                                                 | (23 795)        | (14 340) |
| Other items                                                                | 905             | 5 049    |
|                                                                            | (18 317)        | (7 905)  |
| Timing differences                                                         |                 |          |
| Losses carried forward                                                     | 74              | 22       |
|                                                                            | (18 243)        | (7 883)  |
| Tax effect of 30% re-<br>income tax surcharge over previous 12 or 15 years | (6 391)         | 6 064    |
| Total adjustment tax effect                                                | (4 313)         | (1 819)  |

(d) The effective rate of income tax for the year ended 31st December 1991 is 46% and for the year ended 31st December 1990 is 46%.

### Note 4. Capital

(a) Authorised capital

The authorised capital of the Company comprises 640 000 ordinary shares of 25 cents each (\$160 000) (1990 - 375 000 shares)

(b) Issued capital

The issued capital of the Company is 640 000 ordinary shares of 25 cents each (\$160 000) (1990 - 375 000 shares)

### Note 5. Capital reserves

|                                      | Share<br>premium<br>\$000 | Asset<br>revaluation<br>\$000 | Other<br>\$000 | Total<br>\$000 |
|--------------------------------------|---------------------------|-------------------------------|----------------|----------------|
| Hamersley Group                      |                           |                               |                |                |
| Balance at 31 December 1990 and 1989 | 68 406                    | 474 406                       | 271            | 543 083        |
| Hamersley Holdings                   |                           |                               |                |                |
| Balance at 31 December 1991 and 1990 | 18 406                    | -                             | 271            | 18 677         |

### Note 6. Revenue reserve

|                          | Hamersley Group |       | Hamersley Holdings |       |
|--------------------------|-----------------|-------|--------------------|-------|
|                          | 1991            | 1990  | 1991               | 1990  |
|                          | \$000           | \$000 | \$000              | \$000 |
| Trading stock variations |                 |       |                    |       |
| Balance 30/11/90         |                 |       |                    |       |
| Provision year           |                 |       |                    |       |
| Net movement during year |                 |       |                    |       |
| Balance 31/12/91         |                 |       |                    |       |

### Note 7. Equity in associate company reserve

|                      | Hamersley Group |       | Hamersley Holdings |       |
|----------------------|-----------------|-------|--------------------|-------|
|                      | 1991            | 1990  | 1991               | 1990  |
|                      | \$000           | \$000 | \$000              | \$000 |
| Balance at 1/1/91    |                 |       |                    |       |
| Provision year       | 51              | 307   | 51                 | 307   |
| Movement during year |                 |       |                    |       |
| Shareholdings        | 413             | 244   | 413                | 244   |
|                      | 464             | 551   | 464                | 551   |

### Note 8. Debenture stock and other secured loans

The following debenture stock and other secured loans are secured by a floating charge over the assets of the Company and its subsidiaries and by a charge over the assets of Hamersley Holdings. The interest rate was 8% per annum for the year ended 31st December 1991 and 1990.

|                                             | Hamersley Group |        | Hamersley Holdings |        |
|---------------------------------------------|-----------------|--------|--------------------|--------|
|                                             | 1991            | 1990   | 1991               | 1990   |
|                                             | \$000           | \$000  | \$000              | \$000  |
| (a) Debenture stock                         | 39 007          | 40 104 | 39 007             | 40 104 |
| (b) Other secured loans                     | 27 406          | 27 081 | 27 406             | 27 081 |
| (c) Other secured loans                     | 23 112          | 23 112 | 23 112             | 23 112 |
| (d) Debenture stock and other secured loans | 89 525          | 89 297 | 89 525             | 89 297 |
| (e) Other secured loans                     | 2 104           | 244    | 2 104              | 244    |

EXTRACT FROM ANNUAL REPORT OF  
Hamersley Holdings Limited for the  
years 1990, 1991, 1992 and 1993

Notes on accounts

Note 8. (cont.)

|                                        | Hamersley Holdings |         | Hamersley Group |         |
|----------------------------------------|--------------------|---------|-----------------|---------|
|                                        | 1981               | 1980    | 1981            | 1980    |
|                                        | \$000              | \$000   | \$000           | \$000   |
| (f) Series K Security Stock            | 22 142             | 21 152  | 22 142          | 21 152  |
| (g) Series L Security Stock            | 26 570             | 25 382  | 26 570          | 25 382  |
| (h) Guaranteed Debentures              |                    |         | 22 253          | 21 259  |
| (i) Guaranteed Debentures              |                    |         | 6 978           | 8 063   |
| (j) Guaranteed Debentures              |                    |         | 8 277           | 10 575  |
| (k) Guaranteed Bearer Bonds            |                    |         | 19 544          | 21 423  |
| (l) Guaranteed Debentures              |                    |         | 13 052          | 14 769  |
|                                        | 172 343            | 185 225 | 242 447         | 261 315 |
| Less: Instalments due within 12 months | 9 702              | 13 371  | 35 201          | 21 655  |
|                                        | 162 641            | 166 854 | 207 246         | 239 360 |

| Description                                    | Amount outstanding Dec 31, 1981 | Security                              | Interest rate                           | Repayable    |
|------------------------------------------------|---------------------------------|---------------------------------------|-----------------------------------------|--------------|
| Issued by                                      |                                 |                                       |                                         |              |
| Hamersley Holdings Limited                     |                                 |                                       |                                         |              |
| (a) Australian Stock                           | A\$39 967                       | Australian Debenture Stock            | Rates varied between 8 1/2% and 10 1/2% | 1982 to 1995 |
| (b) Secured Notes                              | US\$31 000                      | Series I Security Stock               | 8 1/2%                                  | 1982 to 1984 |
| (c) Secured Debentures                         | US\$34 000                      | Series H Security Stock               | 9 1/2%                                  | 1982 to 1982 |
| (d) Series C United States Stock               | US\$27 000                      | Series C United States Security Stock | 11%                                     | 1982 to 1990 |
| (e) Canadian Equipment Loan — Series B Advance | C\$2 946                        | Series J Security Stock               | 9 1/2%                                  | 1982 to 1983 |
| (f) Series K Security Stock                    | US\$25 000                      | Series K Security Stock               | Floating                                | 1982 to 1988 |
| (g) Series L Security Stock                    | US\$30 000                      | Series L Security Stock               | Floating                                | 1982 to 1988 |
| Issued by                                      |                                 |                                       |                                         |              |
| Hamersley Iron Finance N.V.                    |                                 |                                       |                                         |              |
| (h) Guaranteed Debentures                      | US\$25 125                      | Series G Security Stock               | 10%                                     | 1982         |
| (i) Guaranteed Debentures                      | US\$7 879                       | Series A Security Stock               | 8 1/2%                                  | 1982 to 1985 |
| (j) Guaranteed Debentures                      | US\$9 248                       | Series B Security Stock               | 8%                                      | 1982 to 1986 |
| (k) Guaranteed Bearer Bonds                    | DA150 000                       | Series E Security Stock               | 8 1/2%                                  | 1982 to 1987 |
| (l) Guaranteed Debentures                      | US\$14 737                      | Series F Security Stock               | 8%                                      | 1982 to 1987 |

Note 9. Equipment and other loans — unsecured

|                                        | Hamersley Group |       |
|----------------------------------------|-----------------|-------|
|                                        | 1981            | 1980  |
|                                        | \$000           | \$000 |
| Equipment loans                        | 712             | 1 487 |
| Other loans                            | 457             | 533   |
|                                        | 1 159           | 2 040 |
| Less: Instalments due within 12 months | 837             | 905   |
|                                        | 322             | 1 135 |

These loans are repayable over periods of up to four years. The interest rates vary between 8% and 10 1/2% per annum.

|                                        | Hamersley Holdings |        |
|----------------------------------------|--------------------|--------|
|                                        | 1981               | 1980   |
|                                        | \$000              | \$000  |
| (a) Banks                              | 15 256             | 18 639 |
| (b) Subsidiary companies               |                    |        |
| Hamersley Iron Finance N.V.            | 54 849             | 57 480 |
|                                        | 70 104             | 76 119 |
| Less: Instalments due within 12 months | 25 499             | 3 882  |
|                                        | 44 605             | 72 237 |

The loans in (a) above represent amounts borrowed with the banks by Hamersley Iron Finance N.V. an indirect wholly owned subsidiary of Hamersley Holdings Limited. The interest Debentures and other securities in (b) above represent the interest Debentures and other securities issued by Hamersley Iron Finance N.V. and Hamersley Holdings Limited in connection with the above loans.

Note 10. Provisions

|                       | Balance 1980 | Charged to earnings | Expenditure & transfers | Balance 1981 |
|-----------------------|--------------|---------------------|-------------------------|--------------|
|                       | \$000        | \$000               | \$000                   | \$000        |
| Hamersley Group       |              |                     |                         |              |
| Long service leave    | 5 100        | 2 172               | 820                     | 7 091        |
| Maintenance and other | 5 531        | 531                 | 746                     | 6 516        |
|                       | 10 631       | 2 803               | 1 566                   | 13 867       |

Some of the above provisions are provided in accordance with the provisions of the Income Tax Act and the Income Tax Regulations.

EXHIBIT "6"—Annual Reports of Hamersley Holdings Limited for the years 1976, 1973, 1981 and 1982



Notes on accounts

Note 11. Creditors

|                                                      | Hamersley Holdings |        | Hamersley Group |        |
|------------------------------------------------------|--------------------|--------|-----------------|--------|
|                                                      | 1981               | 1980   | 1981            | 1980   |
|                                                      | \$000              | \$000  | \$000           | \$000  |
| Installments on long term loans due within 12 months |                    |        |                 |        |
| Debture stock and other secured loans                | 9 702              | 18 371 | 35 291          | 21 855 |
| Equipment and other loans - unsecured                | 2 812              | 2 088  | 827             | 218    |
| Trade creditors                                      |                    |        | 27 454          | 28 151 |
| Subsidiary companies                                 | 32 963             | 4 362  |                 |        |
| Group related corporations                           |                    |        | 492             | 206    |
| Other creditors and accrued liabilities              |                    |        |                 |        |
| Secured                                              | 1 095              | 2 072  | 3 157           | 6 372  |
| Unsecured                                            | 994                | 467    | 35 350          | 42 214 |
|                                                      | 47 467             | 29 243 | 102 531         | 84 013 |

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Note 12. Property, plant and equipment

|                                           | Cost or   | Accumulated  | 1981      | 1980      |
|-------------------------------------------|-----------|--------------|-----------|-----------|
|                                           | valuation | depreciation | Net       | Net       |
|                                           | \$000     | \$000        | \$000     | \$000     |
| Freehold and leasehold land and buildings |           |              |           |           |
| - at cost                                 | 129 255   | 51 198       | 78 059    | 71 424    |
| - at 1.7.78 independent valuation         | 74 660    | 10 647       | 64 213    | 61 611    |
| Plant, machinery & equipment              |           |              |           |           |
| - at cost                                 | 428 439   | 175 323      | 253 116   | 250 640   |
| - at 1.7.78 independent valuation         | 769 763   | 119 237      | 650 476   | 600 028   |
| Motor properties - at cost                | 24 609    | 11 377       | 13 232    | 13 928    |
| Capital works in progress - at cost       | 42 497    |              | 42 497    | 21 550    |
|                                           | 1 487 433 | 367 835      | 1 099 603 | 1 124 781 |

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Note 13. Depreciation

|                                                               | Hamersley Group |        |
|---------------------------------------------------------------|-----------------|--------|
|                                                               | 1981            | 1980   |
|                                                               | \$000           | \$000  |
| The charge for depreciation on fixed assets                   |                 |        |
| Increase arising from fixed assets less value on July 1, 1979 | 22 713          | 21 425 |

Note 14. Subsidiary companies

|                                                                                                                                                                                                                                                                             | Place of incorporation | Hamersley Holdings |         |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|--------------------|---------|
|                                                                                                                                                                                                                                                                             |                        | 1981               | 1980    |
|                                                                                                                                                                                                                                                                             |                        | \$000              | \$000   |
| (a) Shares in subsidiary companies                                                                                                                                                                                                                                          |                        |                    |         |
| Hamersley Iron Pty. Limited (100% owned)                                                                                                                                                                                                                                    | Australia              | 42 000             | 42 000  |
| Mount Bruce Mining Pty. Limited (99.9% owned)                                                                                                                                                                                                                               | Australia              | 10                 | 10      |
| Hamersley Iron Finance Pty. Limited (100% owned) and carries on business in the Netherlands Antilles                                                                                                                                                                        | Netherlands Antilles   | 18                 | 18      |
| Hamersley Exploration Pty. Limited (99.9% owned)                                                                                                                                                                                                                            | Australia              | 1                  | 1       |
| Hamet Corporation Limited (99.9% owned)                                                                                                                                                                                                                                     | Australia              | 1                  | 1       |
| Metalside Pty. Limited (100% owned)                                                                                                                                                                                                                                         | Australia              | 1                  | 1       |
| Pipera Iron Ore Developer Pty. Limited (100% owned)                                                                                                                                                                                                                         | Australia              | 1 230              | 1 230   |
|                                                                                                                                                                                                                                                                             |                        | 48 231             | 48 231  |
| Hamersley Iron Pty. Limited (100% owned) is a public company listed on the Australian Stock Exchange. It is a public company and its shares are listed on the Australian Stock Exchange. It is a public company and its shares are listed on the Australian Stock Exchange. |                        |                    |         |
| (b) Long term loans owing by subsidiary companies                                                                                                                                                                                                                           |                        | 237 246            | 231 720 |
|                                                                                                                                                                                                                                                                             |                        | 250 412            | 250 201 |
| The long term loans are due to the parent company and are secured by the assets of the subsidiary companies.                                                                                                                                                                |                        |                    |         |
| (c) Dividends from subsidiary companies                                                                                                                                                                                                                                     |                        | 12 123             | 28 418  |
| Hamersley Iron Pty. Limited                                                                                                                                                                                                                                                 |                        | 669                | 1 000   |
| Pipera Iron Ore Developer Pty. Limited                                                                                                                                                                                                                                      |                        | 12 123             | 28 418  |

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Note 15. Exploration and development

All amounts are in Australian dollars unless otherwise stated.

EXHIBIT A "A"-Annual Report of Hamersley Iron Pty. Limited for the years 1978, 1979, 1980 and 1981

Notes on accounts

Note 16. Investments

|                                                                     | Hammersley Holdings |           | Hammersley Group |           |
|---------------------------------------------------------------------|---------------------|-----------|------------------|-----------|
|                                                                     | 1981                | 1980      | 1981             | 1980      |
|                                                                     | \$000               | \$000     | \$000            | \$000     |
| <b>Associate</b>                                                    |                     |           |                  |           |
| Shares in listed company, at cost                                   | 10                  | 10        | 10               | 10        |
| Add: Equity in retained earnings                                    | 464                 | 51        | 464              | 51        |
| Being shares in listed company, at Directors' valuation at year end | 474                 | 61        | 474              | 61        |
| <b>Other</b>                                                        |                     |           |                  |           |
| Shares in unlisted companies, at cost                               | 45                  | 45        | 45               | 45        |
| Shares in related corporation, at cost                              |                     | 38        |                  | 38        |
|                                                                     | 45                  | 83        | 45               | 83        |
| Less: Provisions for possible loss                                  | 45                  | 45        | 45               | 45        |
|                                                                     |                     | 38        |                  | 38        |
| <b>Total</b>                                                        | <b>474</b>          | <b>93</b> | <b>474</b>       | <b>99</b> |

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Note 17. Advances

|                                                    | Hammersley Holdings |       | Hammersley Group |        |
|----------------------------------------------------|---------------------|-------|------------------|--------|
|                                                    | 1981                | 1980  | 1981             | 1980   |
|                                                    | \$000               | \$000 | \$000            | \$000  |
| The long term portion of advances comprises:       |                     |       |                  |        |
| The Rural and Industries Bank of Western Australia |                     |       | 13 630           | 15 180 |
| Government of Western Australia                    |                     |       | 1 850            | 2 491  |
| Bulk Shipping Associates Limited                   | 1 470               | 1 156 | 1 470            | 1 156  |
| Rural Land Finance                                 |                     |       | 25               | 33     |
| Other                                              |                     |       | 195              | 314    |
|                                                    | 1 470               | 1 156 | 17 170           | 19 104 |

The deposit with the Rural and Industries Bank of Western Australia is a deposit of with the proceeds of borrowings and received at Karara, Hammersley, with the effect of providing a loan of approximately \$1,166,000 during the year 1981. The deposit is repaid over the same period.

The advance to the Government of Western Australia was made in connection with the purchase of water to the Dampier-Karara area and is repayable by 1988.

The advance to Bulk Shipping Associates Limited relates to Hammersley's 10% interest in a bulk ore carrier.

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Note 18. Stocks and stores

|                          | Hammersley Group |               |
|--------------------------|------------------|---------------|
|                          | 1981             | 1980          |
|                          | \$000            | \$000         |
| Ores and concentrates    | 42 375           | 35 101        |
| Stores, including spares | 45 634           | 55 217        |
| Inventory                | 57               | 62            |
|                          | <b>87 966</b>    | <b>90 380</b> |

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Note 19. Debtors

|                                                  | Hammersley Holdings |                | Hammersley Group |               |
|--------------------------------------------------|---------------------|----------------|------------------|---------------|
|                                                  | 1981                | 1980           | 1981             | 1980          |
|                                                  | \$000               | \$000          | \$000            | \$000         |
| Trade debtors                                    |                     |                | 20 780           | 35 167        |
| Subsidiary companies                             | 164 693             | 109 440        |                  |               |
| Other receivables and prepayments                |                     |                | 321              | 470           |
| Other receivables and prepayments in relation to |                     |                | 9 338            | 12 459        |
|                                                  | <b>164 693</b>      | <b>109 440</b> | <b>20 439</b>    | <b>48 106</b> |

Note 20. Short term deposits

|                      | Hammersley Holdings |       | Hammersley Group |              |
|----------------------|---------------------|-------|------------------|--------------|
|                      | 1981                | 1980  | 1981             | 1980         |
|                      | \$000               | \$000 | \$000            | \$000        |
| Related corporations |                     |       | 35 697           |              |
| Other                |                     |       | 2 355            | 3 600        |
|                      |                     |       | <b>35 692</b>    | <b>3 600</b> |

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Note 21. Deferred revenue expenditure

The expenditure incurred but not yet accounted for in the financial statements is \$1,100,000 in 1981 and \$1,100,000 in 1980. This expenditure is for the purchase of land and buildings for the proposed expansion of the Karara mine. The expenditure is expected to be incurred over the next few years.

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Note 22. Exchange fluctuations

|                                                                     | Hammersley Holdings |          | Hammersley Group |               |
|---------------------------------------------------------------------|---------------------|----------|------------------|---------------|
|                                                                     | 1981                | 1980     | 1981             | 1980          |
|                                                                     | \$000               | \$000    | \$000            | \$000         |
| <b>(a) Exchange loss</b>                                            |                     |          |                  |               |
| Realised losses on exchange fluctuations                            |                     |          | 1280             | 7 210         |
| Less: Provision for losses                                          |                     |          | 1002             | 6 427         |
|                                                                     |                     |          | 32               | 783           |
| Provision for losses on exchange fluctuations on future commitments |                     |          | 1 369            | 11 110        |
| Loss on other financial items                                       | 200                 | 3        | 130              | 307           |
|                                                                     | <b>200</b>          | <b>3</b> | <b>1 537</b>     | <b>12 407</b> |
| <b>(b) Exchange fluctuations</b>                                    |                     |          |                  |               |
| Net unrealised exchange fluctuations                                |                     |          | 10 240           | 3 010         |
| Less: Assets and liabilities in foreign currencies                  |                     |          | 7 333            | 4 211         |
|                                                                     |                     |          | <b>2 907</b>     | <b>3 201</b>  |

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EXTRACT FROM ANNUAL REPORTS OF  
Hammersley Holdings Limited for the  
years 1976, 1977, 1981 and 1982

## Notes on accounts

### Note 23. Directors' emoluments

No emoluments were received, or due and receivable (whether from the Company or from related corporations) during the period in 1981 or in 1980 by:

- (a) Directors of the Company engaged in the full-time employment of the Company and its related corporations (including all bonuses and commissions received or receivable by them as employees but not including the amount received or receivable by them by way of fixed salary as employees); and
- (b) Other Directors of the Company
- No commissions for subscribing for, or agreeing to procure subscriptions for, any shares in or debentures of the Company or any related corporations were received or are due and receivable by any Director.

### Note 24. Auditors' remuneration

|                                                                                                             | Hamersey Holdings |           | Hamersey Group |            | 10 |
|-------------------------------------------------------------------------------------------------------------|-------------------|-----------|----------------|------------|----|
|                                                                                                             | 1981              | 1980      | 1981           | 1980       |    |
|                                                                                                             | \$000             | \$000     | \$000          | \$000      |    |
| Amount paid payable to the Auditors for Auditing the accounts for the Company and the consolidated accounts | 11                | 10        | 126            | 112        |    |
| Other services                                                                                              | 23                | 30        | 34             | 49         |    |
|                                                                                                             | <u>34</u>         | <u>40</u> | <u>160</u>     | <u>161</u> |    |

No other benefits were received by the auditors from the Company.

### Note 25. Contingent liabilities

|                                                                                                            | Hamersey Holdings |        | Hamersey Group |       | 20 |
|------------------------------------------------------------------------------------------------------------|-------------------|--------|----------------|-------|----|
|                                                                                                            | 1981              | 1980   | 1981           | 1980  |    |
|                                                                                                            | \$000             | \$000  | \$000          | \$000 |    |
| There are contingent liabilities on which no loss is expected, outstanding as follows:                     |                   |        |                |       |    |
| <b>Secured</b>                                                                                             |                   |        |                |       |    |
| Debenture Stock issued as security for borrowings of subsidiary companies (plus interest at varying rates) | 70 104            | 75 090 |                |       |    |
| <b>Unsecured</b>                                                                                           |                   |        |                |       |    |
| (i) Stamp duty in connection with registration of debenture trust deeds                                    | 466               | 700    | 466            | 700   |    |
| (ii) Guarantee in respect of equipment loans made to a subsidiary company (plus interest at varying rates) | 712               | 1 467  |                |       | 30 |
| (iii) Guarantee given to Bank of Scotland for loan to Bulk Shipping Associates Limited                     | 1 010             | 1 812  | 1 010          | 1 812 |    |

### Note 26. Commitments

Capital commitments not reflected in the accounts totalled approximately \$17 800 000 (1980 - \$20 870 000).

### Note 27. Ultimate holding company

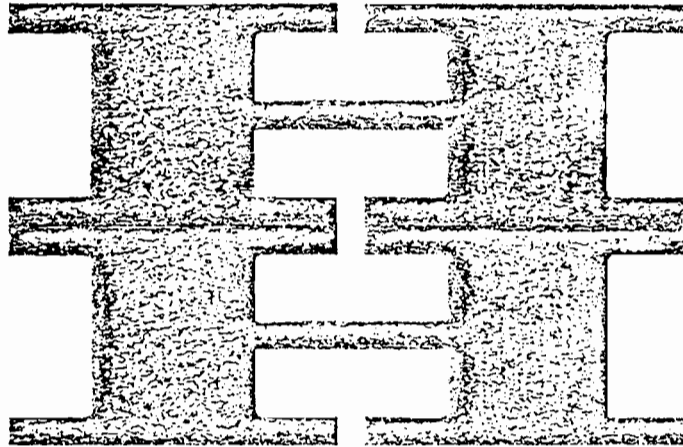
The ultimate holding company of the Company is The Rio Tinto-Zinc Corporation Limited (incorporated in England).

### Note 28. Estimates of debts receivable and liabilities payable calculated from respective balance sheet dates

|                                               | Hamersey Holdings |                | Hamersey Holdings and its guarantor subsidiary |                | 50 |
|-----------------------------------------------|-------------------|----------------|------------------------------------------------|----------------|----|
|                                               | 1981              | 1980           | 1981                                           | 1980           |    |
|                                               | \$000             | \$000          | \$000                                          | \$000          |    |
| <b>Debts receivable</b>                       |                   |                |                                                |                |    |
| not later than 2 years                        | 211 712           | 186 543        | 78 107                                         | 51 868         |    |
| later than 2 years but not later than 5 years | 55 464            | 85 202         | 5 759                                          | 6 150          |    |
| later than 5 years                            | 96 227            | 114 758        | 7 700                                          | 10 819         |    |
|                                               | <u>373 403</u>    | <u>386 503</u> | <u>92 566</u>                                  | <u>68 837</u>  |    |
| <b>Liabilities payable</b>                    |                   |                |                                                |                |    |
| not later than 2 years                        | 106 838           | 93 143         | 211 544                                        | 197 378        |    |
| later than 2 years but not later than 5 years | 65 464            | 65 102         | 65 670                                         | 58 334         |    |
| later than 5 years                            | 94 757            | 113 660        | 94 757                                         | 113 660        |    |
|                                               | <u>267 059</u>    | <u>271 905</u> | <u>371 971</u>                                 | <u>369 372</u> |    |



HAMERSLEY HOLDINGS LIMITED



ANNUAL REPORT  
1982

# Hamersley Holdings Limited

(Incorporated in the Australian Capital Territory)

## Directors

T. Barlow (Chairman of Directors)  
I.F. Burston  
J.T. Ralph

## Secretaries

J.R. Wood  
R.M. Houston

## Registered Office

Level 4, 24 Marcus Clarke Street,  
Canberra City ACT

## Principal Office

29th Floor, 55 Collins Street,  
Melbourne Victoria  
Tel (03) 658 3333

## Share and/or Loan

### Security Registers

ACT  
Level 4, 24 Marcus Clarke Street,  
Canberra City  
VIC

84 Flinders Lane Melbourne

55 Collins Street Melbourne  
NSW

60 Margaret Street Sydney

WA

191 St. George's Terrace Perth

NEW YORK USA

111 Wall Street New York

## Stock Exchanges

Australian Debiture Stock

Listed on Exchanges in

all Australian States

## Bankers

Westpac Banking Corporation

## Auditors

Coopers & Lybrand

## Solicitors

Arthur Robinson & Co

## Notice of meeting

The Annual General Meeting of Hamersley Holdings Limited will be held at 11.00 a.m. on Friday 15 April 1983 on the 34th floor of the ANZ Tower, 55 Collins Street, Melbourne

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A separate notice of meeting and proxy form is enclosed. All shareholders are cordially invited to attend.

The closing date for the receipt of nominations for the office of director to be voted on at the Annual General Meeting is 21 March 1983.

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## Contents

|                                   |        |
|-----------------------------------|--------|
| Notice of meeting                 | page 1 |
| Chairman's statement              | 2      |
| Review of operations              | 3      |
| Directors' report                 | 7      |
| Statement of earnings             | 10     |
| Balance sheet                     | 11     |
| Notes to accounts                 | 12     |
| Sources and applications of funds | 20     |
| Statement by directors            | 20     |
| Auditors' report to members       | 20     |

30

EXHIBIT "6"-Annual Reports of Hamersley Holdings Limited for the years 1976, 1978, 1981 and 1982

# Chairman's statement

## Improved performance

Earnings for 1982 of \$64.7 million were a significant improvement over the previous year's result of \$17.2 million. In terms of capital employed in the Company, the resulting return was 4.4%.

The improved profit performance was achieved on the lowest sales tonnage since 1973. The main influence on the profit improvement was price increases negotiated at the beginning of 1982 on sales contracts, coupled with the devaluation through the year of the Australian dollar against the U.S. dollar.

During the year an independent revaluation was undertaken of fixed assets not previously revalued in 1979, resulting in an increase in net asset values of \$383 million.

## Low capacity utilisation increasing costs

The synchronised global business recession of 1982 has drastically reduced demand for the Company's products. In Japan, the major market for Hamersley, crude steel production fell below 100 million tonnes for the first time since 1971.

As a consequence, the Company's sales in 1982 represented 60% of installed productive capacity and stocks of ore held at the mines and port exceeded 13 million tonnes at the close of the year. This puts extreme pressure on unit costs in a Company with a high fixed cost structure due to the nature and geography of its operations. Cost containment has accordingly been a priority objective of management.

The economic outlook around the world remains bleak and uncertain. Even if there is some improvement in economic activity later in 1983, a lag must be expected before this is transmitted into any substantial increase in the demand for steel and, consequently, for iron ore. The Company will thus be forced to operate facilities at a low utilisation level in 1983, necessitating maintenance of stringent cost reduction policies.

## Industrial relations

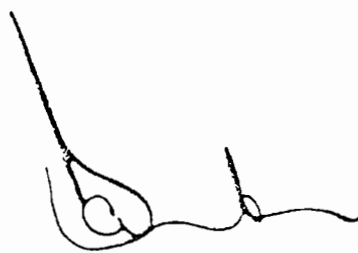
Time lost to industrial stoppages in 1982, while less than in 1981, was still a major disruptive influence on

productivity achievement and continuity of the operations. This continued to bring into question in the market-place the competitiveness of the Company and its reliability as a supplier.

In the shrinking market for iron ore arising from the massive industrial restructuring now taking place around the world, a sound competitive position and a reputation for reliability are paramount to the Company preserving its market share. Management is devoting its full attention to improving industrial relations within the Company. There are signs which give encouragement that some progress is being made.

## Processing obligations

Agreements with the State of Western Australia, under which subsidiaries of the Company hold long term mineral leases, require that proposals for the establishment of a plant to produce metalised agglomerates be submitted to the Government. At the request of the Company the Government has agreed to the deferment of the date for submission of proposals until August 1984.



T. Barrow  
Chairman  
23 February, 1983

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EXHIBIT "6"-Annual Reports of  
Hamersley Holdings Limited for the  
years 1976, 1978, 1981 and 1982

# REVIEW OF OPERATIONS

## Marketing

The year saw a sharp decline in global crude steel production, from 720 million tonnes in 1981 to 650 million tonnes in 1982, with the second half of the year registering the main decrease.

The Company's shipments totalled 28.3 million tonnes, comprising 12.8 million tonnes of high grade lump and 15.5 million tonnes of high grade fines, compared to a total of 29.1 million tonnes in 1981.

Sales to Japan decreased marginally over the previous year and accounted for about 65% of total Company shipments. Underservicing of contracted tonnages by the Japanese Steel Mills remains a major concern for the Company and with the continued depressed forecast for the Japanese Steel industry the outlook for 1983 promises little change over 1982. Price increases averaging 17.1% were implemented from 1 April 1982.

European shipments were affected by the significant decline in EEC steel production, particularly in the second half of the year, caused by reduced domestic and export markets resulting in severe production cutbacks under EEC rationalisation policies.

Sales to Asian markets (other than Japan) showed a marginal increase commensurate with plant expansion and steady demand for steel in the region despite the global situation.

Whilst the pricing gains in 1982 were substantially eroded by the underservicing of contracts, currency movements contributed favourably to sales revenue.

The inability of the world economy to recover quickly from the present recession indicates a difficult year ahead. With high stock levels at the port and production capacity exceeding likely demand for the Company's product, the Company will be forced to reduce production further in 1983.

## Mining and Processing

Total saleable output from Tom Price and Paraburadoo mines was 33.6 million tonnes compared with 28.2 million tonnes in 1981.

Recovery of saleable ore from material mined decreased to 50.0% as a consequence of the commencement of Section 6 development at Tom Price and a continuing low rate of concentrator throughput.

Output of saleable ore from the Tom Price mine was 21.2 million tonnes including 4.0 million tonnes from the concentrator compared with 18.0 million tonnes in 1981. Production included 12.0 million tonnes of high grade lump ore. Total material mined was 40.7 million tonnes.

Paraburadoo saleable production totalled 12.3 million tonnes compared with 11.2 million tonnes in 1981. Production of high grade lump ore was 6.4 million tonnes. Total material mined was 26.4 million tonnes.

Saleable product held in stockpiles at the beginning of 1982 totalled 3.1 million tonnes. This total increased to 13.4 million tonnes at the end of the year due to depressed sales levels.

Operational performance of both mines and crushing and screening plants was satisfactory.

The conversion of the Tom Price haul truck fleet to 170 ton haul trucks was completed by the addition of a further 13 units. These larger, more efficient units will ensure maintenance of productivity levels despite increasing haul distances.

A hydraulic excavator was commissioned on a trial basis at Tom Price as a primary loading unit. During the year, it was able to demonstrate satisfactory productivity and suitability for the mining operation. Evaluation of its mechanical reliability and availability is still being undertaken.

## Concentrator

The Concentrator produced 4.0 million tonnes of saleable ore in 1982 comprising 2.8 million tonnes of high grade lump ore and 1.2 million tonnes of high grade fines.

Capital works in the fine ore processing circuit were completed in the final quarter and present indications are that fines treatment

will no longer constitute a capacity bottleneck.

Metallurgical trials were conducted to examine limitations in the washing and screening plant when processing refractory ore types. Plant modifications are to be tested in early 1983.

System redesign at the low grade head was carried out and alterations have been completed which have increased reliability and capacity of the concentrator feed circuit.

Metallurgical performance as indicated by saleable product grade was to expectation.

## Shipping

Throughout 1982 bunker prices stabilised at the lower levels established towards the end of 1981. Freight levels continued to decline, particularly during the second half of the year, conditioned by a weak demand pattern and a significant inflow of new vessels.

## Rail

The railway system hauled a gross tonnage of 55.4 million tonnes to achieve 34.1 million tonnes of saleable ore. This was a significant increase over 1981 levels, with the eight train per day programme still providing a comfortable margin of available haulage capacity.

During the year 210 car train consists were introduced on a trial basis for long term evaluation of handling characteristics, equipment performance and cost effectiveness. These larger trains are now running regularly and at 26,000 tonnes gross weight are heavier than the nearest units operating in the world.

Five locomotives were replaced with new units during the second half of the year.

Continuing improvements in maintenance practices and technology assisted in the achievement of cost efficiencies and record levels of equipment performance.

The Centralised Train Control and Communication systems continued

to provide safe and efficient traffic movements

The third year of the sleeper replacement programme was completed in record time with a planned 80 500 new concrete sleepers being laid in 59 working days. Approximately 50% of the mainline track between Dampier and Tom Price has now been converted to concrete sleepers. The use of concrete sleepers and a rail profile grinding programme are now making a substantial contribution to improved track quality and reduced maintenance costs

## Ports

A total of 28.4 million tonnes was shipped compared with 29.1 million tonnes in 1981, reflecting the continuing depressed world market for iron ore.

At East Intercourse Island, modification to shiploading equipment, including shiploader boom lightening and trupper stiffening, allowed the loading rate to be increased to 9 000 tonnes per hour. During 1983 an upgrading of berthing facilities will be undertaken to permit acceptance of larger energy efficient vessels currently operating on the Japan/Pilbara route.

The Parker Point wharf, ship loader and berthing basin upgrade was completed in June. As a consequence vessels of a nominal 140 000 DWT have loaded at that facility giving a far greater degree of flexibility to total port operations.

Ten tankers discharged a total of 214 700 tonnes of fuel at the service wharf. Fuel storage was held at satisfactory levels throughout the year.

All services connected with port operations and administration continued to be provided by Pilbara Harbour Services Pty. Limited.

## Pellet Plant

The Plant remained on a care and maintenance basis for the duration of 1982.

## Power

System generation increased marginally compared with 1981, reflecting the increased take by the State Energy Commission for the Township of Karratha and the Burrup Peninsula.

System generating efficiency and security was maintained at a high level. Consistent with the thrusts for energy conservation and efficiency, Hamersley townships showed reductions in demand of between 5% and 10%.

Heavy fuel prices increased by 6.5% reflecting the exchange rate fluctuations of the US dollar.

Negotiations are still in progress with the State Energy Commission on the supply of natural gas for power generation, now projected to be available in 1984. Concurrently investigations have been carried out for the conversion of the Dampier thermal plant to gas firing.

A joint investigation with the State Energy Commission was conducted into future power generation plant options for the Dampier station, including the use of high efficiency gas turbines with waste heat recovery.

## Occupational Health

During 1982 the Occupational Health and Safety Department consolidated its programmes for monitoring workplace conditions with particular emphasis on dust and hazardous chemicals. Audiometric testing of employees continued across all operating sites as part of the Company's hearing conservation programme.

Monitoring of noise in the workplace also continued, with a view to establishing a routine monitoring programme consistent with the requirements of the proposed Hearing Conservation Regulations due for promulgation in 1983.

Activity in the safety area concentrated on consolidation of Company wide statistical reporting functions and co-ordination of uniform safety policies and programmes throughout the Company.

The hazardous materials index was updated and substantial improvements made to data access and presentation.

Investigations into disposal techniques for unwanted hazardous materials continued in conjunction with a consultant team from Monash University. Their work is expected to assist departmental control of the disposal of unwanted hazardous materials.

## Research and Development

The metallurgical evaluation programme involving the testing of samples of ores from various locations within the Company's tenements continued. Activity was matched to exploration requirements.

Collaborative research projects with various outside organisations continued in the following areas:

- pellets for direct reduction;
- direct reduction processes related to Hamersley's raw materials;
- mineralogical properties of ores related to their processing behaviour;
- development of a model to predict the changes in certain physical characteristics of the Company's products during handling and transportation from mine to ship;
- modelling of the mine, plant, rail and port functions to help obviate bottlenecks in the operations;
- blast monitoring for final pit design and for production blast efficiency and instrumentation of final slopes;
- the simulation and automatic control of mineral treatment processes;
- the development of on-stream analysis techniques;
- the interpretation and application of vibration spectra for condition monitoring of fixed plant and mobile equipment;
- development of energy efficient housing designs and air conditioning.

The Company continued to monitor developments in the various direct reduction processes which could be applied to Hamersley products. The market for merchant direct reduced iron (DRI) product continues to be adversely affected by the current low price of scrap, a consequence of the recession in the steel industry.



Some market prospects for high grade pellets suitable for direct reduction may emerge in South East Asia over the next few years. Contact has been maintained with the companies concerned with a view to assessing the likely extent and stability of the potential market. Although Hamersley is ideally placed to service a market in this region, the situation is complicated by the large oversupply of high quality pellets now available at low prices on the world market.

## Exploration

Work on progressive evaluation of known Marra Mamba and Brockman type deposits was suspended in 1982 and exploration effort was directed entirely to the search for hematite orebodies in concealed situations within range of the existing mines and infrastructure.

Ground gravity-magnetic surveys were completed in the east Brockman Syncline and the southern Mt. Pynton — Mt. Margaret area over prospective areas interpreted from aeromagnetic data.

Geophysical logging of drill holes was carried out at Tom Price mine and within the Turner Syncline, providing density and magnetic data to supplement geophysical interpretation and additional information for ore type classification.

Computer modelling programmes for magnetic and gravity interpretation were upgraded and programmes developed for handling borehole logging data.

Deep rotary percussion drilling was carried out throughout 1982 on a number of concealed and blind stratigraphic and structural targets over the Mt. Turner, Mt. Samson and Mt. Tom Price sectors of the Turner Syncline. Similar drill tests were carried out over concealed anomalies in the Paraburdoo Range area. No significant mineralisation was encountered.

## Supply and Services

The procurement of capital equipment, operating materials and consumables, off-site repairs and

rebuilt and other essential services during the year entailed the negotiation and administration of over 42 000 orders and some 150 contracts with an aggregate annualised value in excess of \$150 million.

Some 15 000 tonnes of general freight (excluding fuel and explosives) was transported from Perth to operating sites.

The demand for goods and services remained flat in 1982. Significant benefits however, resulted from earlier decisions and actions taken to secure supply lines for strategic materials. Prices tended to stabilise during the year, with the goods market at year-end reflecting over-capacity in many areas, and slack demand generally.

The Company has been active in the sales tax, tariff and by-law areas in response to new legislation having the potential to adversely affect procurement costs.

## Environmental

Advances in the application of new technology to control dust emissions throughout the operations were achieved during the year. Assessment of haul road stabilisation by a chemical, new for this use in Australia, showed potential for major savings in costs for road watering and road maintenance. A large scale evaluation is scheduled for 1983. On-line moisture analysis was established at the port to provide better control of water addition to the ore for dust suppression. Combined with selective use of water spray systems this control technique has demonstrated the ability to achieve effective dust control with limited water use.

Investigation of the extent of industrial wastes generated, especially oils and chemicals was commenced, and from the initial stage of this study, action was taken to recover used oils for blending with boiler fuel.

Rehabilitation of Pellet Plant limesand leases near Dampier was completed.

The extensive herbarium collected for the Mt. Tom Price and Paraburdoo

regions has been collated and catalogued. Through collaboration with the Western Australian Wildlife Research Centre, the herbarium will form the basis of a Pilbara collection to be housed in the new Karratha Community College administered under the direction of the State.

## Towns

The Company towns of Tom Price, Paraburdoo and Dampier have made further moves towards normalization this year. On 17 November, 1982 an Agreement was signed with the Shire of West Pilbara pursuant to which the Shire will progressively, commencing on 1 January, 1983, take over all facilities of a municipal nature within the towns of Tom Price and Paraburdoo. This will allow for the normal development of those towns in the same manner as any other country town in Western Australia. Discussions with the Shire of Roebourne with respect to Dampier are ongoing.

The Public Works Department will take over certain responsibilities in relation to water and sewerage services for Dampier, Tom Price and Paraburdoo and it is anticipated that the hospitals, schools and police stations will also be taken over by the State by July next year.

As forecast in the 1981 Annual Report, the Company launched its Home Ownership Plan in July 1982, after appropriate legislation was passed by the Western Australian Government changing the nature of the landholding in the towns from leasehold to freehold. This was necessary to allow the sale of homes to employees.

Extensive surveys to permit individual lot titles will be conducted over the next three years. The Company has agreed to sell 400 houses and as at 31 December, 1982, was in the process of concluding contracts of sale for 250 houses of which 53% are being purchased by wages employees. The Company is delighted with this response.

Continuing investment by commercial and private enterprise in the towns has been very satisfying.

## Industrial Relations

The first half of the year saw a substantial amount of industrial activity causing lost time. Much of this lost time was attributable to a major strike concerning absences of union convenors and spanned a five week period during March and April affecting all areas of the Company's operations. Industrial action by employees of the Company during the year resulted in a loss of 10.58% of available hours.

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Negotiations for a new industrial agreement were completed at the end of January. However, only three of the nine unions accepted the Company's offer with the remaining six opting for an award arbitrated by the Western Australian Industrial Commission. The arbitration of that award involved lengthy hearings on site and was completed in October. The Commission handed down its award on 10 December, 1982.

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Activity in the Western Australian Industrial Commission throughout the year has been significant. The strike in March/April caused the Commission to direct the Assistant Registrar at Karratha to undertake an enquiry into the Company's industrial relations procedures. The results of that enquiry are not yet to hand. However, experience throughout the year indicates that those procedures have the support of the bulk of the workforce and are working satisfactorily.

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The considerable investment in time and effort in 1982 towards improving the industrial relations climate resulted in a decreasing incidence of time lost towards the end of the year. It is hoped a more stable and responsible attitude is now emerging.



I.F. Burston  
Managing Director  
Hamersley Iron Pty. Limited  
23 February, 1983



# Directors' report

## Hamersley Holdings Limited

(Incorporated in the Australian Capital Territory)

Your Directors have pleasure in presenting the Annual Report and Group Accounts of Hamersley Holdings Limited ("the Company") and its subsidiaries for the year ended 31 December, 1982 ("the financial year").

### Directors

At the date of this Report, the following are Directors of the Company.

| Director     | Shareholdings in the Company and in related corporations as shown in the Register of Directors' Shareholdings at January 21, 1983 |       |        |       |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------|-------|--------|-------|
|              | HHL                                                                                                                               | BCL   | CRA    | COM   |
| T. Barlow    | —                                                                                                                                 | 3 217 | 17 542 | 3 736 |
| J.T. Ralph   | —                                                                                                                                 | 171   | 557    | —     |
| I.F. Burston | —                                                                                                                                 | —     | —      | —     |

All above shareholdings are held beneficially.

Mr J.T. Ralph is also a director of Group Custodian Pty Limited and CRA Group Staff Fund Pty Limited, which were at 21 January 1983 the registered holders of the following shares as Custodian Trustees for the CRA Group Staff Superannuation funds.

| HHL | BCL     | CRA       | COM     |
|-----|---------|-----------|---------|
| —   | 553 000 | 1 834 420 | 355 400 |

### ABBREVIATIONS

- CRA — CRA Limited ordinary shares of 25 cents each
- BCL — Bougainville Copper Limited ordinary shares of 100 cents each
- COM — Comgold Limited "A" class shares of \$1 each which includes new issue shares accepted pursuant to offer of offer dated 20 January 1983, payment for which was required to be made by 22 February 1983
- HHL — Hamersley Holdings Limited ordinary shares of 25 cents each. Hamersley Holdings Limited shares ceased to be listed on Australian Stock Exchanges from 20 January 1982 due to an insufficient spread of shareholdings.

### Activities

The principal activities of the corporations in the Group during the financial year were mining, transport, and shipping of iron ore, exploration for mineral deposits, servicing of sales contracts, provision of tug, harbour and ship agency services, shipbroking and consultancy, participation in shipping ventures, raising of finance for such purposes and investment of surplus funds. During the financial year, no significant change occurred in the nature of the activities of any of the corporations of the Group.

### Revenue

Net sales revenue of the Group increased by 29% from \$449 420 000 in 1981 to \$578 933 000 in 1982 due to higher prices and a more favourable \$US/\$A exchange rate, notwithstanding reduced shipments resulting from depressed market conditions.

### Earnings

Consolidated net earnings were \$54 885 000 for the year 1981, \$17 178 000,

EXHIBIT "6"—Annual Reports of Hamersley Holdings Limited for the years 1976, 1978, 1981 and 1982

## Subsidiaries

No subsidiaries were acquired or disposed of during the financial year.

## Reserves and provisions

A comprehensive review of all provisions was made at the end of the financial year.

The following material movements occurred in reserves and provisions during the financial year:

|                                                                                                         |                                                                                                      |    |
|---------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|----|
| Hamersley Holdings Limited<br>Equity in Associate Company Reserve<br>— transfer to \$219 000            | Pilbara Harbour Services Pty. Limited<br>Long Service Leave Provision<br>— net transfer to \$810 000 |    |
| Hamersley Iron Pty. Limited<br>Employee Benefit and Other Provisions<br>— net transfer from \$1 336 000 | Fixed Assets Revaluation Reserve<br>— net transfer to \$6 874 000                                    | 10 |
| Long Service Leave Provision<br>— net transfer to \$923 000                                             | Hamersley Japan Limited<br>Long Service Leave Provision<br>— net transfer from \$34 000              |    |
| Exchange Fluctuation Provision<br>— net transfer to \$3 786 000                                         |                                                                                                      |    |
| Fixed Assets Revaluation Reserve<br>— net transfer to \$375 323 000                                     |                                                                                                      |    |

There were no other material movements in reserves or provisions and contribution in the Group during the financial year.

## Shares and debentures

Except as mentioned in this Report no issues of shares or debentures were made by any corporation in the Group during the financial year.

During 1981 the Company negotiated alterations to the terms of issue of its series 'K' debenture stock (created March 1979) to provide more flexibility in the management of its loan funds. As a result of the alterations the series 'K' stock certificate issued in 1979 was cancelled on 27 January 1980 and a new series 'K' debenture stock was issued on the same date to secure the same amount of \$20 100 000.

## Dividends

A final dividend of 10¢ of 5¢ per share was declared by the Company on 8 February 1981 and was paid on 6 May 1981. The dividend was mentioned in the 1980 Report.

The Company did not declare an interim dividend for 1981.

A final dividend of 1980 of 5¢ per share was declared on 10 February 1981 and was paid on 6 May 1981.

## Additional information

(a) Special dividends which the Company are entitled to receive as Director of the Company, are:

Statement of Dividends for the financial year and Balance Sheet as at the end of the financial year were made up to the reasonable steps to ascertain the exact amount of dividend to the writing off of the dividend to cause all known debenture holders to be written off and adequate provisions to be made for doubtful debts.

(b) At the date of this Report the Directors of the Company are not aware of any circumstances which would render the dividend written off for debenture holders of the group or for other corporations in the Group inadequate to any substantial extent.

(c) The Directors of the Company restore the Statement of Dividends for the financial year and Balance Sheet as at the end of the financial year were made up to the reasonable steps to ascertain whether any known assets of the Company were available to pay the dividend to the holders of the business. Their value as at the end of the financial year was \$17 000 000 and was available for 1981. It would be paid in 1981.

(d) At the date of this Report the Directors of the Company are not aware of any circumstances which would render the dividend written off for debenture holders of the group or for other corporations in the Group inadequate to any substantial extent.

(e) A copy of the Report of the Director of the Company is available at the

date of this Report either —  
— in a copy of the assets of any corporation in the Group or  
— in a copy of the assets of any corporation in the Group

which was in effect at the end of the financial year.

(f) At the date of this Report the Directors of the Company are not aware of any circumstances which would render the dividend written off for debenture holders of the group or for other corporations in the Group inadequate to any substantial extent.

(g) The Directors of the Company are not aware of any circumstances which would render the dividend written off for debenture holders of the group or for other corporations in the Group inadequate to any substantial extent.

(h) The Directors of the Company are not aware of any circumstances which would render the dividend written off for debenture holders of the group or for other corporations in the Group inadequate to any substantial extent.

(i) Between 1979 and 1981 the Company has not made any dividend payments to debenture holders of the group or for other corporations in the Group.

substantially the results of the operations of any corporation in the Group for the next succeeding financial year.

(j) (i) As at 10 February, 1983, there were 659 ordinary shareholders who held all the Company's issued capital on which the voting rights are one vote for each share held.

(ii) As at 10 February, 1983, the twenty largest holders of the ordinary shares of the Company held a total of 99.95% of the issued ordinary shares of the Company. Of this total, 65.43% (158,703,480 shares), was held by CRA Limited, 55 Collins Street, Melbourne, Victoria, in which the following companies have a substantial interest:

Tinto Holdings Australia Pty Limited (formerly CRA Holdings Pty Limited) 55 Collins Street,

Melbourne, Victoria, RTZ Australian Holdings Limited, and

The Rio Tinto-Zinc Corporation PLC, 60th of 6 St. James's Square, London, England,

and 29.32% (68,670,760 shares) was held by Conzinc Mines Limited, 55 Collins Street, Melbourne, Victoria, in which the following companies have a substantial interest:

CRA Services Limited, and

CRA Limited,

both of 55 Collins Street, Melbourne, Victoria.

(iii) As at 10 February, 1983, the distribution of the ordinary shares of the Company, which comprise the total issued capital of the Company, was:

| No. of Shares   | No. of Shareholders |
|-----------------|---------------------|
| 1 — 1,000       | 618                 |
| 1,001 — 5,000   | 50                  |
| 5,001 — 10,000  | 1                   |
| 10,001 and over | 10                  |
| <b>Total</b>    | <b>659</b>          |

(k) Since 31 December, 1981, Messrs. T. Barrow, F. Barrett, J. T. Bacon and G. B. Barrow, none of whom is or was a Director or Alternate Director of the Company, and who was engaged in the full-time employment of the Company, and/or its related corporations, have received or become entitled to receive in connection with their employment a fixed salary and other benefits relating to such employment. Save as at present and save as to any pro rata payment of, or entitlement to, emoluments such as are included in the Group Accounts for the financial year, since 31 December, 1981, no Director of the Company has received, or become entitled to receive, a benefit (other than a benefit included in the aggregate amount of Directors' emoluments shown in the Group Accounts for the financial year, or the fixed salary of a full-time employee of the Company, by reason of a contract made by the Company or a related corporation with the Director, or with a firm of which he is a member, or with a company in which he has a substantial financial interest.

(l) The Company is a company of the kind referred to in Companies Regulation 58(6), and in accordance with Section 271 of the Companies Act 1981 and Companies Regulation 58, amounts set out in this Report and accompanying Group Accounts have been rounded off to the nearest thousand dollars.

Signed this 23 February, 1983, in accordance with a resolution of the Directors:



Ian Barrow



John Barrow

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Hamersley Holdings Limited and subsidiary companies

**Statement of earnings**

For years ended December 31

| Hamersley Holdings        |          |      | Hamersley Group |          |
|---------------------------|----------|------|-----------------|----------|
| 1982                      | 1981     |      | 1982            | 1981     |
| \$000                     | \$000    | Note | \$000           | \$000    |
| <b>Income</b>             |          |      |                 |          |
| 25 715                    | 27 183   |      | 578 933         | 449 420  |
| 19 498                    | 12 787   |      |                 |          |
| 1 078                     | 1 791    |      |                 |          |
| 46 291                    | 41 761   |      | 593 155         | 453 576  |
| <b>Costs and expenses</b> |          |      |                 |          |
| 91                        | 282      |      | 311 879         | 300 665  |
|                           |          |      | 99 793          | 78 331   |
|                           |          |      | 3 238           | 4 853    |
|                           |          |      | 1 714           | 1 209    |
| 25 715                    | 27 183   |      | 26 069          | 27 767   |
| 42                        | 200      |      | 11 058          | 1 585    |
| 25 848                    | 27 665   |      | 453 751         | 414 410  |
| 20 443                    | 14 096   |      | 139 404         | 39 166   |
| 239                       | 162      |      | 84 922          | 22 357   |
| 20 204                    | 13 934   |      | 54 482          | 16 809   |
|                           |          |      | (16)            | (43)     |
| 219                       | 413      |      | 219             | 413      |
| 20 423                    | 14 347   |      | 54 685          | 17 179   |
| 20 156                    | 18 350   |      | 187 239         | 182 601  |
| 40 579                    | 32 697   |      | 241 924         | 199 790  |
|                           |          |      |                 |          |
| (219)                     | (413)    |      | (219)           | (413)    |
| (19 404)                  | (12 129) |      | (19 404)        | (12 129) |
| 20 956                    | 20 156   |      | 222 301         | 187 239  |

Notes on pages 12 to 19 inclusive form part of this statement and are to be read in conjunction therewith

EXHIBIT "6"-Annual Reports of  
Hamersley Holdings Limited for the  
years 1976, 1979, 1981 and 1982

Hamersley Holdings Limited and subsidiary companies

**Balance Sheet**

At December 31

| Hamersley Holdings |         |                                         | Hamersley Group |           |       |
|--------------------|---------|-----------------------------------------|-----------------|-----------|-------|
| 1982               | 1981    |                                         | 1982            | 1981      |       |
| \$000              | \$000   |                                         | \$000           | \$000     | Note  |
| 60 637             | 60 637  | Capital and reserves                    |                 |           |       |
| 68 799             | 68 799  | Ordinary shares                         | 60 637          | 60 637    | 4     |
| 683                | 464     | Capital reserves                        | 880 148         | 497 338   | 5     |
| 20 956             | 20 156  | Equity in associate company reserve     | 683             | 464       | 6     |
| 151 075            | 150 056 | Retained earnings                       | 222 301         | 187 239   |       |
|                    |         |                                         | 1 163 769       | 745 678   |       |
| 151 075            | 150 056 | Outside shareholders' interest          | 12              | (4)       |       |
|                    |         |                                         | 1 163 781       | 745 674   |       |
|                    |         | Future income tax liability             | 161 798         | 159 525   | 7     |
|                    |         | Deferred liabilities                    |                 |           |       |
|                    |         | (Maturing later than one year)          |                 |           |       |
| 137 798            | 162 641 | Debenture stock and other secured loans | 177 486         | 207 246   | 8     |
| 39 688             | 44 605  | Unsecured loans                         | 710             | 332       | 9     |
| 177 486            | 207 246 |                                         | 178 196         | 207 578   |       |
|                    |         | Provisions                              | 13 531          | 13 607    | 10    |
|                    |         | Current liabilities                     |                 |           |       |
|                    |         | Bank overdraft — unsecured              | 7 545           | 9 081     |       |
| 55 038             | 47 467  | Creditors                               | 111 725         | 102 531   | 11    |
| 19 404             | 12 133  | Dividend payable                        | 19 404          | 12 129    |       |
| 344                | 218     | Income tax                              | 86 405          | 40 791    | 3     |
| 74 786             | 59 813  |                                         | 225 079         | 164 531   |       |
| 403 347            | 417 115 | <b>Total funds</b>                      | 1 742 385       | 1 290 915 | 20    |
|                    |         | These funds are represented by          |                 |           |       |
|                    |         | Fixed assets                            |                 |           |       |
|                    |         | Property, plant and equipment           | 1 430 794       | 1 099 604 | 12    |
| 220 716            | 250 477 | Subsidiary companies                    |                 |           | 13    |
| 693                | 474     | Investments                             | 693             | 474       | 15    |
| 1 583              | 1 470   | Advances                                | 15 201          | 17 170    | 16    |
|                    |         | Future income tax benefit               | 1 247           | 615       | 7     |
|                    |         | Current assets                          |                 |           |       |
|                    |         | Stocks and stores                       | 118 331         | 87 956    | 17    |
| 180 354            | 164 683 | Debtors                                 | 30 280          | 36 267    | 18    |
|                    |         | Short term deposits                     | 120 290         | 38 062    | 19    |
| 1                  | 11      | Cash and bank balances                  | 562             | 463       |       |
| 180 355            | 164 694 |                                         | 270 663         | 162 956   |       |
|                    |         | Deferred expenditure                    | 6 542           | 7 387     | 20    |
|                    |         | Exchange fluctuation                    | 17 345          | 2 307     | 21(0) |
| 403 347            | 417 115 | <b>Total assets</b>                     | 1 742 385       | 1 290 915 | 30    |

Notes on pages 12 to 19 inclusive form part of this statement and are to be read in conjunction therewith.

Contingent liabilities refer to Note 24  
 Commitments refer to Note 25

Hamersley Holdings Limited and subsidiary companies  
Notes to and forming part of the financial statements

Note 1. Summary of accounting policies

The accounting principles adopted by the holding company and its subsidiaries are in accordance with the accounting standards required by the Australian accounting profession and/or by law and are consistent with those adopted in the previous year, unless otherwise stated.

(a) Historical cost convention

The accounts have been prepared under the historical cost convention and have not been adjusted to take account of the current costs of specific assets or their impact on the operating results except to the extent that they are reflected in the valuation of certain non-current assets.

(b) Consolidation of subsidiaries

Conventional consolidation principles are applied to the accounts of the subsidiary companies listed in Note 13.

(c) Consolidation of associates

Equity accounting is applied in respect of the group interest in earnings and reserves of associates being those companies in which the Hamersley group's equity shareholding is from 20 to 50% together with participation in commercial and policy decisions. Equity in earnings and reserves of associates is usually only recognised to the extent of net asset backing.

(d) Income tax

The income tax charge is calculated on earnings before tax, after allowing for permanent differences. Certain items of expense, principally depreciation and other provisions, are claimed for tax purposes in different years from those in which they are charged against earnings and the resulting taxation timing differences are reported as future tax liability or future tax benefit. It is not group policy to carry forward any part of these differences as an asset where there can be doubt as to its eventual recovery. While this policy has not changed, the procedures for its application were revised in 1982 and as a result the tax expense for the period was reduced by \$752,296 of which \$487,346 relates to prior years.

(e) Foreign exchange

Monetary assets and liabilities (and contingent liabilities — Note 24) in foreign currencies have been translated to Australian currency at the rates of exchange ruling at balance date. Net unrealised exchange gains/losses on overseas borrowings are reflected in an exchange fluctuation account and are being provided for over the period of related borrowings. Other monetary gains and losses are recognised as they occur. Assets, liabilities and earning statement items of overseas subsidiaries have been translated into Australian currency at the rate ruling at balance date. All gains and losses arising on translation have been transferred to a "translation fluctuation reserve" as part of shareholders' equity. This is a change from the "temporary" or "historic" method used in previous years. 1981 comparative figures have been adjusted to reflect the minor prior period effect of this change.

(f) Depreciation of property, plant and equipment

The annual charge for depreciation is determined by dividing the written down value of individual assets by the lesser of their remaining economic useful life or 20 years.

(g) Maintenance and repairs

Maintenance and repair costs, including minor renewals, are charged against earnings as incurred. Provisions are raised in respect of periodic overhauls of major operating plant, the cycle of which extends beyond one financial year.

(h) Stock valuations

Stocks of ore and pellets are valued at the lower of net realisable value and direct production costs. Costs are assigned to stocks on a FIFO basis after adjustment for approximations and include all materials, labour and overheads relating directly to the mining, treatment and storage processes. This is a change from the basis of valuation used previously. The effect of this change on earnings is shown at Note 2(c). Stores stocks are valued at cost with due allowance for obsolescence.

(i) Exploration expenditure

Expenditure on exploration, evaluation or research of individual projects is written off as incurred, however, when a project reaches the stage where future expenditure is expected to be recouped through development or sale, all subsequent expenditure is capitalised. Projects for which expenditure is carried forward as an asset are subject to annual review and written down to estimated realisable value if a permanent diminution in value is considered to have occurred.

(j) Development expenditure

Development expenditure in the initial establishment of access to mineral reserves, together with capitalised exploration and evaluation expenditure in respect of that project, is carried forward as part of the cost of the mine property and with the written down value amortised over the shorter of the mine life or twenty years. Subsequent development expenditure is charged against earnings as incurred, except when such expenditure results in significant future benefits, when it is carried forward as an asset and amortised over the lesser of the period of the benefit or twenty years.

(k) Capitalisation of interest

Interest on funds borrowed for major capital projects is capitalised as a project cost from commencement of operations.



**Note 2. Earnings before tax**

(a) Earnings before tax is arrived at after charging and crediting the following items

|                                                     | Hamersley Holdings |        | Hamersley Group |        |
|-----------------------------------------------------|--------------------|--------|-----------------|--------|
|                                                     | 1982               | 1981   | 1982            | 1981   |
|                                                     | \$000              | \$000  | \$000           | \$000  |
| <b>Charges</b>                                      |                    |        |                 |        |
| Interest paid, payable                              |                    |        |                 |        |
| — Subsidiary                                        | 3 713              | 4 623  |                 |        |
| — Other borrowings                                  | 22 002             | 22 560 | 26 069          | 27 767 |
| Provisions for future liabilities (Note 10)         |                    |        | 913             | 2 303  |
| Auditors' remuneration (Note 23)                    | 23                 | 34     | 141             | 151    |
| Government royalties                                |                    |        | 33 933          | 25 202 |
| Loss on sale of fixed assets                        |                    |        | 27              | 1 700  |
| Bad debts                                           |                    |        | 14              | 2      |
| <b>Credits</b>                                      |                    |        |                 |        |
| Interest on short term deposits                     |                    |        |                 |        |
| — Related corporations                              |                    |        | 11 638          | 1 593  |
| — Other                                             |                    |        | 679             | 1 145  |
| Profit on sale of fixed assets                      |                    |        | 240             | 1 229  |
| Profit on sale of investment in related corporation |                    | 48     |                 | 48     |
| Dividend from unrelated company                     | 1                  | 1      | 1               | 1      |

(b) 1982 includes additional depreciation of \$27 462 as a result of revaluation and changes in asset lives of certain fixed assets in 1982 (Figure in \$000's)

(c) Change in basis of ore stock valuation decreased net earnings by \$3 391 (figure in \$000's)

**Note 3. Income tax**

(a) The prima facie tax payable on the operating profit differs by more than 15% from the income tax provided in the accounts and is reconciled as follows

|                                                    | Hamersley Group |         |
|----------------------------------------------------|-----------------|---------|
|                                                    | 1982            | 1981    |
|                                                    | \$000           | \$000   |
| Operating profit before tax                        | 139 404         | 39 166  |
| Prima facie tax at 46%                             | 64 126          | 18 016  |
| Tax effect of permanent differences                |                 |         |
| Rebateable dividends and exempt income             | (319)           | (596)   |
| Investment and other allowances                    | (4 173)         | (2 912) |
| Net exchange losses                                | 5 364           | 708     |
| Non-allowable depreciation                         | 23 352          | 10 946  |
| Other                                              | 437             | 167     |
| Under/(over) provision in previous year            | (3 865)         | (4 072) |
| Income Tax Expense                                 | 84 922          | 22 357  |
| Tax effect of timing differences                   |                 |         |
| Deferred Depreciation                              | (5 747)         | (9 756) |
| Stock/Inventory valuation                          | (4 057)         | 4 633   |
| Disallowed provisions                              | (1 229)         | (326)   |
| Other                                              | 10              | 570     |
| Under/(Over) provision in previous years           | 9 375           | (1 698) |
|                                                    | 83 275          | 5 790   |
| Unpaid portion of prior years income tax liability | 3 130           | 35 011  |
| Provision for income tax                           | 86 405          | 40 791  |

(b) The effective rate of income tax for Hamersley Holdings Limited is negligible as the majority of its taxable earnings comprises rebateable dividends

**Note 4. Capital**

(a) Authorised capital

The authorised capital of the Company comprises 300 000 000 ordinary shares of 25 cents each \$75 000 000 (1981) — \$75 000 000.

(b) Issued capital

The issued capital of the Company is 242 950 000 ordinary shares of 25 cents each fully paid \$60 637 500 (1981) — \$60 637 500.

**Note 5. Capital reserves**

|                                    | Share   | Fixed Asset | Other | Total   |
|------------------------------------|---------|-------------|-------|---------|
|                                    | Premium | Revaluation |       |         |
|                                    | \$000   | \$000       | \$000 | \$000   |
| <b>Hamersley Group</b>             |         |             |       |         |
| Balance December 31, 1981          | 68 425  | 428 486     | 417   | 497 328 |
| Asset revaluation January 1, 1982  |         | 362 797     |       | 362 797 |
| Translation Fluctuation            |         |             | 13    | 13      |
| Balance December 31, 1982          | 68 425  | 811 283     | 430   | 880 138 |
| <b>Hamersley Holdings</b>          |         |             |       |         |
| Balance December 31, 1981 and 1982 | 68 425  |             | 374   | 68 799  |

**Note 6. Equity in associate company reserve**

|                                       | Hamersley Holdings |       | Hamersley Group |       |
|---------------------------------------|--------------------|-------|-----------------|-------|
|                                       | 1982               | 1981  | 1982            | 1981  |
|                                       | \$000              | \$000 | \$000           | \$000 |
| Balance from previous year            | 464                | 51    | 464             | 51    |
| Movement as per statement of earnings | 219                | 413   | 219             | 413   |
| Balance December 31                   | 683                | 464   | 683             | 464   |

**Note 7. Future tax**

Movements in future tax for the year were as follows

|                                              | Hamersley Group |         |
|----------------------------------------------|-----------------|---------|
|                                              | 1982            | 1981    |
|                                              | \$000           | \$000   |
| (a) Liability                                |                 |         |
| Balance from the previous year               | 159 525         | 142 927 |
| Net effect of timing differences in the year | 2 273           | 16 598  |
| Balance December 31                          | 161 798         | 159 525 |
| (b) Benefit                                  |                 |         |
| Balance from the previous year               | 615             | 522     |
| Exchange adjustment                          | 6               |         |
| Net effect of timing differences in the year | 626             | 21      |
| Transfer from/(to) net current assets        |                 | 72      |
| Balance December 31                          | 1 247           | 615     |

**Note 8. Debenture stock and other secured loans**

The following debenture stock and secured loans are secured by fixed floating charges covering substantially all the assets of Hamersley Holdings Limited and Hamersley Iron Pty Limited. The Trust Deeds under which the debenture stock was issued place restrictions on the dividend policy of both these companies.

|                                                   | Hamersley Holdings |         | Hamersley Group |         |
|---------------------------------------------------|--------------------|---------|-----------------|---------|
|                                                   | 1982               | 1981    | 1982            | 1981    |
|                                                   | \$000              | \$000   | \$000           | \$000   |
| (a) Australian stock                              | 38 892             | 39 967  | 38 892          | 39 967  |
| (b) Secured notes                                 | 29 750             | 27 455  | 29 750          | 27 455  |
| (c) Secured debentures                            | 34 641             | 30 112  | 34 641          | 30 112  |
| (d) Series C United States stock                  | 24 452             | 23 913  | 24 452          | 23 913  |
| (e) Canadian equipment loan<br>— Series B advance | 804                | 2 184   | 804             | 2 184   |
| (f) Series K security stock                       | 24 452             | 22 142  | 24 452          | 22 142  |
| (g) Series L security stock                       | 28 214             | 26 570  | 28 214          | 26 570  |
| (h) Guaranteed debentures                         |                    |         |                 | 22 253  |
| (i) Guaranteed debentures                         |                    |         | 5 930           | 6 978   |
| (j) Guaranteed debentures                         |                    |         | 8 100           | 8 277   |
| (k) Guaranteed bearer bonds                       |                    |         | 18 125          | 19 544  |
| (l) Guaranteed debentures                         |                    |         | 14 385          | 13 052  |
|                                                   | 181 205            | 172 343 | 227 745         | 242 447 |
| Less: Installments due within 12 months           | 43 407             | 9 702   | 50 259          | 35 201  |
|                                                   | 137 798            | 162 641 | 177 486         | 207 246 |

| Description                                       | Amount outstanding<br>December 31, 1982 | Security                                    | Interest<br>rate %                       | Repayable       |
|---------------------------------------------------|-----------------------------------------|---------------------------------------------|------------------------------------------|-----------------|
| 000                                               |                                         |                                             |                                          |                 |
| Issued by<br>Hamersley Holdings Limited           |                                         |                                             |                                          |                 |
| (a) Australian stock                              | A\$38 892                               | Australian<br>debenture<br>stock            | Rates varied<br>between 5.25<br>and 10.5 | 1983 to<br>1995 |
| (b) Secured notes                                 | US\$29 750                              | Series I<br>security stock                  | 6.5                                      | 1983 to<br>1984 |
| (c) Secured debentures                            | US\$34 000                              | Series H<br>security stock                  | 8.5                                      | 1983 to<br>1982 |
| (d) Series C United States stock                  | US\$24 000                              | Series C<br>United States<br>security stock | 11.0                                     | 1983 to<br>1990 |
| (e) Canadian equipment loan<br>— Series B advance | C\$ 804                                 | Series B<br>security stock                  | 9.25                                     |                 |
| (f) Series K security stock                       | US\$27 892                              | Series K<br>security stock                  | Floating                                 | 1983            |
| (g) Series L security stock                       | US\$24 000                              | Series L<br>security stock                  | Floating                                 | 1983 to<br>1988 |
| Issued by<br>Hamersley Iron Finance N.V.          |                                         |                                             |                                          |                 |
| (h) Guaranteed debentures                         | US\$5 800                               | Series A<br>security stock                  | 9.5                                      | 1983 to<br>1985 |



Note 8 Continued

| Description                 | Amount Outstanding<br>December 31, 1982 | Security                   | Interest<br>Rate % | Repayable       |
|-----------------------------|-----------------------------------------|----------------------------|--------------------|-----------------|
| (i) Guaranteed debentures   | US\$7,950                               | Series B<br>security stock | 9.0                | 1983 to<br>1986 |
| (j) Guaranteed bearer bonds | DM 42,600                               | Series E<br>security stock | 6.75               | 1983 to<br>1987 |
| (k) Guaranteed debentures   | US\$14,119                              | Series F<br>security stock | 8.0                | 1983 to<br>1987 |

Note 9. Unsecured loans

(a) Hamersley Holdings

Repayment of the debentures and bonds referred to in Note 8 operates in priority satisfaction of these unsecured loans which include \$28,990,000 (1981 — \$32,164,000) owing to a subsidiary company.

(b) Hamersley Group

These loans are repayable over periods of up to four years. The interest rates vary between 8% and 15% per annum.

Note 10. Provisions

|                             | Balance<br>1981 | Charged to<br>earnings | Expenditure<br>& transfers | Balance<br>1982 |
|-----------------------------|-----------------|------------------------|----------------------------|-----------------|
|                             | \$000           | \$000                  | \$000                      | \$000           |
| Hamersley Group             |                 |                        |                            |                 |
| Long Service Leave          | 7,091           | 2,413                  | (1,154)                    | 8,350           |
| Employee Benefits and Other | 6,516           | (1,500)                | 165                        | 5,181           |
|                             | 13,607          | 913                    | (989)                      | 13,531          |

Some of the above provisions include amounts which may fall due within twelve months but such amounts cannot be specifically ascertained.

Note 11. Creditors

|                                                     | Hamersley Holdings |        | Hamersley Group |         |
|-----------------------------------------------------|--------------------|--------|-----------------|---------|
|                                                     | 1982               | 1981   | 1982            | 1981    |
|                                                     | \$000              | \$000  | \$000           | \$000   |
| Instalments on long term loans due within 12 months |                    |        |                 |         |
| Debenture stock and other secured loans             | 43,407             | 9,702  | 50,258          | 35,291  |
| Unsecured loans                                     | 3,332              | 2,812  | 139             | 837     |
| Trade Creditors                                     |                    |        | 18,506          | 18,333  |
| Subsidiary companies                                | 6,209              | 32,963 |                 |         |
| Other related corporations                          | 2                  |        | 847             | 492     |
| Other creditors and accrued liabilities             |                    |        |                 |         |
| Secured                                             | 1,397              | 1,096  | 4,332           | 3,187   |
| Unsecured                                           | 691                | 894    | 37,642          | 44,476  |
|                                                     | 55,038             | 47,467 | 111,725         | 102,531 |

Note 12. Property, plant and equipment

|                                              | Hamersley Group |         |
|----------------------------------------------|-----------------|---------|
|                                              | 1982            | 1981    |
|                                              | \$000           | \$000   |
| Freehold and leasehold land and buildings    |                 |         |
| — At cost                                    | 56,317          | 129,267 |
| Less accumulated depreciation                | 16,512          | 51,199  |
|                                              | 39,805          | 78,068  |
| — At independent valuation — July 1, 1979    | 73,835          | 74,860  |
| Less accumulated depreciation                | 13,426          | 10,647  |
|                                              | 60,409          | 64,213  |
| — At independent valuation — January 1, 1982 | 202,259         |         |
| Less accumulated depreciation                | 11,572          |         |
|                                              | 190,687         |         |
| Plant, machinery and equipment               |                 |         |
| — At cost                                    | 251,130         | 428,425 |
| Less accumulated depreciation                | 88,590          | 175,307 |
|                                              | 162,540         | 253,118 |
| — At independent valuation — July 1, 1979    | 769,450         | 769,763 |
| Less accumulated depreciation                | 155,622         | 119,287 |
|                                              | 613,828         | 650,476 |
| — At independent valuation — January 1, 1982 | 324,441         |         |
| Less accumulated depreciation                | 40,784          |         |
|                                              | 283,657         |         |

Note 12 Continued

|                                              | Hamersley Group  |                  |
|----------------------------------------------|------------------|------------------|
|                                              | 1982             | 1981             |
|                                              | \$000            | \$000            |
| Mine Properties                              |                  |                  |
| — At cost                                    |                  | 24 509           |
| Less accumulated depreciation                |                  | 11 377           |
|                                              |                  | <u>13 232</u>    |
| — At independent valuation — January 1, 1982 | 66 635           |                  |
| Less accumulated depreciation                | 3 331            |                  |
|                                              | <u>63 304</u>    |                  |
| Capital Works in Progress                    |                  |                  |
| — At cost                                    | 16 570           | 40 497           |
| Total                                        |                  |                  |
| — At cost                                    | 324 017          | 622 798          |
| — At independent valuation — July 1, 1979    | 843 285          | 844 623          |
| — January 1, 1982                            | 593 335          |                  |
|                                              | <u>1 760 637</u> | <u>1 467 421</u> |
| Less accumulated depreciation                |                  |                  |
| — At cost                                    | 105 102          | 237 933          |
| — At independent valuation — July 1, 1979    | 169 048          | 129 934          |
| — January 1, 1982                            | 55 693           |                  |
|                                              | <u>329 843</u>   | <u>367 817</u>   |
|                                              | <u>1 430 794</u> | <u>1 099 604</u> |

The revaluation of certain property, plant and equipment at January 1, 1982 was in accordance with an independent valuation by Fluor Australia Pty Limited, Construction Engineers and Project Managers. The increase in net asset value was \$382 797 000.

Note 13. Subsidiary companies

| (a) Shares in subsidiary companies                                                                                                                          | Place of Incorporation | Class of Share | Hamersley Holdings Investment at Cost |                |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|----------------|---------------------------------------|----------------|
|                                                                                                                                                             |                        |                | 1982                                  | 1981           |
|                                                                                                                                                             |                        |                | \$000                                 | \$000          |
| Hamersley Iron Pty Limited (100% owned)                                                                                                                     | Victoria               | Ordinary       | 42 000                                | 42 000         |
| Mount Bruce Mining Pty Limited (99.9% owned)                                                                                                                | Western Australia      | Ordinary       | 10                                    | 10             |
| Hamersley Iron Finance N.V. (100% owned and carries on business in the Netherlands Antilles)                                                                | Netherlands Antilles   | Ordinary       | 18                                    | 18             |
| Hamersley Exploration Pty Limited (99.9% owned)                                                                                                             | Western Australia      | Ordinary       | 1                                     | 1              |
| Himet Corporation Limited (99.9% owned)                                                                                                                     | Victoria               | Ordinary       | 1                                     | 1              |
| Metallised Ores Limited (99.9% owned)                                                                                                                       | Western Australia      | Ordinary       | 1                                     | 1              |
| Pilbara Harbour Services Pty Limited (100% owned)                                                                                                           | Victoria               | Ordinary       | 1 200                                 | 1 200          |
|                                                                                                                                                             |                        |                | <u>43 231</u>                         | <u>43 231</u>  |
| Hamersley Iron Pty Limited has —                                                                                                                            |                        |                |                                       |                |
| (i) a 99.9% interest in Hamersley Japan Limited, a company incorporated in Japan which carries on business in Japan.                                        |                        |                |                                       |                |
| (ii) a 100% interest in Hamersley Europe Pty Limited, a company incorporated in Victoria which carries on business at Melbourne, Perth and London, England. |                        |                |                                       |                |
| (iii) a 60% interest in Northern Cross Chartering Limited A/S, a company incorporated in Norway which carries on business in Norway.                        |                        |                |                                       |                |
| (b) Long term debts owing by subsidiary companies                                                                                                           |                        |                | 177 485                               | 207 246        |
|                                                                                                                                                             |                        |                | <u>220 715</u>                        | <u>250 477</u> |

The long term debts owing by subsidiary companies represent the borrowing of moneys borrowed by Hamersley Holdings Limited and are repayable on the same terms and conditions.

(c) Group contributions and dividends

During the year members of the group contributed to the results for the year as follows

|                            | Contributions to Consolidated Net Earnings |        | Dividends received from subsidiaries |        |
|----------------------------|--------------------------------------------|--------|--------------------------------------|--------|
|                            | 1982                                       | 1981   | 1982                                 | 1981   |
|                            | \$000                                      | \$000  | \$000                                | \$000  |
| Hamersley Holdings Limited | 925                                        | 1560   |                                      |        |
| Hamersley Iron Pty Limited | 53 448                                     | 14 889 | 19 404                               | 12 123 |

Note 13 Continued

|                                       | Contributions to consolidated net earnings |               | Dividends received from subsidiaries |               |
|---------------------------------------|--------------------------------------------|---------------|--------------------------------------|---------------|
|                                       | 1982                                       | 1981          | 1982                                 | 1981          |
|                                       | \$000                                      | \$000         | \$000                                | \$000         |
| Pilbara Harbour Services Pty Limited  | 94                                         | 659           | 94                                   | 659           |
| Hamersley Japan Limited               | 53                                         | 27            |                                      |               |
| Hamersley Europe Pty Limited          | 29                                         | 31            |                                      |               |
| Northern Cross Chartering Limited A/S | 24                                         | 66            |                                      |               |
| Mount Bruce Mining Pty Limited        | 112                                        | (49)          |                                      |               |
| Hamersley Iron Finance N.V.           |                                            |               |                                      |               |
| Hamersley Exploration Pty Limited     |                                            |               |                                      |               |
| Himet Corporation Limited             |                                            |               |                                      |               |
| Metallised Ores Limited               |                                            |               |                                      |               |
|                                       | <u>54 685</u>                              | <u>17 179</u> | <u>19 498</u>                        | <u>12 787</u> |

Note 14. Exploration and development

All costs incurred in 1982 and 1981 were written off against earnings

Note 15. Investments

|                                                                     | Hamersley Holdings |            | Hamersley Group |            |
|---------------------------------------------------------------------|--------------------|------------|-----------------|------------|
|                                                                     | 1982               | 1981       | 1982            | 1981       |
|                                                                     | \$000              | \$000      | \$000           | \$000      |
| <b>Associate</b>                                                    |                    |            |                 |            |
| Shares in unlisted company at cost                                  | 10                 | 10         | 10              | 10         |
| Add Equity in retained earnings                                     | <u>683</u>         | <u>464</u> | <u>683</u>      | <u>464</u> |
| Being shares in unlisted company at directors valuation at year end | <u>693</u>         | <u>474</u> | <u>693</u>      | <u>474</u> |
| <b>Other</b>                                                        |                    |            |                 |            |
| Shares in unlisted companies at cost                                | 45                 | 45         | 45              | 45         |
| Less Provision for possible loss                                    | <u>45</u>          | <u>45</u>  | <u>45</u>       | <u>45</u>  |
| <b>TOTAL</b>                                                        | <u>693</u>         | <u>474</u> | <u>693</u>      | <u>474</u> |

Note 16. Advances

|                                                    | Hamersley Holdings |              | Hamersley Group |               |
|----------------------------------------------------|--------------------|--------------|-----------------|---------------|
|                                                    | 1982               | 1981         | 1982            | 1981          |
|                                                    | \$000              | \$000        | \$000           | \$000         |
| The long term portion of advances comprises:       |                    |              |                 |               |
| The Rural and Industries Bank of Western Australia |                    |              | 12 271          | 13 630        |
| Government of Western Australia                    |                    |              | 1 209           | 1 950         |
| Bulk Shipping Associates Limited                   | 1 583              | 1 470        | 1 583           | 1 470         |
| Related corporation                                |                    |              | 15              | 25            |
| Other                                              |                    |              | <u>123</u>      | <u>195</u>    |
|                                                    | <u>1 583</u>       | <u>1 470</u> | <u>15 201</u>   | <u>17 170</u> |

The deposit with the Rural and Industries Bank of Western Australia is in connection with the provision of housing and services at Karratha. Hamersley Iron Pty Limited currently has a commitment to pay annual lease rentals to the Bank of approximately \$1 730 000 until the year 1992. The deposit is repayable over the same period.

The advance to the Government of Western Australia was made in connection with the supply of water to the Damper/Karratha area and is repayable by 1995.

Bulk Shipping Associates Limited, in which Hamersley Holdings Limited has a 50% interest, owns and operates a bulk ore carrier.

Note 17. Stocks and stores

|                         | Hamersley Holdings |               | Hamersley Group |               |
|-------------------------|--------------------|---------------|-----------------|---------------|
|                         | 1982               | 1981          | 1982            | 1981          |
|                         | \$000              | \$000         | \$000           | \$000         |
| Ores and pellets        | 71 994             | 42 375        | 71 994          | 42 375        |
| Stores including spares | 46 272             | 45 534        | 46 272          | 45 534        |
| Livestock               | 55                 | 57            | 55              | 57            |
|                         | <u>118 321</u>     | <u>87 966</u> | <u>118 321</u>  | <u>87 966</u> |

Refer Note 14(b) for change in basis of valuation for ore stocks

Note 18. Debtors

|                                       | Hamersley Holdings |                | Hamersley Group |               |
|---------------------------------------|--------------------|----------------|-----------------|---------------|
|                                       | 1982               | 1981           | 1982            | 1981          |
|                                       | \$000              | \$000          | \$000           | \$000         |
| Trade debtors                         |                    |                | 22 246          | 26 708        |
| Subsidiary companies                  | 180 354            | 164 683        |                 |               |
| Other related corporations            |                    |                | 422             | 321           |
| Other debtors and payments in advance |                    |                | <u>3 212</u>    | <u>9 338</u>  |
|                                       | <u>180 354</u>     | <u>164 683</u> | <u>25 880</u>   | <u>36 367</u> |

Note 19. Short term deposits

|                     | Hamersley Group |               |
|---------------------|-----------------|---------------|
|                     | 1982            | 1981          |
|                     | \$000           | \$000         |
| Related Corporation | 118 757         | 35 697        |
| Other               | 1 533           | 2 365         |
|                     | <u>120 290</u>  | <u>38 062</u> |

Note 20. Deferred expenditure

The expenditure is stated at cost less amounts amortised. The balances unamortised comprise \$59 000 (1981 — \$336 000) in respect of costs of borrowings and \$6 492 000 (1981 — \$7 549 000) being costs of railway locomotive repairs, and contributions for the erection of schools and other township facilities. These costs are being amortised over periods ranging from five to eight years.

Note 21. Exchange fluctuation

|                                                                              | Hamersley Holdings |            | Hamersley Group |              |
|------------------------------------------------------------------------------|--------------------|------------|-----------------|--------------|
|                                                                              | 1982               | 1981       | 1982            | 1981         |
|                                                                              | \$000              | \$000      | \$000           | \$000        |
| (a) Exchange loss                                                            |                    |            |                 |              |
| Realised losses/(gains) on repayment of overseas borrowings                  |                    |            | 7 833           | (260)        |
| Less: Previously provided                                                    |                    |            | 4 034           | (292)        |
|                                                                              |                    |            | <u>3 799</u>    | <u>32</u>    |
| Provision for possible net exchange losses/(gains) on future loan repayments |                    |            | 7 820           | 1 369        |
| Loss/(gain) on other monetary items                                          | 42                 | 200        | (561)           | 124          |
|                                                                              | <u>42</u>          | <u>200</u> | <u>11 058</u>   | <u>1 595</u> |
| (b) Exchange fluctuation                                                     |                    |            |                 |              |
| Net unrealised exchange losses                                               |                    |            | 29 564          | 10 240       |
| Less: Accumulated provision for possible losses                              |                    |            | 11 719          | 7 933        |
|                                                                              |                    |            | <u>17 845</u>   | <u>2 307</u> |

Note 22. Directors' emoluments

No emoluments were received, or are due and receivable (whether from the Company, or from related corporations) during the period in 1982, or in 1981, by —

(a) Directors of the Company engaged in the full-time employment of the Company and its related corporations (including all bonuses and commissions received or receivable by them as employees but not including the amount received or receivable by them by way of fixed salary as employers); and

(b) Other Directors of the Company.

No commissions for subscribing for, or agreeing to procure subscriptions for any shares in or debentures of the Company, or any related corporations were received, or are due and receivable by any Director.

Note 23. Auditors' remuneration

|                                                               | Hamersley Holdings |           | Hamersley Group |            |
|---------------------------------------------------------------|--------------------|-----------|-----------------|------------|
|                                                               | 1982               | 1981      | 1982            | 1981       |
|                                                               | \$000              | \$000     | \$000           | \$000      |
| Total amounts receivable by the Auditors of the company for — |                    |           |                 |            |
| (a) Audit of the Holding Company and Group Accounts           | 7                  | 11        | 7               | 11         |
| (b) Audit of Accounts of subsidiaries                         |                    |           | 108             | 107        |
| (c) Other services                                            | 16                 | 23        | 18              | 25         |
|                                                               | <u>23</u>          | <u>34</u> | <u>133</u>      | <u>143</u> |
| Total amounts receivable by other auditors for —              |                    |           |                 |            |
| (d) Audit of accounts of subsidiaries                         |                    |           | 8               | 3          |
|                                                               | <u>23</u>          | <u>34</u> | <u>141</u>      | <u>151</u> |

No other benefits were received by the auditors from the Company.

NOTES Continued

Note 24. Contingent liabilities

|                                                                                                            | Hamersley Holdings |        | Hamersley Group |       |
|------------------------------------------------------------------------------------------------------------|--------------------|--------|-----------------|-------|
|                                                                                                            | 1982               | 1981   | 1982            | 1981  |
|                                                                                                            | \$000              | \$000  | \$000           | \$000 |
| There are contingent liabilities outstanding on which no loss is expected, as follows                      |                    |        |                 |       |
| <b>Secured</b>                                                                                             |                    |        |                 |       |
| Debenture Stock issued as security for borrowings of subsidiary companies (plus interest at varying rates) | 46 539             | 70 104 |                 |       |
| <b>Unsecured</b>                                                                                           |                    |        |                 |       |
| (i) Stamp duty in connection with registration of trust deeds                                              | 427                | 466    | 427             | 466   |
| (ii) Guarantee in respect of equipment loans made to a subsidiary company (plus interest at varying rates) |                    | 712    |                 |       |
| (iii) Guarantee given to Bank of Scotland for loan to Bulk Shipping Associates Limited                     | 987                | 1 010  | 987             | 1 010 |

Note 25. Commitments

- (a) Capital expenditure commitments not reflected in the accounts totalled approximately \$4 544 000 (1981 — \$23 238 000)
- (b) Lease and hire commitments contracted but not provided for in the accounts are as follows —

|                          | Hamersley Group |               |
|--------------------------|-----------------|---------------|
|                          | 1982            | 1981          |
|                          | \$000           | \$000         |
| Land and Buildings       | 3 098           | 4 319         |
| Plant                    | 2 079           | 4 567         |
| Mine Properties          | 1 211           | 1 763         |
|                          | <u>6 388</u>    | <u>10 649</u> |
| Due within twelve months | 1 537           | 3 312         |
| Due after twelve months  | 4 851           | 7 337         |

Note 26. Ultimate holding company

The ultimate holding company of the Company is The Rio Tinto-Zinc Corporation PLC (incorporated in England)

Note 27. Borrowing corporation requirements

|                                               | Hamersley Holdings |                | Hamersley Holdings and its Guarantor Subsidiary |                |
|-----------------------------------------------|--------------------|----------------|-------------------------------------------------|----------------|
|                                               | 1982               | 1981           | 1982                                            | 1981           |
|                                               | \$000              | \$000          | \$000                                           | \$000          |
| <b>Debts Receivable:</b>                      |                    |                |                                                 |                |
| not later than 1 year                         | 180 354            | 164 684        | 151 460                                         | 75 592         |
| later than 1 year but not later than 2 years  | 23 730             | 47 028         | 2 015                                           | 2 515          |
| later than 2 years but not later than 5 years | 75 103             | 65 464         | 4 645                                           | 6 759          |
| later than 5 years                            | 80 236             | 96 227         | 8 417                                           | 7 700          |
|                                               | <u>359 423</u>     | <u>373 403</u> | <u>166 537</u>                                  | <u>92 566</u>  |
| <b>Liabilities Payable:</b>                   |                    |                |                                                 |                |
| not later than 1 year                         | 74 786             | 59 810         | 224 440                                         | 164 390        |
| later than 1 year but not later than 2 years  | 23 731             | 47 028         | 23 871                                          | 47 154         |
| later than 2 years but not later than 5 years | 75 102             | 65 464         | 75 521                                          | 65 670         |
| later than 5 years                            | 78 653             | 94 757         | 78 804                                          | 94 757         |
|                                               | <u>252 272</u>     | <u>277 059</u> | <u>402 636</u>                                  | <u>371 971</u> |

## Consolidated statement of sources and applications of funds

|                                              | 1982   |                | 1981   |                |
|----------------------------------------------|--------|----------------|--------|----------------|
|                                              | \$000  | \$000          | \$000  | \$000          |
| <b>Sources of Funds</b>                      |        |                |        |                |
| Net earnings                                 | 54 625 |                | 17 179 |                |
| Add: Exchange losses                         | 11 058 |                | 1 585  |                |
| Earnings from trading                        |        | 65 743         |        | 18 764         |
| Government royalties provided                |        | 33 933         |        | 25 202         |
| Depreciation and amortisation                |        | 101 607        |        | 79 540         |
| Income tax provided                          |        | 84 922         |        | 22 357         |
| Long term borrowings                         |        | 520            |        |                |
| Decrease in other working capital            |        |                |        | 13 799         |
| Other                                        |        | 7 370          |        | 1 109          |
|                                              |        | <u>293 828</u> |        | <u>160 763</u> |
| <b>Applications of Funds</b>                 |        |                |        |                |
| Expenditure on property, plant and equipment |        | 48 371         |        | 56 372         |
| Government royalties paid                    |        | 30 062         |        | 13 371         |
| Income tax paid                              |        | 37 664         |        | 1 292          |
| Loan repayments                              |        | 42 699         |        | 26 394         |
| Dividends                                    |        | 12 128         |        | 16 379         |
| Increase in cash funds                       |        | 23 663         |        | 19 474         |
| Increase in other working capital            |        | 17 983         |        |                |
| Other                                        |        | 22 626         |        | 16 362         |
|                                              |        | <u>293 828</u> |        | <u>160 763</u> |

## Statement by Directors

In the opinion of the directors —

- (a) the accounts of the company and of the group (set out on pages 10 to 13) are drawn up so as to give a true and fair view of the state of affairs as at December 31, 1982, and the results for the year ended on that date, of the company and of the group so far as they concern members of the company;
- (b) there are reasonable grounds to believe that the company will be able to pay its debts as and when they fall due.

Signed at Melbourne this 23 February, 1983, in accordance with a resolution of the directors

T. Barlow  
I.F. Burston  
Directors

## Auditors' Report to the Members

In our opinion —

- (a) the accounts and group accounts (set out on pages 10 to 13) which have been prepared under the historical cost convention stated in note 11a, together with the statement by directors are properly drawn up in accordance with the provisions of the Companies Act 1981 and so as to give a true and fair view of —
- (i) the state of affairs of the company and of the group as at December 31, 1982 and of the results of the company and of the group for the year ended on that date so far as they concern members of the holding company; and
- (ii) the other matters required by section 269 of that Act to be dealt with in the accounts and in the group accounts;
- (b) the accounting records and other records (and the registers, if applicable) that Act to be kept by the company and by its subsidiaries have been properly kept in accordance with the provisions of that Act or, in the case of the subsidiaries incorporated in a foreign State, in the Territory in which they are incorporated with the provisions of the corresponding law of that State.

The subsidiaries of which other members of the group and of related undertakings have shares which carry preference rights (viz. Finance NZ and Western Grass) are not public companies within the meaning of section 269 of the Companies Act 1981 and are not audited by a Chartered Accountant. We have examined the accounts of these subsidiaries together with the audited accounts of the company.

We are satisfied that the accounts of the subsidiaries that have been consolidated with the company accounts are in form and content appropriate and proper for the consolidated presentation of the company accounts and that we have received satisfactory information and explanations required by us for that purpose.

No additional report on the accounts of any of the subsidiaries was made available to any of our auditors and we do not give any comment thereon or thereon under section 269 of that Act.

Coopers & Lybrand  
Chartered Accountants

by D.H. Evans  
Signed at Melbourne this 23 February, 1983

**EXHIBIT "6"—Annual Reports of  
Hawersley Holdings Limited for the  
years 1976, 1978, 1981 and 1982**



PART III—WASHING

Where materials are crushed, dust created in the rushing operation is seldom entirely removed by reening. Additional dust is created in handling to and from storage. In most states, specifications require that dust be removed by washing.

Silt is usually present as a coating on grains of sand, silt, coal, clay lumps, and soft fragments corresponding to the various sizes of the aggregate. It is impossible to get rid of them by screening, so they are eliminated by the following methods:

(1) Scrubbing.—Silt and clay can be removed by scrubbing the grains together; agitating the material in the presence of water by use of blade, paddles, baffles, etc.

(2) Softening and disintegration.—Silt is removed by flow of water while sand and gravel settle.

(3) Wearing away by the force of water.—Clay softens and wears away under the effect of a stream of water directed against it.

*Washing Before Screening.*—Sand and gravel often can be washed during the screening process, but if the material carries undesirable matter, a scrubber or washer should precede the screening process.

*Scrubbing.*—When "fines and discharge" from the crushing plant are coated with clay and other sticky substances, they should be put through a rotary scrubber to scour the gravel before it goes to the screen. Material that contains a smaller amount of clay and silt may be cleaned satisfactorily by a log washer, vibrating screen with spray bars attached, or a revolving washing screen.

*Allis-Chalmers.*—This company developed a rotary scrubber with "Post-Tork" drive, a new method of driving a revolving machine. Driving force is transmitted through a conventional speed reducer to solid resilient industrial tires which rotate and support the scrubber and its load (Fig. 1). This design eliminated external gearing, metallic carrying rings, and rollers with their inherent noise, vibrations and wear. Built in five sizes, from 5x9 to 6x18-ft., to handle 30 to 400 tph—up to 7" ring size.

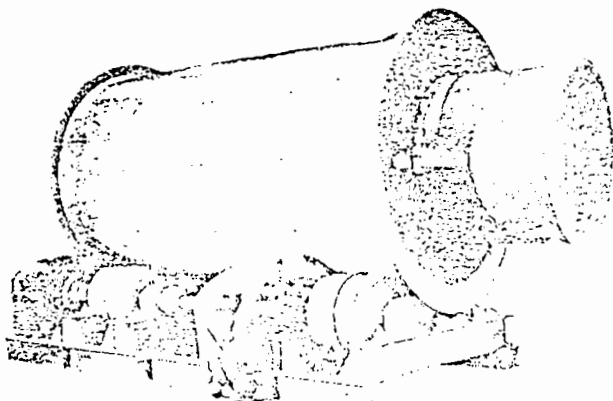


Fig. 1. Allis-Chalmers scrubber with "Post-Tork" drive. Drum rotates due to friction contact with tires that support and drive it. Speed: usually 63% of critical.

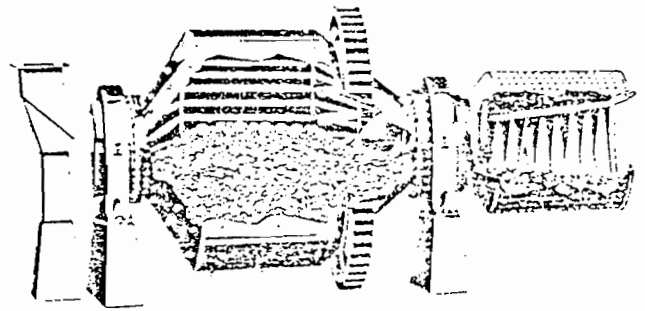


Fig. 2. Hardinge conical scrubber.

*Hardinge.*—In the Hardinge scrubber (Fig. 2) the stone or gravel enters one end of a conical-shaped drum, which rotates on trunnion bearings, and is discharged at the other end into a revolving screen. Water is introduced at the feed end in sufficient quantities to completely coat the material being cleaned. The dirty water, carrying the silt, disintegrated clay balls and sand, is discharged through the first section of the screen. Cleaning sprays, within the screen, wash the adhering dirty water from the material before the latter is discharged from the end of the screen. The scrubber proper has on its inner surface a series of steel lifters, which are arranged so that they throw the oncoming material back into the cylindrical section, the larger clay balls having a tendency to slide back and to be picked up and further disintegrated by the lifters. The conical section produces the circulating and classifying action which, coupled with the weight of the material within the drum and the rapid rotation, does the thorough scrubbing.

*Kawasaki spiral classifier* is used for sand washing in many stone crushing plants. It is also installed together with a rod mill in sand making plants. The classifier has a spiral which is attached to the main shaft and rotated in the inclined tank. As the material to be treated is fed into the tank, the sinking part is raked up continuously and thus separated from water. The slime which does not sink is discharged, flowing over the dam. There are two types of the Kawasaki spiral classifier: one is the type-H (high wear) and the other the type-S (submerged). The Type-H classifier has the rear part of the spiral partially projecting above the water level, and is suitable for classifying coarse sands. The Type-S classifier has the rear part of the spiral completely submerged in the water, and is suitable for classifying fine sands. The classifier with a double spiral will also be available for large capacity treatment.

Kawasaki spiral classifiers have spiral diameters from 300 to 1,380 mm, tank lengths from 3,300 to 12,000 mm, maximum rake-up amount capacities from 6 to 260 T/H, pool area from 1.2 to 28.0m<sup>2</sup>, spiral revolution from 4.0 to 6.5 rpm, and reduction motors: kw x poles x reduction from 1.5 x 4 x 1.20 to 22.0 x 4 x 1.50. Raked-up capacities are based on sand of specific gravity 2.7. Revolution of spiral. Raked-up subject to material be handled, grain size. Winding up for spiral is performed manually, but chain block for winding up is not provided.

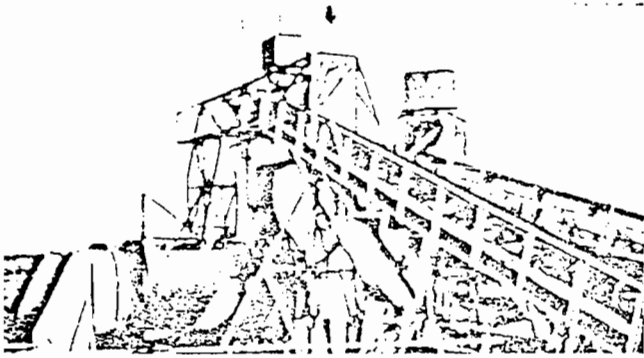


Fig. 2a. Kawasaki drum washer.

Kawasaki drum washer (Fig. 2a) available in models with feed sizes of 75 mm to 200 mm, having washing capacities from 70 to 300 T/H. Drum rpm ranges from 25 to 33.

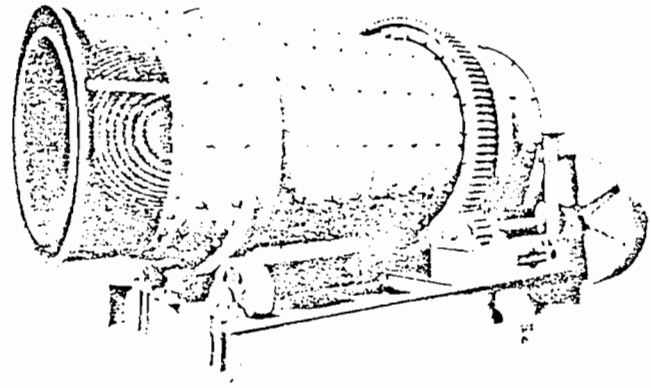


Fig. 3. McLanahan Heavy-duty cylinder scrubber

desander. These units successfully handle product sizes up to 5". McLanahan EHD Extra Heavy-Duty Scrubbers handle feeds larger than 8".

Base frames of all units maintain alignment of components on the frame. The scrubber cylinder, constructed of rolled plate sections, forms a circular drum capable of withstanding continual shock loads. A feed chute with flanged openings accepts material from conveyors, screens, feeders, etc. The bottom of the feed chute is equipped with renewable liners.

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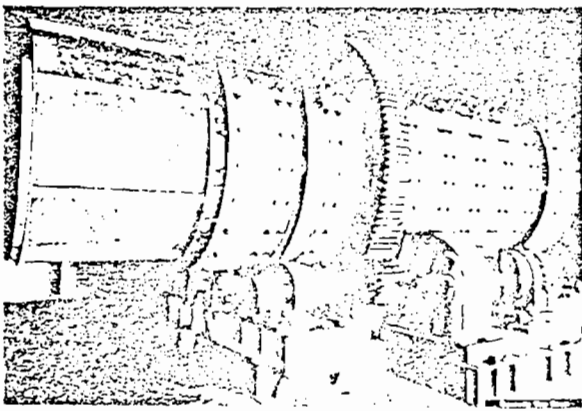


Fig. 4. Kennedy heavy-duty scrubber, 20' long x 8' dia.

**Kennedy Van Sain**—KVS engineers have applied rotary kiln and ball mill design features into their new horizontal Heavy Duty Scrubber-Disintegrator-Separator. This revolving unit, of various diameters and lengths, is used to disintegrate dirt, clay and soft materials and to separate them from hard stone and ore. The rolled steel shell is electric welded and rides on two or more forged steel riding rings. Shafts of the forged steel carrying rollers ride in self-aligning roller bearings. The cut tooth pinion and girth gear are driven by a motor and gear reducer mounted on a common base. Shell is lined with replaceable wear resistant liners. These liners have integral cast lifters and paddles to churn and advance the material toward the discharge end lifters that place it in a single, double or multiple trommel for sizing and dewatering. Water is generally applied at the abrasion resistant lined feed chute and rinse sprays are used in the trommel. Whether flow of material and wash-water is parallel or counterflow depends upon the cleaning problem.

**McLanahan heavy-duty scrubbers** (Fig. 2) are designed to remove dirt, heavy light oils, and similar materials from sand, gravel, crushed stone and ores. The operator can process fine and coarse feed simultaneously, or remove fine materials first through use of a

An optional desander, consisting of a large circular perforated plate, can serve as the feed end of the Scrubber. An opening in the center allows entry of materials from the feed chute, and screen cloth of desired size is bolted to the plate. A dewatering screen extension comprised of a circular perforated plate is bolted to the discharge end, the plate being covered with renewable screen cloth for separating fine materials. The Scrubber is driven by an external power source through a V-belt drive to a grooved balanced flywheel pulley mounted on the end of the Scrubber countershaft. The countershaft is supported in three self-aligning bearings, one at the flywheel hub, the other two on either side of the drive pulley.

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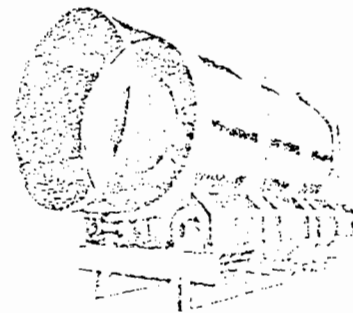


Fig. 5. Telsmith pneumatic tread Super-Scrubber available in 72", 96" and 120" diameters. Capacities: 50 to 700 stpm.

**Telsmith**—A high speed grinding and cascading action characterizes the Telsmith Super-Scrubber (Fig. 5). The drum is rotated close to critical speed, carrying the gravel in a high arc, so that the resultant fall is sufficient to disintegrate adhering dirt and clay. The machine can be used as a silt-rock disintegrator. The sand present in

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drum through perforated plates at the feed end. The coarser sand not removed in this manner can be taken out by the perforated cylinder at the discharge end of the drum. Additional cleansing action is obtained by means of a rising spray in this perforated cylinder. The wash-water flows counter to the flow of aggregates, entering at the discharge end of the drum and leaving at the feed end. A launder can be attached to the feed-end housing to carry the sand and water to the tanks where clean sand is recovered.

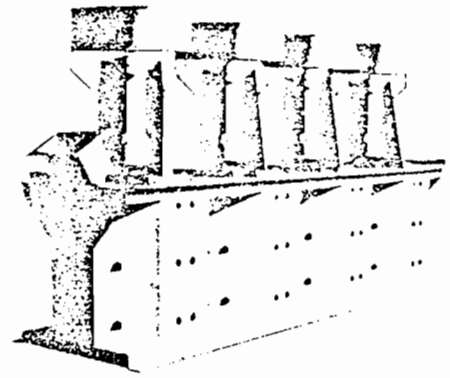


Fig. 9. Wemco sand scrubber, an attrition machine.

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*C-E Tyler.* — Ty-Rock Trough Washing Screen combines the operations of washing, screening and dewatering in one machine. The 5 ft. x 10 ft. Ty-Rock Trough Washing Screen shown (Fig. 8) has 3 washing troughs. High pressure water sprays directed into these troughs in combination with the high speed circle-throw action wash the material thoroughly and then the material overflows to the next screen section for removal of the fines and water.

*Wemco.*—Sand Scrubber (Fig. 9) is designed to scrub coatings from sands and other fine granular materials. It agitates slurry to high turbulence inside an octagonal tank where pitch of impeller blades reverses direction of flow, repeatedly. This results in highly intense collisions between individual particles, which thus

scour each other free of coatings. Sand Scrubbers are used in series to insure that all undesired silts, clays and colloids are broken free and dispersed. A final washing with fresh water in a Sand Prep will separate out a clean, uncoated specification sand. All wearing parts are rubber covered.

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*Dancer Attrition Scrubber* (patented) allows high horsepower input which keeps entire tank capacity active with grains of material abrading each other (Fig. 10). Twin turbine blade propellers are set at opposite and unequal pitch so top propeller forces material down while the bottom propeller forces it upward. This action, alternating from one tank to the next, eliminates short circuiting of sands. Scrubbing: at 70-80% solids. Sizes to 250 on R cell. Larger units are reducer driven.

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Fig. 8.

Ty-Rock circle-throw trough washing screen.

MINERAL "A" - 1975-77 Pit and Quarry Handbook and Buyer's Guide, 50th Edition, pages B173 to 177 only 1975-77

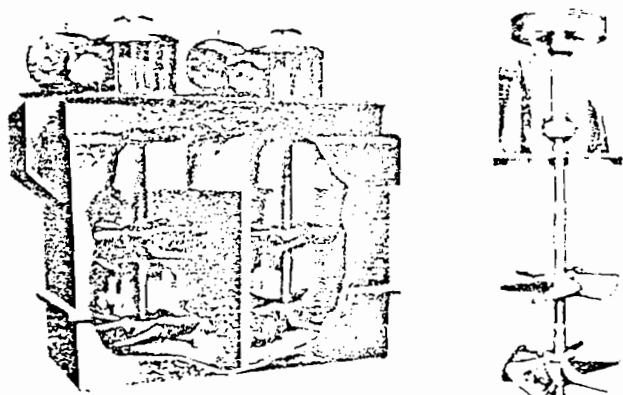


Fig. 10. Denver attrition scrubber and one of its turbines.

*Eagle Attrition Mill* (Fig. 11) for scrubbing sand at high densities of solids removes coatings from sand grains or color stains from specialty sands. Two turbine blade propellers at opposite pitch, force grains to scour each other free of coatings. Drive assembly, cover, shaft and propellers may be removed as a unit. Tank is lined with renewable abrasion-resistant rubber. Propellers and shaft sleeve are of Ni-Hard. Adjustable motor mount is standard.

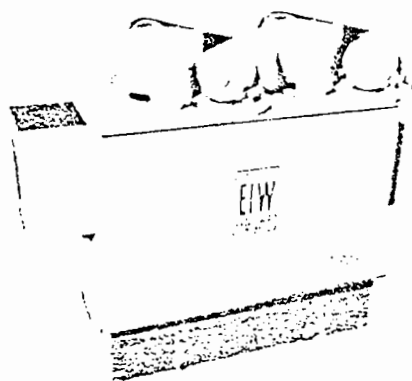


Fig. 11. Eagle Attrition Mill comes in 2, 4 and 6-cell units.

*Log Washer*—The log washer is an excellent device for removing clay. The original washer consisted of two wood logs with metal paddles driven into them.

*Eagle*.—The Eagle Iron Works heavy duty log washer (Fig. 12), with its double logs (rows of paddles)



Fig. 12. Log washer with 3-ft. diameter paddles.

handles problems involving certain cemented aggregates, tough insoluble clays, conglomerates and soft stone. Renewable shoes of Ni-Hard are mounted on steel feet attached to welded fabricated tubular steel logs. These heavy duty shoes of increased thickness, feature a wearing surface provided with corrugated sections delivering a scrubbing action similar to the old-time washboard to remove unwanted material. The logs are welded and bolted at each end to flanged steel hubs.

As paddles scour, scrub, and grind material in conveying it to the upper discharge end, wash water is forced up through the aggregate to float foreign particles of lighter specific gravity to the surface and back to the water discharge at the lower end. This water is introduced through holes in the pool area at the bottom of the tub. This method maintains the correct constant rising current in the tub for full efficiency. Capacity: 80 to 150 tph. Material size: 4" (max.).

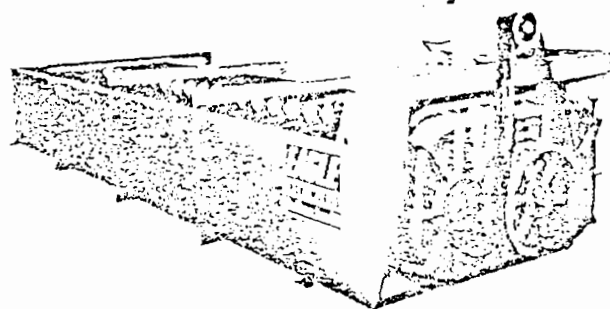


Fig. 12a. Eagle "Sol-Clay" light duty washer.

The Eagle "Sol-Clay" light duty unit (Fig. 12a) resembles the coarse material snow washer design, but has corrugated paddles. Its field of use is midway between a screw washer and heavy-duty log washer. It gives material a more thorough abrading than a screw unit but is not capable of the scrubbing jobs handled by heavy-duty log washers. It is designed to handle coarse aggregate passing through a 24-in. screen. Capacity is 50 to 125 tph, depending on contaminants.

*El-Jay* gravel washer (Fig. 12b) reportedly can be set to remove practically all material of less specific gravity than the gravel itself and also all fine clay and silt, leaving a clean, fluffy material with its contained water. Specially designed paddles with narrow tapered leading edges and heavy wear-resistant beveled point cut easily through the bed of gravel, while the corrugated face of each paddle vigorously abrades the gravel and lifts it up against the flow of water for efficient low-power cleaning. Discharge weirs are adjustable so the depth of water in the washer can be easily adjusted to suit the cleaning requirements. Available in single log or double log models, ranging from 37" x 15" to 50" x 24" with capacities from 40 tph to 240 tph.

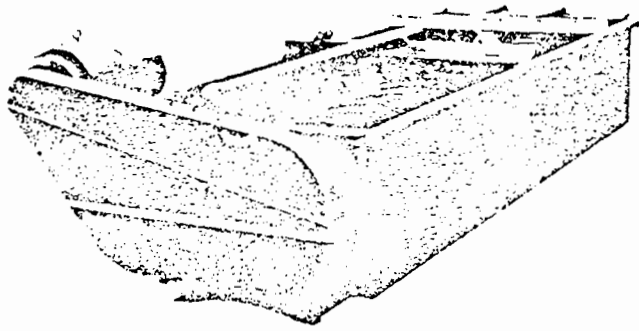


Fig. 12b. El-Jay gravel washer.

McLanahan log washers (Fig. 13) are available in Mudmaster (feeds up to 4" maximum) and Super Mudmaster (feeds up to 6" maximum) designs. Both are intended for removal of tough, plastic clays, coal and other soft wastes from gravel, crushed stone and various ores. The Mudmaster is available in 36" x 25', 36" x 30' sizes (with 36" paddle swing), and 38" x 25', 38" x 30', 38" x 35' sizes (with 38" paddle swing). The Super Mudmaster is available in 44" x 30', 44" x 35' sizes (with 44" paddle swing). Capacity ratings based on handling round natural gravel are: 36" size, 80-110 tph; 38" size, 90-125 tph; 44" size, 140-175 tph. For crushed or broken angular feeds the capacity would be 80% or that for round feeds. All are based on material weighing 100 lbs per cu ft.



Fig. 13. McLanahan "Mudmaster" log washer.

On all sizes, the washer box is of fabricated steel construction flanged at the top edge, ribbed and braced to assure maximum stability, reportedly eliminating under-vibration and movement. The log shafts are square section, each constructed of four heavy steel angles beveled and welded by continuous automatic process at the seams. Four hole paddle bases welded at an angle to the face of the logs enable the operator to move paddles to the upper limit when worn, reportedly resulting in approximately twice the normal paddle life. Paddles are built of highly abrasion resistant heat-treated high carbon steel having a Brinell hardness of 500 to 550. Transmission rollers at the center of shafts are of the same alloy, rapid slope adjustment for varying feed conditions. Front end submerged bearings are water lubricated box and flange type with alternate Teflon Seal. Other bearings available in an extra. All drive and bearings are self-aligning, anti-friction type, grease filled, and chain are steel with machine oil bath running in sealed oil bath case. A spray pipe with nozzles is located at the discharge end for rinsing and washing of material prior to discharge.

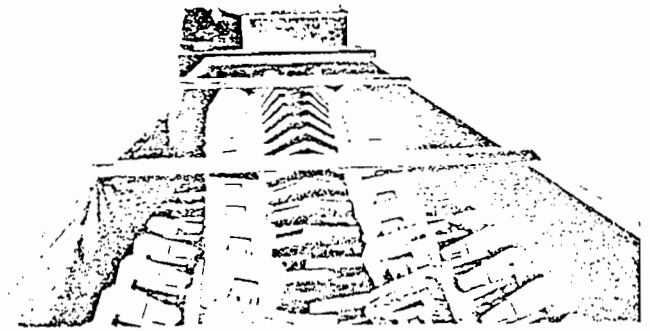


Fig. 14. Wemco-log washer (spiral offset paddle design).

Wemco.—The Wemco log-washer (Fig. 14) is designed to remove stubborn coatings from coarse aggregates, and to break clay balls and certain types of conglomerates in a wide range. Its double log (two shafts) with abrasion resistant paddles arranged in a spiral pattern, contacts material in sequence, rather than all at the same time, so a smooth and more constant power application results. Driver mechanism runs in oil, totally enclosed, for trouble-free operation. Heavy duty lower bearings located outside the tank prevent dirt contamination. Shafts have water lubricated seals which retain pulp in the tank.

The Wemco FP gravel washer (Fig. 15) is a high capacity device for removing deleterious, lightweight materials from river dredged or pit run gravel. It takes advantage of the different settling rates of particles of different specific gravities: a controlled current of water rises through incoming gravel at just the right velocity to float up lightweight particles (trash) yet permit heavier particles (gravel) to sink.



Fig. 15. Wemco FP gravel-washer.

Washing Screws.—In many plants where clean sand and gravel are commercial products washing is done by washing screws, whose continuous helical blades arranged about 45°s from the material up an inclined trough against a stream of water introduced at the higher end. This action carries down the soluble clay occurring with the material, and dumps the washed product over the higher end of the trough.

Some screw washers are furnished in both single-row and twin-row types. The twin-row washer has doubled the capacity of the single-row washer and both are self-contained units.

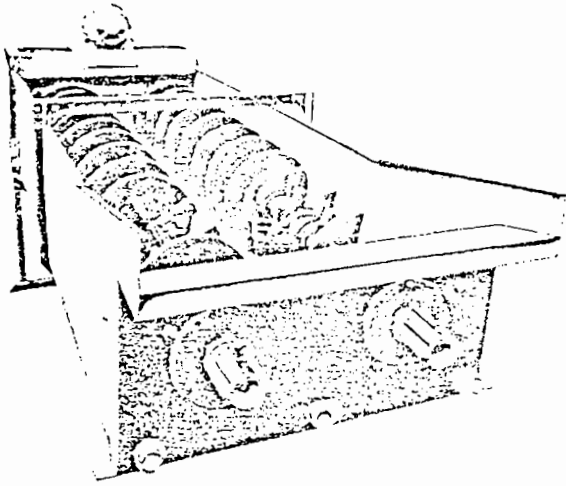


Fig. 16. Eagle double-screw coarse material washer with trash remover, viewed from the waste overflow end.

*Eagle*.—An Eagle double screw washer-dewaterer, viewed from the water discharge end, is shown in Fig. 16. The latter picture brings out the details of the bottom water inlets, the sectional conveying screw, and the way in which screw flights can be replaced by paddle flights at the lower end for more severe scrubbing action. Straight 15 ft. to 20 ft. welded steel plate tubs provide a drain board of sufficient length at the upper end for effective water removal. Various tub widths and flight diameters are available, depending on material to be handled and output desired. Capacities: Single screw, 45 to 250 tph. (Double screw, 200 to 500 tph. Material size 3" max.).

Tumbling and folding action of the screw or paddles in conveying material up to discharge sets up a severe abrading of grain against grain, loosens and breaks up aggregate, and separates and exposes undesirable material to washing action. The rising current of wash water, introduced through a multiplicity of small holes in the bottom, carries the foreign material of lighter specific gravity up out of the aggregate and back over the material bed to the lower discharge end. Single or double screw units have sectional screw flights (two flights make one revolution) for replacement or substitution of paddles where needed. The double screw unit has a single input, double output shaft gear reducer drive, which provides properly-timed counter revolution of the screw shafts, and requires only a single motor and single set of V-belts.

Eagle Slurry Retain Separator unit uses mud, or slurry of silt to clean oil particles of lighter specific gravity than sand or gravel being recovered. Slurry flows from screw type washer to vibrating screen where contaminants are discharged. Screw flights convey cleaned material up drainboard and water spray near discharge gives it final rinse.

McLanahan screw washers are available in fine material and coarse material design. Fine Material screw washers are available in single and double designs for processing concrete, mason mortar or other sands of similar size. Coarse material screw washers are available in single and double dual designs for the

removal of soluble wastes including crusher dust, coatings, film, dirt and loamy clays from gravel, crushed stone and various ores with feed sizes ranging up to 4" maximum fine material screws are available in sizes up to 60" diameter while coarse material screws are available in sizes up to 44" diameter.

Fine material screw washer boxes are fabricated from steel plate, ribbed and flanged for maximum stiffness and rigidity. The flared settling zone has adjustable overflow weirs on the sides and end. The feed opening is on the side of the washer box ahead of a removable baffle plate designed to minimize turbulence in the settling zone and assure maximum retention of desirable fines. This feed opening can be located on either side of the washer box or in the center as required by the installation. Water manifold inlets beneath the settling zone are used to inject fresh water, if required, for maximum efficiency in desliming and for fines control. The screw shaft is composed of extra heavy steel pipe with spiral steel flights welded to it and equipped with bolt on renewable abrasion resistant wearing shoes. Each screw is flanged at both ends and bolted to stub shafts to facilitate maintenance. The submerged end bearing is McLanahan A pra-Lube water bearing or alternate Twin-Seal Pak-roller bearing. Drive end bearings are combination radial and thrust load anti-friction roller bearing pillow blocks. A steel cased torque arm reducer is mounted on the stub shaft at the drive end with motor mounted on an adjustable base plate attached to the reducer for proper V-belt tensioning.

Coarse material screw washers are equipped with a section of flights at the feed end to start material away from the bearing and are followed by a section of paddles used to wash, tumble and abrade material upon material for removal of undesirable soluble wastes. The section of paddles is followed by screw flights which convey the material to the discharge while at the same time providing additional washing and dewatering so that the product may be conveyed to stockpile. Washer box is fabricated from steel plate, ribbed and flanged for rigidity. An adjustable overflow weir is located at the head end for removable or waste. Water manifolds beneath the pool area provide for maximum removal of dissolved wastes.



Fig. 17. McLanahan single screw washer.

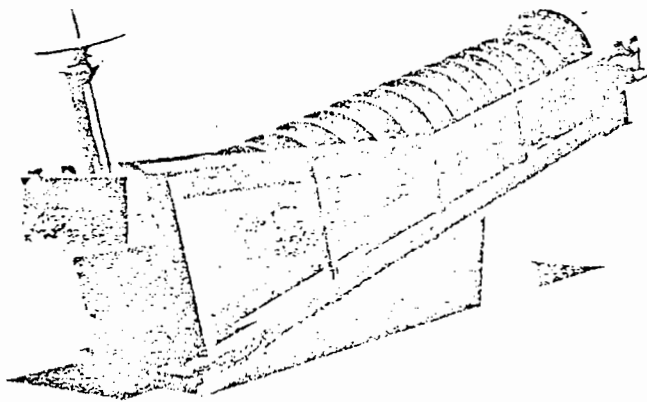


Fig. 18. The Wemco Agg Prep.

**Wemco Agg Prep.**—This machine (Fig. 18) applies where coatings and clay balls, in medium or coarse aggregate, are friable and do not require the severe attrition action of a log washer. In operation the aggregate scrubs itself. The pieces scrub each other. This is accomplished by spacing the flights of a Sand Prep further apart, and adding a series of lifter bars to the face of the spirals. Material is thus kept continually in motion in the active area, and washed and drained free of deleterious material on the conveying desk.

**Washing Screens.**—Cylindrical rotary screens, and vibrating screens equipped with high pressure water sprays, will do a satisfactory job of washing pit-run sand and gravel to meet specifications if the material is not so dirty as to necessitate intense scrubbing.

**Revolving Washing Screens.**—The rotary washing screen is cylindrical in shape and made up of three sections—a scrubber, a sand jacket, and a gravel-screening section—mounted on a steel frame. Screens of this type made by McLanahan and Pioneer Div. of Portec Inc., all are designed along the same general lines.

Copiously, water is sprayed on the material as it comes down the feed chute into the scrubber. Paddles raise the material up and let it fall back to break up chunks and wash loose material off the stones. A retaining ring at the discharge end of the scrubber section retards the rate of flow of material and water to ensure loosening of the silt, which is then carried away in the water. After the material leaves the scrubber section it enters the perforated portion of the rotary screen. Now water is applied and the sand is washed upward to a sand jacket which carries it to a discharge. Gravel is sized in the remaining perforated plate sections. The Pioneer cylindrical revolving washing screen is supported its full length by a heavy framework. A bevel gear on the delivery end of the drum drives the unit. The revolving end is carried by a malleable-iron casting which rests on two rollers, which leaves the receiving end wide open for easy and rapid feeding.

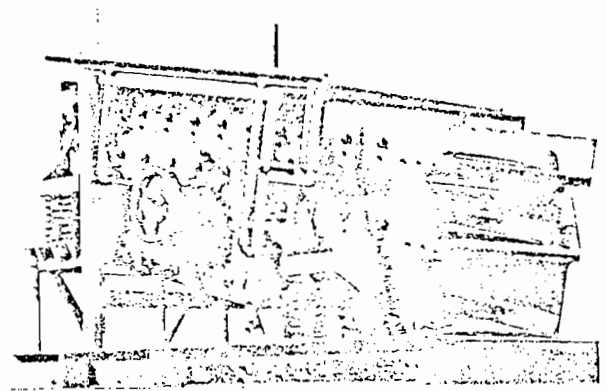


Fig. 20. Pioneer washing screen.

**Pioneer Washing Screen.** This 3-deck inclined 2-bearing vibrating screen (Fig. 20) reportedly performs washing and screening at high-speed and top efficiency, under capacity and sizing control, because it combines gravity with downhill circular motion which together help prevent sand deck plugging and consequent water carryover. In addition, material travels faster across its inclined screens than over horizontal. A thinner bed of material results, and allows water to reach all particles passing thru the sprays from nozzles on all decks. At each corner of the screen frame, dual sets of coiled springs actually float the screen to minimize transfer of vibrations to supporting structure. Replacing old-fashioned flywheels, newly designed counterweights that greatly reduce starting and stopping time, allow the screen to quickly pass through harmful vibrating frequencies without undue bouncing. Sizes to 5' x 20'.

**Spray Bars.**—Various makes of spray bars are available for attachment to vibrating screens for washing aggregates that do not contain a high percentage of impurities.



Fig. 21. Spray bars installed on vibrating screens.

**Other Design and Construction.** Howard has Elliptex designations, utilizing the Elliptex vibrator principle, has a heavy-duty bulk handling and portable version (BZ) of the Modular type, and is equipped with a series of flaps against which the material

builds up, creating a bed in which the finest sizes can be trapped. The mass of the beds tends to squeeze the water out of the bottom layer. This effectively removes the greatest percent of surface moisture from granular material, even in fractional millimeter-measured sizes.

In dewatering materials that contain particles finer than the deck opening, minimum loss of fines can be attained by putting dual sumps under the dewaterizer. The liquid and fines which pass through at the feed end are recirculated and gently fed on top of the bed of coarser material formed by the dams. The bed of material acts as a filter, passing the liquid and entrapping the fines.

Normally installed at a slight uphill angle, a pivot and trunnion mounting arrangement facilitates making any needed slope adjustments that may be required.

The Hewitt-Robins Eliptex dewaterizer is available in single or double deck models in sizes ranging from 3 ft. x 5 ft. to 5 ft. x 20 ft.

The Dorree Sand Washer is a bucket type classifier designed for the production of concrete sand from raw material in which the intermediate sizes are in balance. The mechanism consists of rotating scoops installed in an inclined tank fitted with an overflow launder and a discharge port. The slurry feed is introduced through a trough at the bottom. Sand is picked up by the scoops, carried above water level and discharged in a clean, drained condition. Dirty water overflows an adjustable weir at the opposite side of the tank. Single 12 ft. dia. units will produce up to 100 tons of concrete sand per hour where the water to sand ratio is 2 to 1 or less.

AGITATORS, CONDITIONERS AND THICKENERS

Denver agitator and conditioners have enclosed worm and gear designed for severe overloads. A new application of large turntable bearing provides positive alignment in a compact, economical drive. Axial flow propellers are of steel with rubber, neoprene or special coverings, sizes 9" to 28" in true helix design. Tank sizes 60' x 50' and larger are available.

Manitowoc agitators (Fig. 25) combine mechanical and air agitation to produce uniform slurry.



Fig. 25. Above production shows air and agitation of slurry accomplished by the Manitowoc agitator.

Worm agitators and conditioners for conditioning pulp prior to beneficiation are offered with rubber covered shafts and propellers for handling corrosive or extremely abrasive pulps. A center shaft rake type agitator is also available for processes which require introduction of air or gas into a pulp. Standard sizes range from 3 to 20 ft in diameter. Smaller units are built to specifications.

Thickeners in the aggregate industry can be utilized for water reclamation and reduction of stream pollution. Thickened overflow is recycled and the thickened underflow sludge is impounded.



Fig. 26. Denver thickener clarifier with CFP fluid power drive mechanism provides sand plant with closed water system.

In Denver thickeners, settled particles are moved to the tank center by rakes operated by one of three types of mechanism, depending on tank size. Tanks, either wood or bolted steel, larger than 150 ft. call for a new fluid power mechanism. A pier mounted patented CFP Denver thickener mechanism supports the rake assembly through a steel spider attached to a large turntable bearing. The carrying hub is driven by hydraulic cylinders arranged to impart a continuous rotary motion with up to 750,000 ft. lbs. of torque. Under 150' diameter the smaller units, BB & CFB, either pier or bridge mounted, use the same turntable bearing with enclosed worm gear reducers for heavy duty ratings. Standard or acid resisting shaft and rake mechanisms in all ratings are available. Manual handload, motorized and automatic lifts can be furnished. For easy control of the settled solids underflow, many operators choose Denver float arm pumps.

Instrumentation and control equipment, which provides repaired monitoring and control, is available in standard packages.

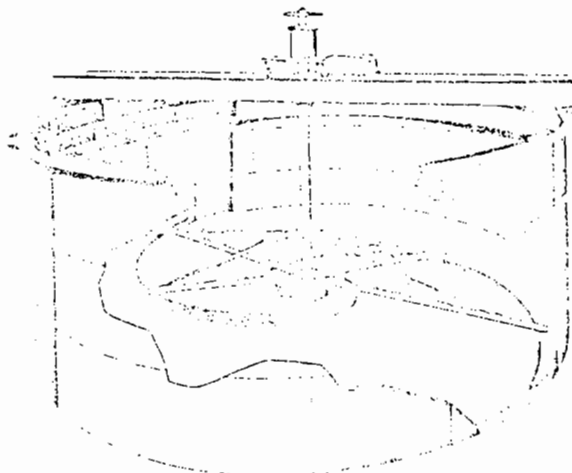


Fig. 27. Harding conditioner with dual tanks. Central scrapers clean tank bottom with each revolution. Full speed to avoid sludge and sludge bed.



IN THE SUPREME COURT  
OF WESTERN AUSTRALIA

IN THE MATTER of an Agreement between  
LANGLEY GEORGE HANCOCK, ERNEST  
ARCHIBALD MAYNARD WRIGHT, WRIGHT  
PROSPECTING PTY. LTD., HANCOCK  
PROSPECTING PTY. LTD., two other  
companies and HAMERSLEY IRON PTY.  
LIMITED

10

B E T W E E N:

HAMERSLEY IRON PTY. LIMITED

Plaintiff

AND

LANGLEY GEORGE HANCOCK

First Defendant

ERNEST ARCHIBALD MAYNARD WRIGHT

Second Defendant

HANCOCK PROSPECTING PTY. LTD.

Third Defendant

WRIGHT PROSPECTING PTY. LTD.

Fourth Defendant

L.S.P. PTY. LTD.

Fifth Defendant

20

THE NATIONAL MUTUAL LIFE ASSOCIATION  
OF AUSTRALASIA LIMITED

Sixth Defendant

AFFIDAVIT

I, DOUGLAS FREDERICK TOMPSETT of 6-9 Kestral Way, Marrara in the State of Western Australia, Metallurgical Engineer, make oath and say as follows:

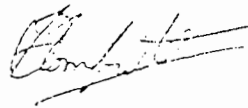
- I hold the degree of Bachelor of Chemical Engineering (1970) from the University of New South Wales. I have since 1977 been employed by the Plaintiff at its iron ore operations in the Pilbara. Since April 1980 I have been Senior Process Metallurgist with the Plaintiff, with responsibility among other things for advising and recording on metallurgical aspects of the Plaintiff's processing operations including the Tom Price concentrator. I am duly authorised to make this affidavit on behalf of the Plaintiff, and I do so from my own knowledge.

1337

*B. D. ... 3P*  
24.5.83

2. On 9th March, 1983 I accompanied Robin John Batterham on a visit to the concentrator. During that visit Dr. Batterham asked me to obtain photographs of feed at various stages of processing in the concentrator. On 23rd March, 1983 I supervised the taking of such photographs which are now produced and shown to me marked "Exhibit DFT 1". The photographs and the descriptions accompanying them are accurate. The ore being fed to the concentrator on 23rd March, 1983 was of substantially the same quality and physical characteristics as the ore being processed during Dr. Batterham's visit.
  
3. I have read the Affidavit of Colin Roy Langridge sworn on 2nd September, 1982 and filed herein and ask leave to refer to it. Now produced and shown to me marked "Exhibit DFT 2" to "Exhibit DFT 11" are accurately labelled samples of feed to the concentrator, including samples of clayey material referred to by Mr. Langridge. The samples were taken under my supervision.

SWORN by the said DOUGLAS )  
 FREDERICK TOMPSITT atdwp )  
 in the State of Queensland )  
 this 24th day of )  
 May 1983. )



Before me:

Robin John Batterham J.P.  
 A Justice of the Peace 24.5.83

Filed on behalf of the Plaintiff.



"EXHIBIT CFT 1"

DESCRIPTIONS OF PHOTOGRAPHS

| <u>Photograph<br/>Number</u> | <u>Description</u>                                               |    |
|------------------------------|------------------------------------------------------------------|----|
| 1.                           | Belt 140: 80 x 0mm feed                                          |    |
| 2.                           | Pulping Box: 80 x 0mm feed                                       |    |
| 3.                           | Washing and Screening Primary Screen, Top Deck: Feed End         |    |
| 4.                           | Washing and Screening Primary Screen, Top Deck: Discharge End    |    |
| 5.                           | Belt 220: 80 x 30mm                                              |    |
| 6.                           | Head, Belt 600: 80 x 30mm                                        | 10 |
| 7.                           | Course Drum Feed Preparation Screen, Feed Chute Sprays           |    |
| 8.                           | Course Drum Feed Preparation Screen, Feed End                    |    |
| 9.                           | Course Drum Feed Preparation Screen, Discharge End               |    |
| 10.                          | Washing and Screening Primary Screen, Bottom Deck: Discharge End |    |
| 11.                          | Head, Belt 240: 30 x 6mm                                         |    |
| 12.                          | Head, Belt 510: 30 x 6mm                                         |    |
| 13.                          | Medium Drum Feed Preparation Screen, Feed Chute Sprays           |    |
| 14.                          | Medium Drum Feed Preparation Screen, Feed End                    |    |
| 15.                          | Medium Drum Feed Preparation Screen, Discharge End               |    |
| 16.                          | Washing and Screening Primary Screen, Underflow                  | 20 |
| 17.                          | Sieve Bend and Washing and Screening Secondary Screen, Feed End  |    |
| 18.                          | Washing and Screening Secondary Screen, Discharge End            |    |
| 19.                          | Belt 250: 6 x 0.5mm                                              |    |
| 20.                          | Head, Belt 410: 6 x 0.5mm                                        |    |
| 21.                          | Heavy Media Cyclone Feed Distributor                             |    |
| 22.                          | Heavy Media Cyclone Feed Preparation Screen, Sieve Bend          |    |
| 23.                          | Heavy Media Cyclone Feed Preparation Screen, Sprays              |    |
| 24.                          | Heavy Media Cyclone Feed Preparation Screen, Discharge End       | 30 |
| 25.                          | Heavy Media Cyclone Feed Preparation Screen, Underflow           |    |
| 26.                          | Washing and Screening Secondary Screen, Underflow                |    |

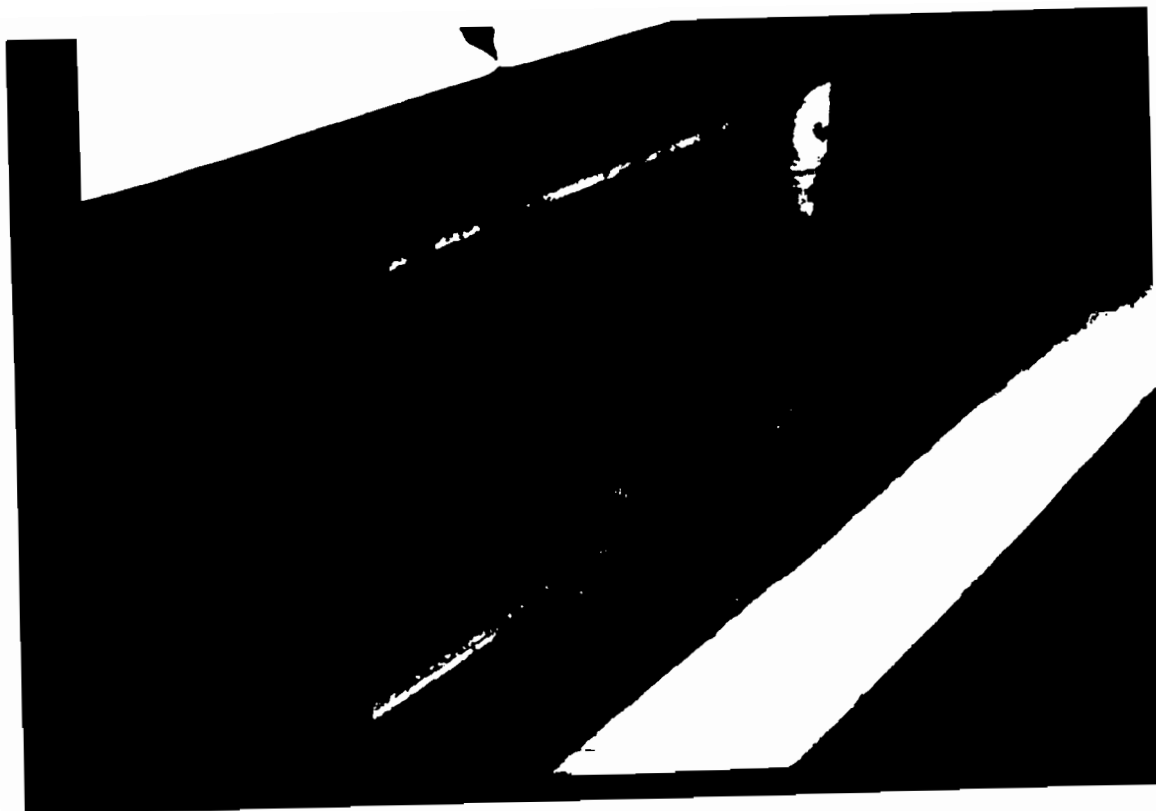


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EXHIBIT "8 DFT1"-26 photographs of feed at various stages of processing in the Tom Price concentrator dated 23.3.83



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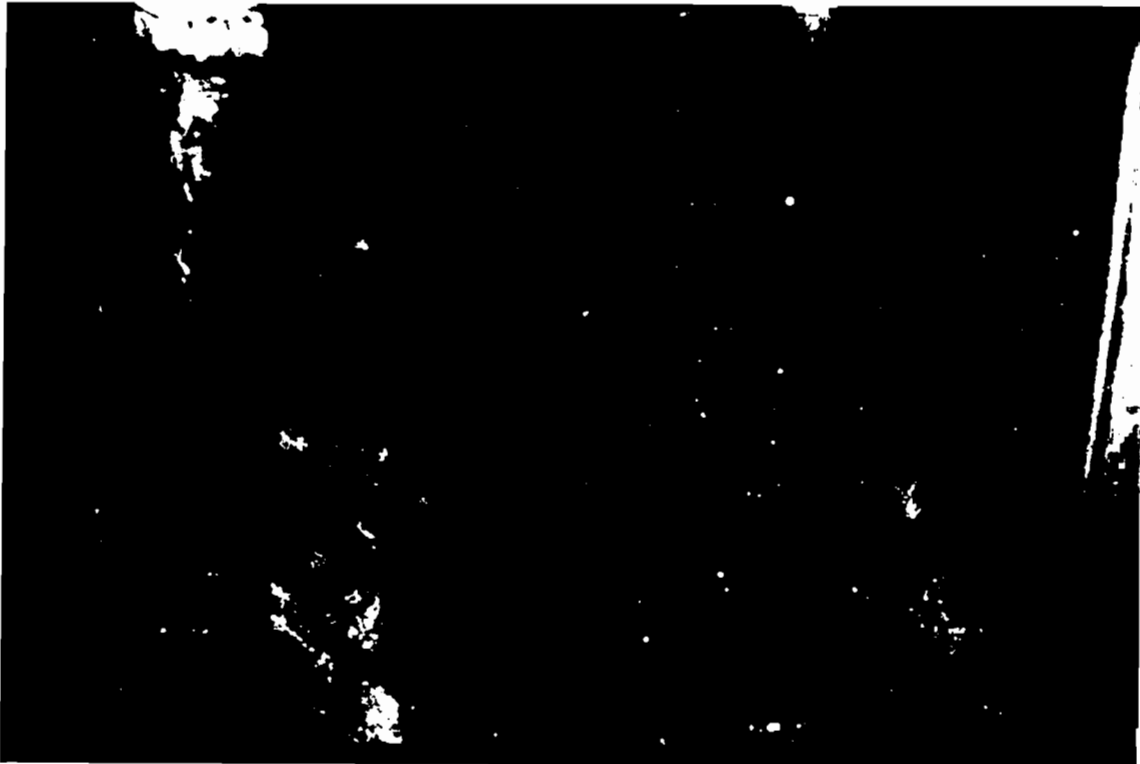
EXHIBIT "8 DFT1"-26 photographs of feed  
at various stages of processing in the  
Tom Price concentrator dated 23.3.83



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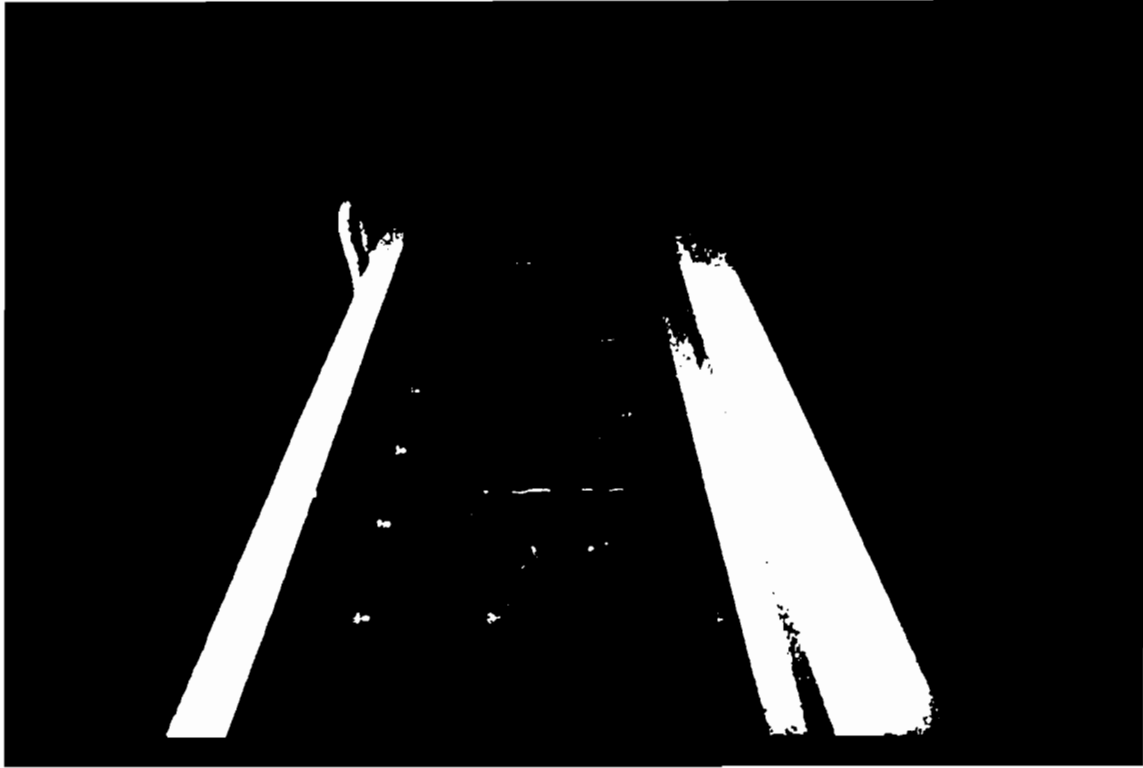


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EXHIBIT "3 DFT1"-26 Photographs of feed  
at various stages of processing in the  
Tom Price concentrator dated 23.3.83



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EXHIBIT "8 DFT1"-26 Photographs of feed  
at various stages of processing in the  
Tom Price concentrator dated 23.3.83



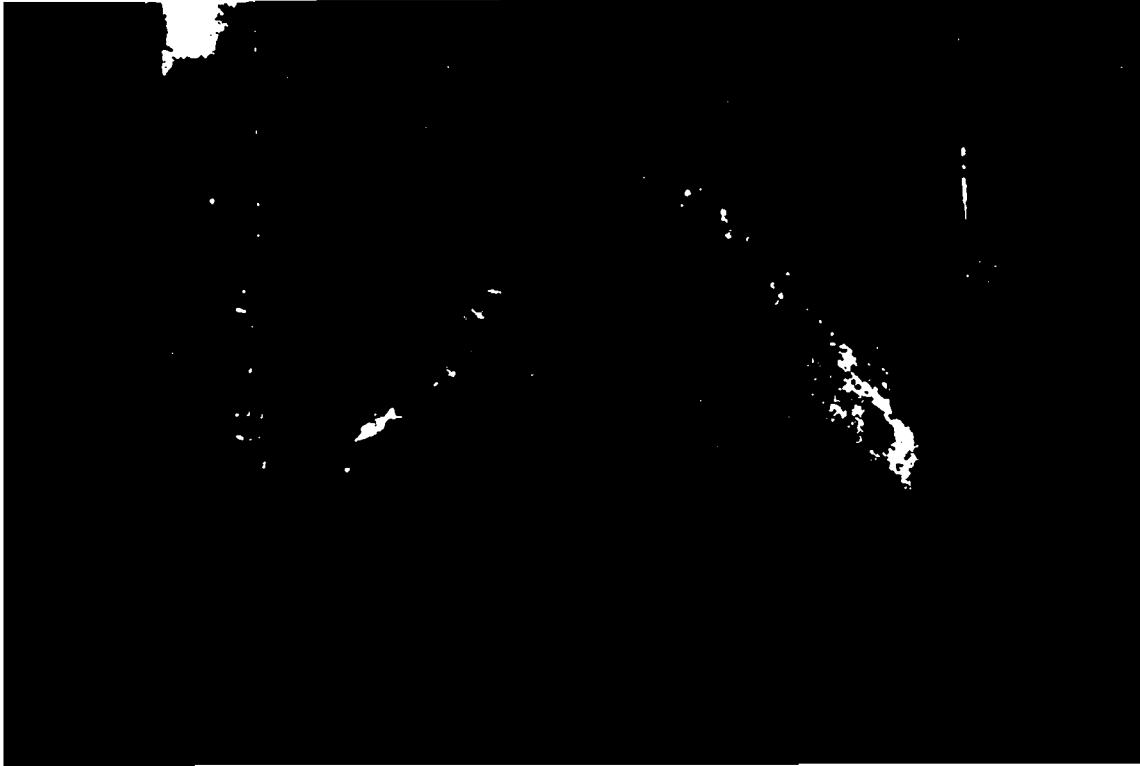


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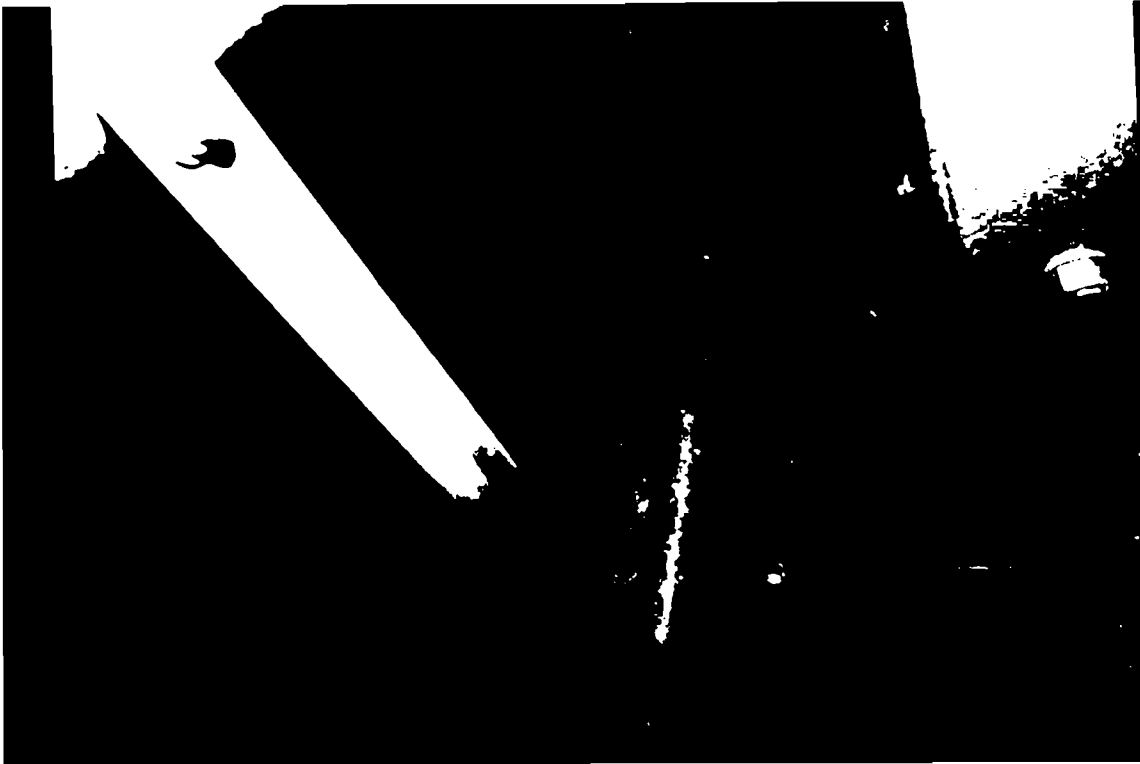


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EXHIBIT "8 DFT1"-26 Photographs of feed  
at various stages of processing in the  
Tom Price concentrator dated 23.3.83

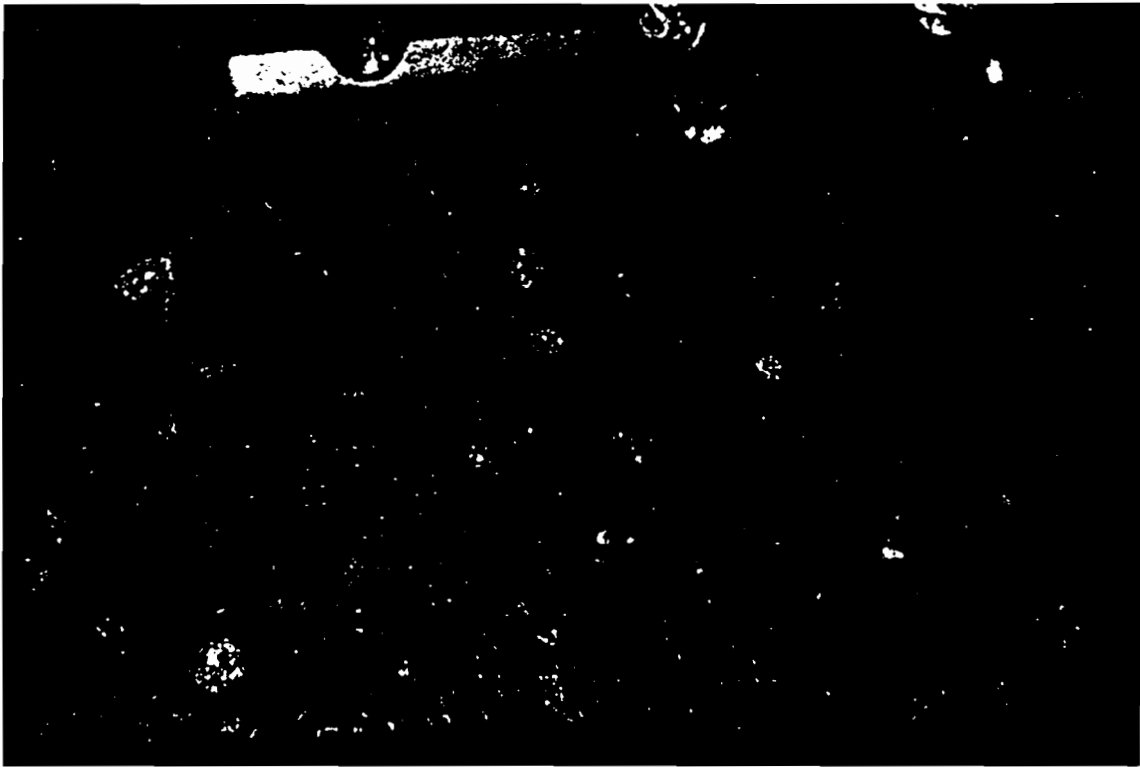


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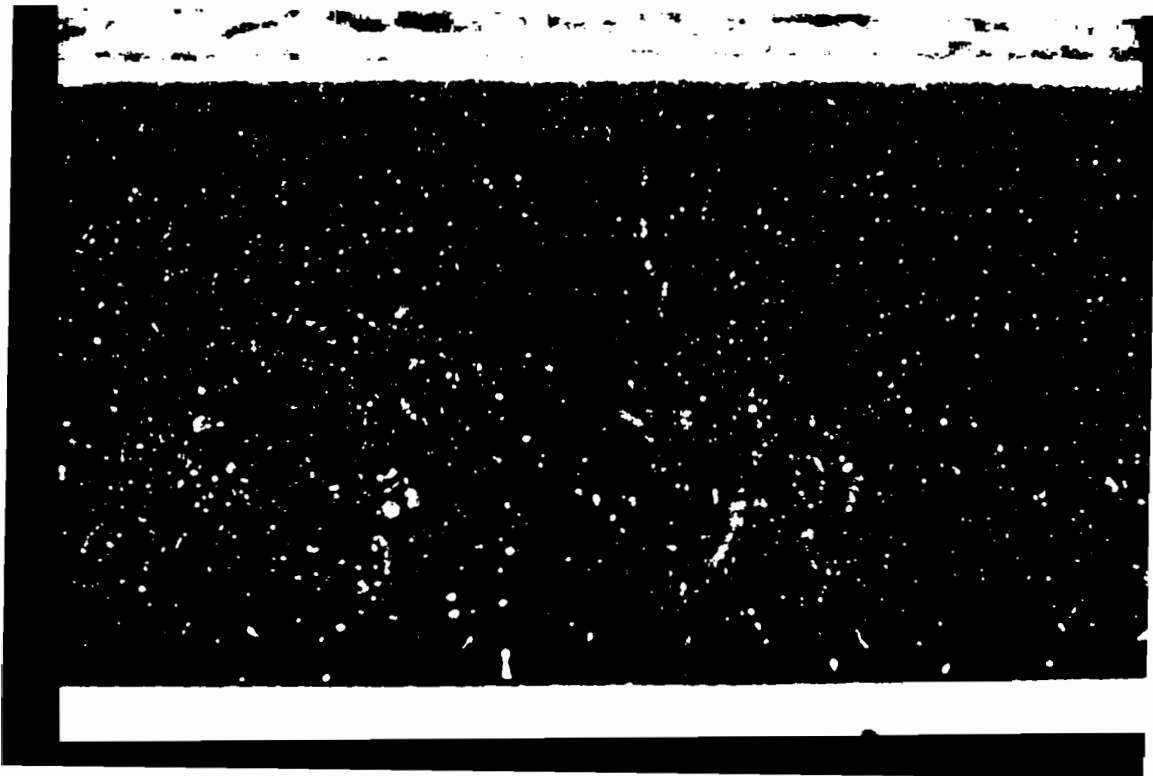


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EXHIBIT "8 DFT1"-26 Photographs of feed  
at various stages of processing in the  
Tom Price concentrator dated 23.3.83



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16

EXHIBIT "8 DFT1"-26 Photographs of feed  
at various stages of processing in the  
Tom Price concentrator dated 23.3.83



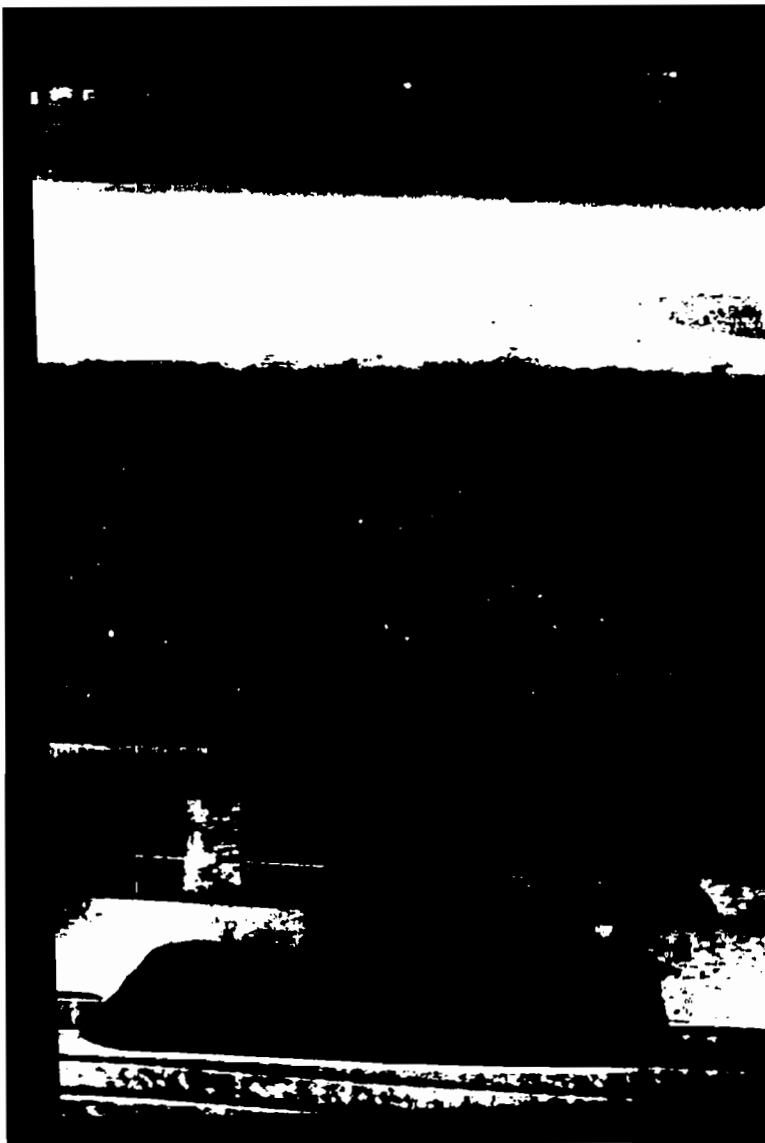
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EXHIBIT " 8 DFT1"-26 Photographs of feed  
at various stages of processing in the  
Tom Price concentrator dated 23.3.83

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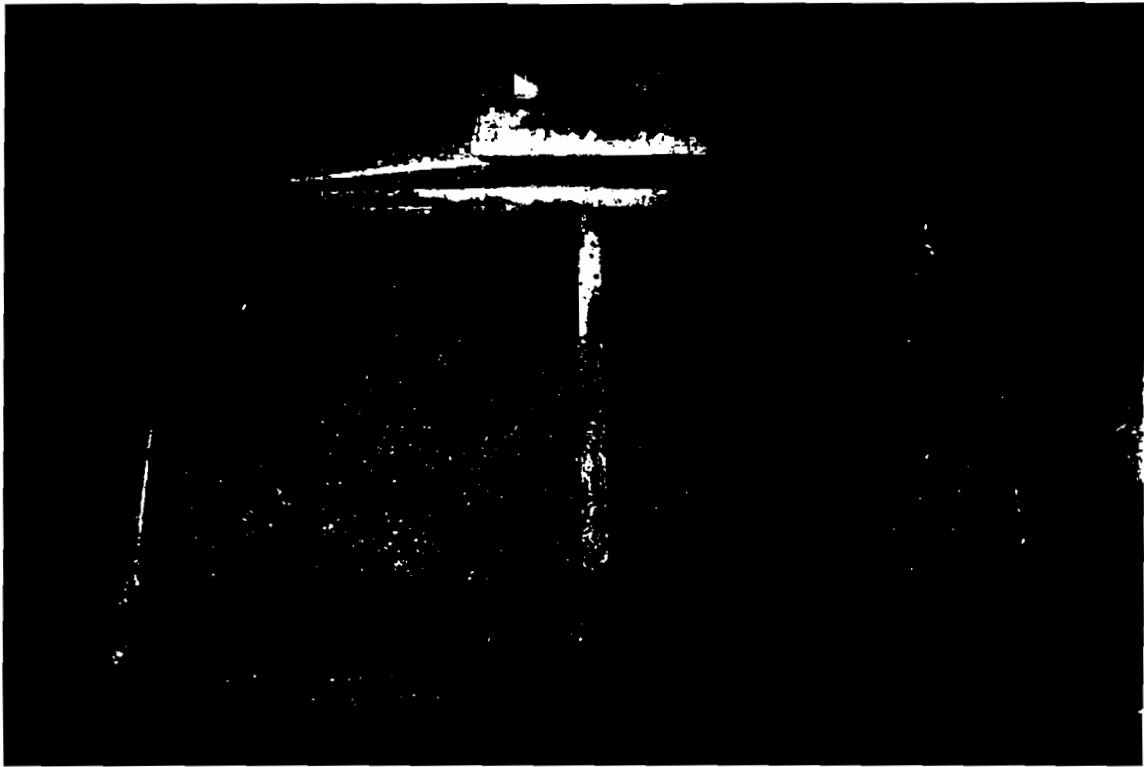


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EXHIBIT "8 DFT1"-26 photographs of feed  
at various stages of processing in the  
Tom Price concentrator dated 23.3.83

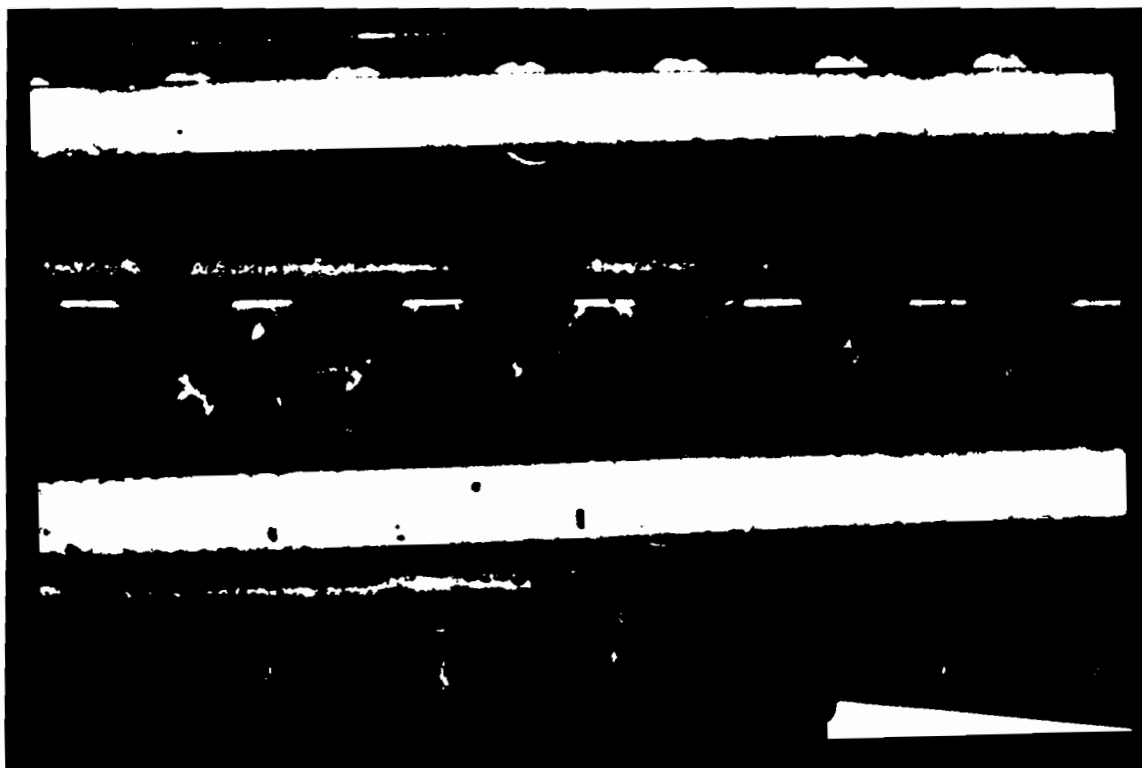


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EXHIBIT "8 DFT1"-26 Photographs of feed  
at various stages of processing in the  
Tom Price concentrator dated 23.3.85



23



25

EXHIBIT"8 DFT1"-26 photographs of feed  
at various stages of processing in the  
Tom Price concentrator dated 23.3.83



25



26

EXHIBIT "8 DFT1"-26 Photographs of feed at various stages of processing in the Tom Price concentrator dated 23.3.83



IN THE SUPREME COURT  
OF WESTERN AUSTRALIA

No. 2313 of 1982

IN THE MATTER of an Agreement between  
LANGLEY GEORGE HANCOCK, ERNEST  
ARCHIBALD MAYNARD WRIGHT, WRIGHT  
PROSPECTING PTY. LTD., HANCOCK  
PROSPECTING PTY. LTD., two other  
companies and HAMERSLEY IRON PTY.  
LIMITED

B E T W E E N:

HAMERSLEY IRON PTY. LIMITED

Plaintiff

10

AND

LANGLEY GEORGE HANCOCK

First Defendant

ERNEST ARCHIBALD MAYNARD WRIGHT

Second Defendant

HANCOCK PROSPECTING PTY. LTD.

Third Defendant

WRIGHT PROSPECTING PTY. LTD.

Fourth Defendant

L.S.P. PTY. LTD.

Fifth Defendant

THE NATIONAL MUTUAL LIFE ASSOCIATION  
OF AUSTRALASIA LIMITED

Sixth Defendant

AFFIDAVIT

I, ALBAN JUDE LYNCH of 41 Bellata Street, The Gap in the State of Queensland, 20  
Doctor of Science, make oath and say as follows:

1. (a) I hold the degrees of Doctor of Science (1975) from the University of New South Wales and Doctor of Philosophy (1965) from the University of Queensland. I am and have since 1970 been the Director of the Julius Kruttschnitt Mineral Research Centre, which is a specialist institution within the Department of Mining and Metallurgical Engineering in the University of Queensland carrying out research and postgraduate training in mineral engineering.

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1353

a. j. Lynch

(b) From 1954 to 1958 I worked as a metallurgist with The Zinc Corporation Limited at Broken Hill. Since then I have been a member of the staff of the University of Queensland. I have supervised twenty students engaged in research for a Doctorate of Philosophy and fifteen engaged in research for a Master's Degree in various fields of mineral engineering. I was a Visiting Professor at the University of Minnesota in 1971/1972 and have lectured at mining schools in the United Kingdom, Germany, France and Yugoslavia. I am the author of two books - Mineral Crushing and Grinding Circuits (Amsterdam, 1977) and Mineral and Coal Flotation Circuits (Amsterdam, 1981) - and have contributed approximately seventy articles to technical journals concerned with mineral processing. I am on the editorial committees of mineral processing journals published in Australia, the United States, the Netherlands and South Africa.

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(c) The Julius Kruttschnitt Centre specialises in research into ore treatment, including crushing, screening and other forms of processing. For the purposes of my work it has been necessary for me to acquire a detailed practical understanding of and familiarity with the processes, operating circuits and machinery in use in the mining industry. I have visited and studied most of the major mineral processing plants in Australia as well as the iron ore processing operations of Erie Mining Company, United States Steel and National Steel in Minnesota in the United States and the facilities of Amax and Asarco in the United States, Cominco in Canada, the Union Corporation in South Africa and Bougainville

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*A. J. Lynch*

EXHIBIT "9"-Affidavit of Alban Jude  
Lynch dated 22.5.83

Copper Limited in Papua New Guinea. I visited and studied the Plaintiff's High Grade Ore facility and its concentrator at Tom Price in 1981 and again in May, 1983.

2. I have been asked to advise the Plaintiff in relation to these proceedings and I have read, and ask leave to refer to, the Affidavit of Colin Roy Langridge sworn on 2nd September, 1982 and the Affidavits of Niles Earl Grosvenor and Peter Forbes Booth both sworn on 27th October, 1982 all filed herein. I have also read the exhibits to each of those Affidavits, including the Agreement which is "Exhibit CRL 1".

3. I agree with Mr. Grosvenor and Mr. Booth that the expressions "beneficiation", "treatment", "crushing" and "screening" have been for very many years, and since before 1962, terms used in a technical sense in the mining industry in countries where English is the working language. That does not mean that they are used universally or with a constant meaning. For example, "beneficiation" is not found in Wills's Mineral Processing Technology (London, 1979) and "beneficiation" and "treatment" are each used in both a broader and narrower sense.

4. I also agree with them concerning the broader meaning of "beneficiation" and "treatment". Both words usually have a purposive connotation. The definition of "beneficiation" in Pryor's Mineral Dressing (London, 1965) accords in substance with my opinion and experience of its usual meaning in the Australian mining and mineral processing industry. That definition reads: "Beneficiation. - Treatment of crude ore in order to improve its quality for some required purpose."

 S.R.

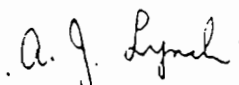
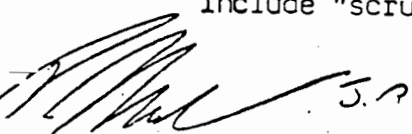
 A. J. Lynch

EXHIBIT "9"-Affidavit of Alban Jude  
Lynch dated 22.5.83

5. In iron ore processing "crushing and screening" is generally regarded as a composite process aimed at reducing the ore in size and separating the broken ore into size fractions. I adopt Pryor's definition of "comminution" as "crushing and/or grinding of ore by impact and abrasion". "Crushing" almost always refers to the coarse end of comminution and in iron ore plants is always carried out in dry form. "Grinding" generally refers to the fine end of comminution and further size reduction of the smaller particles. In the iron ore industry, grinding is usually carried out wet, although dry grinding (which is much less energy efficient) may be used in special cases. A similar distinction is drawn by Professor Gaudin at page 8 of the book referred to in paragraph 10 of Mr. Grosvenor's Affidavit. The Plaintiff's High Grade Ore facilities at Tom Price and Paraburdoo exemplify "crushing and screening" processes in that usual sense, which was also the usual sense in Australia in 1962. Now produced and shown to me marked "Exhibit AJL 1" and "Exhibit AJL 2" respectively are photocopied extracts from Pryor and Gaudin. 10

6. The "screening" part of "crushing and screening" refers to the separation of material by size rather than to the separation of different kinds of material, although the latter may occur incidentally. The addition of water as described in paragraphs 9, 10 and 11 of Mr. Langridge's Affidavit has three distinct effects. The first effect is to break down the water-active clayey material. The second effect is to separate small particles (whether of ore or gangue) which adhere to other particles, by counteracting the forces that hold them together. Abrasion assists both those effects. Technically they are both "scrubbing" effects. The term "washing" is often used in the industry in a non-technical sense to include "scrubbing". For example a building in which this sort of process 20

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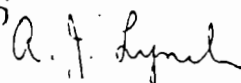


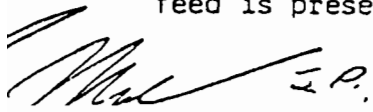
EXHIBIT "9"-Affidavit of Alban Jude Lynch dated 22.5.83

takes place might be called a "washing plant". The third effect is to accelerate the passage through the screen of particles which are already separate.

7. The purpose of adding water as described in Mr. Langridge's Affidavit is to permit the further processing of the feed in the heavy media drums and cyclones and in the WHIMS. The third effect described in paragraph 6 hereof is less important. The scrubbing is not properly to be regarded as an integral part of crushing and screening. The act of screening takes place when the separated particles are presented to the screen 10 apertures. Scrubbing is a completely different physical process which begins in the pulping box. I am not aware of any iron ore processing plant in Australia or overseas where a wet process was in use in 1962 or is in use now solely as an adjunct to crushing and screening without some further process in view.

8. At Tom Price the scrubbing effected by the water is a step essential to the preparation of the ore for the drums, cyclones and WHIMS. For the reason given in paragraph 11 of Mr. Langridge's Affidavit, it is crucial from a metallurgical point of view to get rid of contaminants before the 20 ore is presented to those units. It is not enough for the feed to be sized. It must be clean enough not to interfere with the specific gravity of the separation medium or contaminate the medium thereby hindering its recovery. In my opinion, the initial addition of water must be viewed as the first step in a process which those units complete.

9. For these reasons, in my opinion, the place at which beneficiation (other than crushing and screening) begins is where the feed is first wet in the washing and screening house. That occurs in the pulping box before the feed is presented to the screen. I would add that the pulping box would

 E.P.

1357

A. J. Lynch

EXHIBIT "9"-Affidavit of Alban Jude Lynch dated 22.5.83

not have been designed the way it is if it were not for the purpose of maximising the scrubbing effect of the water before the feed moves on to the screen deck. Mr. Booth's statement in paragraph 16 of his Affidavit that the arrangement is quite standard is correct only if a scrubbing effect is desired prior to the screen.

10. In my opinion the wetting of the feed in the pulping box would also have been regarded in 1962 as the first step in beneficiation other than crushing and screening.

SWORN by the said ALBAN )  
JUDE LYNCH at *TOM PRICE* )  
in the State of *WESTERN AUSTRALIA* )  
this *22<sup>nd</sup>* day of )  
*MAY* 1983. )

*A. J. Lynch*

10

Before me:



P. MULRENNAN  
JUSTICE OF THE PEACE

A Justice of the Peace

Filed on behalf of the Plaintiff.

# MINERAL PROCESSING

by

E. J. PRYOR

A.R.S.M., D.S.C., D.I.C., M.I.M.M.

*formerly Reader in Mineral Dressing  
University of London*

THIRD EDITION

ELSEVIER PUBLISHING CO LTD  
AMSTERDAM - LONDON - NEW YORK

1965

## APPENDIX A

### GLOSSARY

- Activator.**—Substance added to increase the activity of a compound or to speed up chemical reaction, e.g. by heightening the attraction to a specific mineral surface of desired collector ions in flotation.
- Agglomeration.**—Process using development of surface forces employed in froth flotation, but applied to deslimed sands. Aerophilic particles form glomerules with sufficient imprisoned air to cause them to act as low gravity systems removable by gravity treatment.
- Air Lance.**—Length of piping down which compressed air is blown, to stir settled sands or to free choked passages. 10
- All-sliming.**—Term used for cyanidation by agitation, no coarse sands being separated for leaching.
- Amalgamation.**—Use of mercury to catch native gold by sorption, forming a liquid or plastic *amalgam* from which mercury is later removed by distillation. *Barrel A. A* in small ball mill. *Plate A* metal plates smeared with Hg trap gold as pulp flows over them.
- Amenability.**—Characteristic reaction of minerals to basic methods of mineral processing, studied in preliminary testwork on unknown ores. 20
- Angle of Nip.**—Angle included between two approaching faces at or below which a particle is seized. Approximately 23° for most minerals.
- Anion.**—In electrolyte, ion carrying negative charge.
- Arrested Crushing.**—Comminution in which the product can fall clear of the crushing zone when broken below the "set" (*q.v.*) of the machine, without undergoing further reduction.
- Assay Grade.**—The percentage of an element or compound in a representative sample, as found by analytical test (assay).
- Assay-ton.**—For a *long* ton (2240 lb. av.) 32.667 gm., and for a *short* ton (2000 lb. av.) 29.1667 gm. The number of mg. of bullion obtained from one assay-ton equals the number of ounces (troy) of bullion per ton of ore. 30
- Autogenous.**—(1) In DMS process, fluid media partly composed of a mineral species selected from ore being treated.  
(2) Selectively sized lumps of ore used as grinding media.
- Automation.**—Process control employing servo-mechanisms or monitoring devices to supplement or replace human control.
- Bank (of cells).**—A row of flotation cells in line.
- Banket.**—Metamorphosed quartz-pebble conglomerate carrying gold and uranium mined on the Rand.
- Barren Solution.**—A solution in hydro-metallurgical treatment from which all possible valuable constituents have been removed. See also *Cyanide*.
- Batch-treatment.**—Treatment of a parcel of material in isolation, as distinct from the treatment of a continuous stream of ore. 40
- Bedding (Jig).**—The layer of heavy and oversized material placed above the screen in jigging—also called "ragging".
- Beilby Layer.**—Flow layer resulting from incipient fusion during polishing of mineral surface, and therefore not characteristic of true lattice structure.



- Belt Conveyor.**—An endless belt on which ore is placed and moved from point to point in the transport system.
- Beneficiation.**—Treatment of crude ore in order to improve its quality for some required purpose.
- Blocking (of Crusher).**—Obstruction of crushing zone by clayey material or rock which refuses to break down and pass to discharge.
- Break.**—Optimum mesh-of-grind (*q.v.*).
- Bubble.**—The dictionary definition of "bubble" is modified in this book to define two physical states:
- (a) *N-Bubble.* A bubble immersed in water or pulp, with surface tension at or approaching that of water. 10
  - (b) *F-Bubble* (usually written "bubble" in text). An emerged free bubble of surface tension substantially below that of water and having an area twice that of an N-bubble of equal diameter.
- Bubble Pipe.**—Tube inserted in pulp at regulated depth, through which compressed air is gently bubbled. The air-pressure indicates the pulp density and provides a means of control.
- Bulk Flotation.**—The intentional raising as a mineralised froth of more than one mineral in one operation. 20
- Capacitor (Capacitator).**—An adjustable electric appliance used in circuit with a motor to adjust the power factor.
- Cascading (in grinding).**—Motion of crushing bodies in a ball mill in which they slide or roll down the surface of the crop load (*q.v.*) after reaching the highest point attainable.
- Catacting.**—Motion of crushing bodies in a ball mill in which some fall freely after breaking away from the top of the crop load (*q.v.*) and fall with impact to the toe of the load. 30
- Centrifuging.**—Application of centrifugal force to mineral treatment.
- Chemical Extraction.**—Term taking the place of hydro-metallurgy. Embraces leaching (acid, alkaline, and pressure), ion exchange, solvation-precipitation, calcination.
- Choked Crushing.**—Comminution in which the discharge arrangements can restrict departure of ore even when it has been broken to the release size of the machine.
- Circulating Load.**—Retention in *closed circuit* of part of the ore or pulp flowing through the mill, for re-treatment.
- Classification.**—Sorting of particles in accordance with their rate of fall through a fluid. 40
- Climate (flotation).**—Of pulp undergoing froth flotation, the prevailing balance of chemical energy reached by the reacting electrical, physical, and chemical forces.
- Close Sizing.**—Sizing (*q.v.*) with screens fairly close in size of aperture (mesh). On a Tyler series normal mesh aperture ( $\sqrt{2}$  series) is 208, 147, 104, 74 . . . , etc.  $\mu$ , but in close sizing one or more intermediate apertures might be used.
- Closed Circuit.**—In mineral dressing, a system in which ore passes from comminution to a sorting device which returns oversize (*q.v.*) for further treatment and releases undersize (*q.v.*) from the closed circuit.
- Close-ranged.**—Screened or classified between close maximum and minimum limits of size or settlement. 50
- Collector.**—Promoter. Heteropolar compound containing a HC group and

- an ionised group, chosen for ability to adsorb selectively in froth flotation process and render adsorbing surface relatively hydrophobic.
- Colloid Mill.*—Grinding appliance such as two discs set close and rotating rapidly in opposite directions, so as to shear or emulsify material passed between them.
- Comminution.*—Crushing and/or grinding of ore by impact and abrasion. For convenience, the word "crushing" is used for dry methods and "grinding" for wet ones in the text.
- Concentrate.*—The valuable mineral separated from ore undergoing a specific treatment.
- Concentration Criterion.*—Relation between density of heavy ( $S_h$ ) and light ( $S_l$ ) mineral/s in crushed ore, in a supporting liquid. For water

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$$C = \frac{(S_h - 1)}{(S_l - 1)}$$

- Conditioning.*—Stage of froth-flotation process in which the surfaces of the mineral species present in a pulp are treated with appropriate chemicals to influence their reaction when the pulp is aerated.
- Contact Angle " $\theta$ ".*—The angle across the water phase of an air-water-mineral system, used to measure effect of surface conditioning.
- Counter-current.*—In mineral dressing, a system in which a stream of ore pulp is progressively impoverished as it proceeds in one direction (usually through a series of machines) while the desired product it contains is progressively enriched as it moves in the opposite direction.
- Country Rock.*—The valueless rock surrounding a lode.
- Coursing Bubble.*—One rising freely through cell during froth flotation.
- Critical Speed.*—The theoretical speed at which a ball is held to the inner

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surface of the smooth ball mill liners by centrifugal force  $\left[ n = \frac{76.6}{\sqrt{d}} \right]$

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- where  $n$  = r.p.m., and  $d$  the mill diameter in feet.
- Crop Load.*—The mixture of crushing bodies, ore particles, and water being tumbled in the ball mill.
- Crystallography.*—Science of the shapes, colour, chemical, electrical, physical, and optical properties of crystals.
- Customs Mill.*—A plant receiving ore for treatment from more than one mine.
- Cyanicide.*—Any substance present in a pulp which attacks or destroys the cyanide salt being used to dissolve precious metals.
- Cyanide.*—Usually refers to cyanide solution in circulation in a mill treating gold or silver ores. The "stock" or "solution" is of two main types, "barren" from which all possible value has been extracted, and "pregs" or "pregnant", which is charged with gold or silver and awaits their removal.
- Cyclone.*—Hydro-cyclone. A classifying (or concentrating) separator into which pulp is fed, so as to take a circular path. Coarser and heavier fractions of solids report at apex of long cone while finer particles overflow from central vortex.
- Dense-Media Separation (DMS).*—Heavy Media Separation, or sink-float. Separation of sinking heavy from light floating mineral particles in fluid of intermediate density.

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- Depressing Agent.**—One used in flotation process to render selected mineral/s more hydrophilic or to prevent collector action, thus helping to keep them from reporting with the mineralised froth.
- Differential Flotation.**—Concentration as separate products of a series of minerals removed from an ore by froth flotation.
- Dipole.**—Co-ordinated valence link between two atoms, or electrical symmetry of a molecule.
- Discontinuity Lattice.**—See *Lattice*.
- Dispersing Agent.**—A chemical used to promote the removal of slime from floccules and particle surfaces. 10
- Disseminated Ore.**—Ore in which the valuable mineral is fairly evenly distributed through the gangue, as crystals or aggregates of regular size.
- Dunip.**—Deposit of waste material discarded in connexion with ore treatment; stockpile of ore or partly processed material.
- Dusting Loss (laboratory sampling).**—The loss of part of a sample undergoing test, through leakage of particles into the atmosphere.
- Electric Eye, Ear.**—Former is photo-electric cell arranged in connexion with monitoring flow, turbidity, height of material in ore bin, etc.; latter is microphonic signal using noise level to check loading of ball mill.
- Electrostatic "Bunching".**—Flocculation of particles during dry screening due to binding electrical forces at their surfaces. 20
- Electrostatic Separation.**—Treatment based on ability of particles to retain or dissipate electric charge after passing through a high-voltage field and while falling between a grounded surface and deflecting electrode.
- Elutriation.**—Laboratory *classification (q.v.)*, in which sands are sorted in rising columns of fluid, under precise conditions of control.
- Filtration.**—Commercially, separation of relatively clear filtrate from pulp, with arrest of solids on suitable membrane, usually moved continuously so as to discharge a ribbon of mineral. 30
- Fines.**—The particles of ore below a given size or mesh (undersize), as contrasted with the coarser particles.
- Flocculation.**—Coalescence of minute particles into floccules (often consisting mainly of water) to accelerate settlement as part of dewatering or thickening of a pulp. Appropriate chemicals are used to promote adhesion.
- Flotation, Bulk, and Differential.**—Production of a mineralised froth into which the desired ore constituents have been bound firmly enough to ensure the removal of this froth from the original pulp. If this froth carries more than one mineral as a designated main constituent, it is a "bulk float". If it is selective to one constituent of the ore, where more than one will be floated, it is a "differential" float. 40
- Flow-sheet (Flow-line).**—A diagram showing the sequence of operations, the products made and their respective routes, and any required details of machines, rates, and optimum performance.
- Free-milling Gold.**—Gold with so clean a surface that it readily amalgamates with mercury after liberation by comminution. 50
- "Free Settling".**—As opposed to "hindered settling" in classification, free fall of particle through fluid media.
- Frother, Frothing Agent.**—Chemical added to pulp before flotation, to promote transient froth in cell.

- Gangue.**—The fraction of ore rejected as tailing in a separating process. It is usually the valueless portion, but may have some secondary commercial use.
- Gap.**—The maximum working cross-section of a crushing machine, as regards reception for size reduction of a piece of ore.
- Gauss.**—Intensity of magnetic field produced by one CGS unit of current (10 amps.) at centre of circle of 1 cm. radius when flowing through arc of 1 cm.
- Geiger Muller Counter.**—Valve in which a 1000-volt current is discharged by ionising effect. When a charged particle causes this discharge the effect is registered as a clicking noise, or made to activate a counting device.
- Go-Devil.**—Tool attached to drain-rods, or ball with cutting surface, used to descale pipes.
- Gravity Separation.**—Exploitation of differences between the densities of particles.
- Grindability.**—The effect produced on representative pieces of ore by applying standard methods of comminution, assessed comparatively in terms of size reduction and power used.
- Hardness.**—Of minerals, measurement on Moh's scale according to whether the specimen under test scratches or is scratched by Talc (1), Gypsum (2), Calcite (3), Fluorite (4), Apatite (5), Orthoclase (6), Quartz (7), Topaz (8), Corundum (9), Diamond (10).
- "High-grading".**—Theft of valuable pieces of ore.
- High Tension Separation.**—Electrostatic separation by use of a D.C. field of from 18,000 to 80,000 volts to charge small particles of ore before separating them on the basis of their retentive quality when in contact with a conductor.
- Hindered Settling.**—Settlement of particles through a crowded zone, usually in a hydraulic column through which their fall is opposed by rising water.
- Impact Grinding.**—Shattering of particles by direct fall upon them of crushing bodies.
- Interphase.**—The zone between two or more phases, or faces.
- Iso-electric Point.**—Zero potential or point of electrical neutrality; the pH at which particles in aqueous suspension are neutral, and best able to flocculate.
- IX.**—Ion exchange.
- Jigging.**—Up-and-down motion of a mass of particles in water by means of pulsion.
- Lattice.**—The pattern formed by the orderly distribution of atoms in a crystal. *Discontinuity* lattices, whether internal or external, are boundaries of crystals.
- Leaching.**—Extraction of element or compound from ore by chemical attack causing its dissolution.
- Liberation.**—Freeing by comminution of particles of a specific mineral from their interlock with other constituents of the ore.
- Liberation Mesh.**—That particle size at which a specified mineral should in theory become detached from other minerals in the ore during comminution.

- Lode.**—An ore body occurring as a steep vein or layer filling a rock fissure.
- Long-ranged.**—Of crushed or ground ore, size distribution covering a wide range of meshes.
- Lyophilic.**—Having the property of attracting liquids.
- Magnetic Separation.**—Use of permanent or electro-magnets to remove relatively strong ferro-magnetic particles from para- and dia-magnetic ores.
- Mesh.**—The aperture framed by the wires of a sieve opening. With square-woven sieves the number of wires per linear inch defines the mesh—e.g., 30 mesh means that there are thirty wires per inch-run.
- When crushed ore is fed on to two sieves, the lower being the finer, the coarse sieve defines the *limiting mesh* and the fine one the *retaining mesh* of the sand held between the screens. It can be defined as “-12-120 $\mu$ ”, the +12 for this particular combination being called *oversize* and the -120 $\mu$  *undersize*.
- The terms “long-ranged” or “short-ranged” are sometimes used to indicate roughly the cut-off limits of the sand sizes in an aggregate of particles.
- Mesh-of-grind.**—Written m.o.g. It states optimum particle size in grinding, in terms of the percentage of the material passing (or alternatively retained on) a given screen-mesh.
- Metallurgical Balance Sheet.**—Statistical presentation of an operation in terms of the general equation:
- $$\text{Units of value in feed} = \text{Units in concentrate} + \text{units in tailings} \\ + \text{units retained in circuit.}$$
- An equation is needed for each valuable mineral undergoing extraction.
- Micelle.**—(Part). A colloidal aggregate of molecules present in aqueous solutions of many soaps and dyes/stuffs.
- Middlings.**—In two-component ore, particles incompletely liberated by comminution into concentrate or gangue. In complex ores, in addition to incomplete liberation there may be multiphased particles of middling, or intermediate species which react too feebly to treatment to report as concentrate or tailing.
- Mill (Milling).**—Also concentrator, plant, reduction works. The place where run-of-mine ore is received and treated, and from which end-products are dispatched.
- Mill Head.**—Ore accepted for treatment in concentrator, after any preliminary rejection such as waste removal.
- Mineral Dressing.**—Treatment of natural ores or partly processed products derived from such ores in order to segregate or up-grade some or all of their valuable constituents, and/or to remove those not desired by the industrial user. Mineral-dressing processes are applied to industrial waste to retrieve useful by-products.
- Mineral Species.**—Native element or inorganic substance corresponding generally with ideal mineral having a precise formula and known lattice structure.
- Muck-shifting.**—Term used for extensive earth-moving operations.
- Near-mesh.**—Near-sized; grains close in cross-section to a specified screening mesh, which tend to blind apertures and slow down sizing.
- Nine-Point Sample.**—At final stage of sample preparation, manipulation of small quantity of finely ground mineral. Material is rolled on glazed cloth or paper, flattened into a disc, and divided into eight equal segments. Final sample is drawn equally from each segment and from centre.

**Nip, Angle of.**—The angle of nip, or wedge angle, is that below which a piece of ore can be seized between two crushing surfaces without slipping.

**Opencast.**—A working place open to the sky, and from which ore is extracted.

**Open Circuit.**—A flow-line in which the solid particles pass from one appliance to the next without being screened, classified, or otherwise checked for quality, no fraction being returned for retreatment.

**Optimisation.**—Co-ordination of various processing factors, controls and specifications to provide best overall conditions for technical and/or economic operation.

**Optimum.**—The use of this word in mineral dressing is associated with the idea of quality control. As an example, a pulp might be required to be delivered from one section to the next at an optimum pH, mesh size, and percentage of solid *plus* or *minus* 10% to ensure smooth working of the receiving section. The  $\pm$  or  $-$  tolerance must be acceptable to the treatment which follows.

**Ore.**—A naturally occurring complex of minerals from which any fraction of commercial value can be extracted and used. "Raw" and "run-of-mine" ore is ore as it comes from the working place.

**Overburden.**—Valueless earth or rock overlying the ore body.

**Over-grinding.**—Reduction of size of particles of a given mineral below that aimed at in comminution.

**Oversize.**—See *Mesh*.

**Packing.**—Blocking, (*q.v.*).

**Panning.**—Use of plaque, vanning shovel, pan to fractionate finely ground mineral into light and heavy portions for visual assessment.

**Parting Density.**—That maintained in the bath in DMS.

**Peak Load.**—The maximum permissible draft of power from the source of supply.

**Penalty.**—Reduction in the price per unit paid for concentrate when it fails to reach an agreed specification as regards assay grade, purity, etc.

**Permeability Test.**—Measurement of the resistance to fluid flow offered by a known volume of particles, as a measure of their "packing" or voids.

**Pilot Plant.**—A small-scale mill in which representative tonnages of ore can be tested under conditions which foreshadow (or imitate) those of the full-scale operation proposed for a given ore.

**Placer.**—An alluvial deposit of ore, usually as mineral-bearing gravel or sand.

**Plant.**—See *Mill*.

**Potential-determining Ions.**—Those which leave the surface of a solid immersed in aqueous liquid before equilibrium (saturation-point) has been reached, while an electrical double layer is building up and *zeta-potential* develops.

**Pregnant Solution.**—A value-bearing solution in a hydro-metallurgical operation. And see *Cyanide*.

**Pseudo-viscosity.**—The viscous effect of friction between the surfaces of particles in a pulp, as distinct from the true viscosity of its liquid component.

**Pulp.**—A mixture of ground ore and water capable of flowing through suitably graded channels as a fluid. Its dilution or *consistency* is specified either as solid-liquid ratio (by weight) or as a percentage of solids (by weight).

**Ragging.**—See *Bedding*.

**Rank.**—Of coal, tabulation of type which shows some degree of metamorphism (from peat to anthracite).

**Reef.**—A lode (*q.v.*), typically flattish.

**Rejects.**—Ore minerals removed and discarded at any stage of treatment.

**Release Mesh.**—Specified mesh-of-grind (*n.o.g.*) for best conditions for treatment to recover a specific mineral from the ore.

**Retaining Mesh.**—See *Mesh*.

**Reynold's Number.**—Dimensionless expression of relation between inertia and viscosity. 10

$$R_e = \frac{v\delta\rho}{\eta}$$

*v* is velocity (cm./sec.);

$\delta$  is diameter of spherical particle (cm.);

$\eta$  is absolute viscosity of fluid (gm./cm./sec.);

$\rho$  is density of fluid.

**Riffle.**—An obstacle to the smooth flow of a pulp along a channel, designed to arrest heavy particles.

**Ring Size.**—A term for particle size where the piece of ore is too large for screening. It refers to the diameter of the gauge or ring which can be slipped over it. 20

**Roasting.**—Heat treatment to produce structural change, normally oxidation of sulphides. If complete "sweet roasting".

**Roughing.**—The removal of a rough concentrate at the earliest stage of treatment of the ground ore. *Scavenging* is the removal of the last recoverable fraction of value before discarding the final tailing from the treatment reaction. *Cleaning* is the retreatment of the *rough concentrate* to improve its quality.

**Run-of-mill Ore.**—Mill-head ore; that accepted for treatment.

**Sampling.**—Separation of a representative fraction of ore, pulp, or any product for testing or checking purposes. 30

**Scalping.**—A milling term for the removing of a mineral during closed-circuit grinding of the ore.

**Scavenging.**—See *Roughing*.

**Scintillometer.**—Gamma ray detector.

**Screening, or Sizing.**—Use of one or more screens (sieves) to separate particles of ore into defined sizes.

**Sedimentation.**—Method of classification by exploitation of free-falling rates of minute (subsieve) particles. See "Beaker Decantation" in text. 40

**Separation.**—See *Concentrate*.

**Set.**—The discharge opening of a crushing machine. It regulates the size of the largest escaping particle.

**Shaking Tables.**—Flattish tables oscillated horizontally during separation of minerals fed on to them.

**Shape Factor.**—Property of a particle which determines the relation between its mass and surface area, and hence its response to frictional restraint.

**Size Range.**—That between upper (limiting) and lower (retaining) mesh sizes with reference to screened or classified material. 50

**Sizing.**—See *Screening*.

**Slimes.**—"Primary" slimes are extremely fine particles derived from ore, associated rock, clay, or altered rock. They are usually found in old

- dumps, and in ore deposits which have been exposed to climatic action and include clay, alumina, hydrated iron, near-colloidal common earths, and weathered feldspars.  
 "Secondary" slimes are very finely ground minerals from the true ore.
- Sluicing.**—Separation of minerals in a flowing stream of water.
- Solution.**—See *Cyanide*.
- Solvation.**—A combination between solute and solvent (Hackh).
- Sorption.**—Reaction at or immediately adjacent to, the surface of a solid.  
*AdS*, monomolecular; *AbS*, deeper physical penetration; *Chemis*, sorption with chemical action and change.
- Sorting.**—Removal by hand (hand picking) of selected pieces of rock. Term also applied to classification (*q.v.*) of finely ground pulps. 10
- Specific Population.**—Number of particles in unit volume of pulp.
- Specific Surface.**—Total area of particles in unit-weight of ground material, usually reported in  $\text{cm}^2/\text{gm}$ .
- Specimens.**—In mineral dressing, unusually rich pieces of ore or characteristic constituents thereof in coarsely crystalline form—not representative samples.
- Spills, Spillage.**—Ore, pulp, circulating liquor inadvertently discharged from flow-line and requiring appropriate means of recovery or removal. 20
- Stage.**—Stage-grinding is successive comminution. Stage-concentration is stage-grinding repeated on the concentrate produced by treatment between grinding stages. Stage-addition in flotation refers to deliberate use of insufficient reagent in the early part of the treatment, in order to increase selectivity of conditioning, followed by further addition at a later point in the process.
- Starvation.**—As used in flotation, the deliberate inadequate addition of a reagent in order to restrict its effect. In comminution, avoidance of crowding in the machine by restricting rate of feed. 30
- Stope.**—Underground working place formed as ore is extracted.
- Stope Assay Plans.**—Plan showing assay value of exposures of ore in a stope, together with any other data desired.
- Subsieve Sizing.**—Size analysis of particles too small for efficient grading by use of screens, usually *minus* 200 mesh.
- Substrate.**—The true lattice of a crystal, as distinct from its discontinuity lattice, or surface.
- Superpanner.**—Mechanism invented by Professor H. T. Haultain which simulates rocking, bumping, and sluicing action used in panning, and gives precise information as to possibility of gravity treatment of sands. Used in rapid assays and as a research aid. 40
- Surge** (tanks, bins).—Receptacles capable of receiving and redispersing small tonnages, thus steadying any fluctuations in a flow-line.
- Sweet Roasting.**—Removal of sulphur from metal sulphides by ignition.
- Tailing.**—See *Gangue*.
- Teeter.**—The dance of a bed of particles in a column of rising water, or teeter column.
- Theta ( $\theta$ ).**—The symbol for contact-angle in flotation testing.
- Thickener.**—Large circular tank in which solids settle slowly and form a slurry which is continuously removed from below while fairly clear water overflows. 50
- Thixotropy.**—Property of certain mineral suspensions in water (*e.g.*, bentonite) of remaining fluid while agitated, but gelling when quiescent.



- Throughput.**—Quantity of material passing through a specified treatment in a given time.
- Throw.**—Lateral displacement of screen, shaking table or crushing surface in motion.
- Titer (of fatty acids).**—The solidifying range of a liquid fatty acid.
- Toggle Action.**—Application of crushing force so that the distance moved diminishes without change of input strength, between "gape" and "set". Thus greatest speed of movement of the approaching faces is applied with weakest thrust and *vice versa*.
- Tramp Iron.**—Pieces of iron, steel, etc., which have been gathered with the ore and which would damage crushing machinery if allowed to enter. *Tramp oversize* is ore which should not have been released from the previous section at the delivery size.
- Trash Screen.**—Protective screen for removing detritus from the pulp stream.
- Turbidimetry.**—Measurement of obstruction of light offered by solids in suspension as a guide to their area, settling characteristics and shape.
- Tyler.**—A sieving system. See Chapter VIII.
- Undergrinding.**—Insufficient reduction of particle size to produce effective liberation of value.
- Undersize.**—See *Mesh*.
- Unit Cell.**—Of crystals, a single complete geometric unit. Of flotation, a single appliance.
- Unlocking.**—See *Liberation*.
- Values.**—Compounds separated from run-of-mill ore and worked up to a marketable state; usually expressed as assay grade.
- Voids.**—Porosity; unfilled space in unit volume of granular material compacted under stated conditions, and expressed as percentage or ratio of solid to void.
- Waste Rock.**—Barren or submarginal rock or ore which has been mined but is not of sufficient value to warrant treatment and is therefore removed ahead of the milling processes.
- Wetting Agent.**—A chemical promoting adhesion of a liquid (usually water) to a solid surface.
- Zeta-potential Layer.**—The zone of shear surrounding a particle immersed in an electrolyte.

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# PRINCIPLES OF MINERAL DRESSING

BY

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**Scope of Mineral Dressing.** To a large extent, mining and quarrying operations are concentrating operations in that they bear only on those portions of mineral deposits whose content of the material wanted is the highest available. This was especially true of mining in antiquity, but it remained so to a large degree until very recent times because of the crudity of dressing methods. With improvements in mineral dressing, it has become possible to mine increasingly lower grade ores until the practice which may be termed "bulk mining" has come to supersede to a large extent that which by contrast is termed "selective mining." That is, it has been found more advantageous to mine ore carelessly, including in the mined product much of the waste that happens to be in the way, but at a much lower cost than would be required for careful mining, with the view of later purifying the ore by careful, large-scale, inexpensive dressing.

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In a general way, the scope of mineral dressing is twofold, its object being to eliminate either (1) unwanted chemical species or (2) particles of unsuitable size or structure. The first of these objects is commonly considered to be the extent of ore dressing, and is indeed the more important of the two, but the other is of sufficient importance to warrant attention even in an introductory text.

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The principal steps involved in the preparation of mineral particles from a chemical standpoint are (1) liberation of dissimilar particles from each other and (2) separation of chemically dissimilar particles. Likewise, the principal steps involved in the preparation of mineral products valued for their physical structure are (1) reduction in size and (2) separation of particles of dissimilar physical character. Thus, it will appear that in every instance mineral dressing involves a size-reducing or liberating operation or group of operations as a first step and a separating operation or group of operations as a second step. This generalization should not be emphasized too much since instances are common of operations in which liberation and separation stages are made to alternate in order to accomplish the desired ends most advantageously.

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**Historical Outline.** In order to get a satisfactory perspective of the status of mineral dressing, it is desirable to review briefly the development of the art from its inception<sup>(32)</sup>. As in other

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fields of human endeavor, our information concerning the operations of the past is not so full as might be wished. We have to refer to Aristotle, Herodotus, and Pliny for information concerning antiquity. That information is incomplete, largely because educated Athenians and Romans alike would not lower themselves to such "common" duties as are implied in technological descriptions or discussions. The records from civilizations contemporary with, or older than, that of the Greeks and Romans are even less complete.

With the dawn of new thinking in the latter part of the medieval epoch, more attention was paid to matters pertaining to the mineral industry. A great record of medieval and early Renaissance practice is embodied in Agricola's "De re metallica," of which a translation into English by the Hoovers is available in most technical libraries.<sup>(2)</sup>

The oldest dressing method was unquestionably *hand sorting*. By this is meant the choosing of valuable lumps of ore from worthless lumps, basing such choice on appearance and "heft." The oldest metallurgical operations were so crude that only the highest grade material could be smelted. Naturally, hand sorting played a preponderant part in supplying the smelter with suitable feed. It was done underground, at the surface, or at both places. Hand sorting survives in modern dressing operations only where cheap labor is available and where certain peculiar characteristics of the mineral product are encountered. Underground hand sorting is still practiced where selective mining is employed. The wisdom of extensive underground hand sorting is not always defensible, and its economic worth should always be scrutinized.

*Washing* was, in all probability, the next process to be evolved. It is likely that even in very primitive civilizations man must have noticed that water exerts a cleansing action on fine mineral particles, effecting a separation between fine grains of sandy character and those of slimy character. Undoubtedly, washing was used, first without, and later with, conscious appreciation of chemical dissimilarity between coarse and fine particles. Remains of ancient works have recently been discovered which show that concentration by washing was practiced centuries before the Christian era. In recent times, washing has taken a

"back seat" as a concentration method; it is nevertheless still used extensively for the beneficiation of some types of ores, especially oxide ores of iron.

Although the first steps to be evolved in the dressing of mineral products were concentrating procedures (hand sorting and washing), it was discovered quite early in the development of the art that valuable particles generally occur in relatively intimate aggregation with worthless material and that improvement in the operations could be obtained by first *crushing* the ore and then separating the dissimilar grains. The earliest crushing methods were of the sledge-hammer type, and the motive force was the brute force of the operator. This was superseded by crushing contraptions in which the work was done by horses or other draft animals. It is only in recent times that power-driven machinery was substituted for horses or man; it has produced such tremendous savings as to put an entirely different aspect on the whole art of mineral dressing.

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From the washing operations of the ancients, it was only a step to the use (but not the understanding) of a combination of the washing force of streams with the force of gravity to segregate mineral particles of different specific gravities. Ruins of the works at the famous silver mines in Attica have yielded stone tables set at a slant; these were used by the Athenians for the concentration of the fines from the argentiferous lead ores of Laurium. Water was allowed to flow down the slope of the table, and it carried away the lighter and finer particles; at the same time, the heavier particles settled on the table. After a certain length of time, the valuable sediment was scraped from the table, and the operation was repeated as often as necessary on either the concentrated product or the waste. This was the beginning of *tabling*, a form of *gravity concentration*.

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In medieval days, it was discovered that concentration of granular material could be effected by jiggling it on a submerged sieve. The machine in which this work was done was operated by hand; it was known as a jig and the operation as *jigging*. Much of this development occurred in the Harz mountains of north central Germany. Jigs have played a very important part in dressing, and although obsolescent for many purposes, they remain of great importance in coal cleaning and in the beneficiation of iron ores. They now are, of course, power driven.

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From Agricola's time on, it became increasingly evident that the greater portion of the losses of valuable mineral was among the fine particles. To minimize this loss, devices called *buddles* and *vanners* were evolved, which were essentially modifications of the Athenian tables. Buddles and vanners were greatly improved in Cornwall and have remained in use there longer than in most other places. Toward the end of the nineteenth century, the *shaking table* devised by A. R. Wilfley of Denver succeeded in giving a new lease of life to gravity concentration by making the previously intermittent operation of tables a continuous operation<sup>(32,40)</sup>.

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This sketchy account of the historical growth of gravity concentration would not be adequate without a mention of those friends of the prospector the *sluice box* and the *rocker*, devices eminently suited to the handling of placer material.

Modern *grinding* machinery has been developed concurrently with the improvement of concentration technique for the treatment of particles of fine size. Early devices were essentially variants of equipment used in milling flour. They are now all historic monuments to man's ingenuity and have been replaced by more effective devices consisting of a grinding medium of tumbling stone pebbles, iron or steel balls, or steel rods contained within a rotating shell.

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The development of crushing and grinding technique has necessitated the development of a technique for the *sizing* of the crushed or ground material—this, because crushing and grinding are most efficiently carried out on material from which have been removed the sizes finer than those to which it is desired to break or grind the material under treatment. The first sizing devices used were stationary *screens*. These are still used, although rotating cylindrical screens known as *trommels* have replaced them to a large extent; but even trommels are becoming obsolete as vibrating screens are being improved. For sizing fine particles, *classifiers* are preferred to screens. For their operation, classifiers depend on the difference in the settling velocity of particles of different sizes in water.

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In recent years, forces other than that of gravity have been used to separate minerals. One of these is magnetism; for the concentration of some iron ores, *magnetic separation* is without a peer. Magnetic separation can also be used for the concentration

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of ores in which minerals occur that are only slightly magnetic. The application of this process is limited by the fact that the initial cost of the machinery is relatively high if the minerals are not very magnetic. It is limited, also, because the design of wet magnetic separators, *i.e.*, of machines operating on ores pulped with water, has lagged behind the development of magnetic separators operating on dry-crushed minerals.

*Flotation*, the newest method of mineral concentration, has been developed very recently, historically speaking. It utilizes forces characteristic of mineral surfaces in such a way that particles may be caused to adhere either to the water in which they are immersed or to air bubbles. The particles are collected in a froth or remain in the pulp, depending on whether they stick to the air or to the water.

In the treatment of sulphide ores, flotation is without a competitor, and its application to the treatment of nonsulphide ores is making great strides. A related process which seems due for startling advances in the field of nonmetallic minerals is that of *agglomeration*.

A number of other methods have been used to a varying extent and with local success. In these methods, use is made of characteristics other than chemical affinities, magnetism, or gravity. Among these should be mentioned methods of separation based on the electrical conductivity of mineral particles, their color, decrepitation upon heating, shape, and dielectric constant.

*Operating Steps Involved.* There are four principal types of operations. To these may be added a number of auxiliary operations which are not directly involved in effecting either liberation or separation. The four kinds of principal operations are comminution, sizing, concentration, and dewatering.

*Comminution* means reduction to a smaller size. It is accomplished either on the dry ore or in aqueous pulp. Depending upon the size of the material being comminuted, the operation is regarded as crushing or grinding. Crushing is almost always conducted on dry ore, and grinding may be wet or dry.

*Sizing* is the separation of a material into products characterized by difference in size. This can be accomplished by screening or by classifying, the latter being a sizing method depending upon the relationship existing between the size of mineral

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## INTRODUCTION

particles and their settling velocity in a fluid medium, generally water or air.

*Concentration* may be accomplished by washers, sluice boxes, shaking tables, flotation cells, magnetic separators, electrostatic separators, or other specific concentrating devices. It can also be achieved by screens, classifiers, or a combination of screens and classifiers.

*Dewatering* is generally carried only to the extent of producing a damp cake, in two steps: first in thickeners to remove most of the water; then in filters, which receive the thickened pulp and yield the damp mineral cake. If further dewatering is desired, driers requiring fuel for evaporation of moisture are essential.

*Auxiliary operations* are naturally quite diverse. They involve storing in bins, conveying (by conveyors, feeders, elevators, or pumps), sampling, weighing, reagent feeding, pulp distributing, etc.

To give an idea of usual arrangements of dressing machinery, a number of flow sheets are presented on the following pages. These flow sheets are qualitative in that no account is taken of the size or number of units required, and auxiliary operations are disregarded. The flow sheets are simply designed in order to give the reader who is being introduced to the subject of mineral dressing an idea of the most important machines needed for different treatment methods, of the general arrangement of the machines, and also a crude measure of the relative complexity of each type of treatment. Broadly speaking, the flow sheets are presented in order of increasing complexity.

In this description of flow sheets, the use of a certain amount of technical jargon is unavoidable. When in doubt, the reader is referred to other parts of the text, reference to which can be found in the index. A number of terms, however, recur so often that a brief definition is useful.

The *feed* to a concentrating machine, also known as heading, is the material received for separation. The products of the separation are the *concentrate* and *tailing*, if only two products are made, the concentrate being the valuable part and the tailing the discarded product. If more than two products are made, the other may be an additional concentrate or a *midaling*. The additional product is termed a concentrate if it contains in con-

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concentrated form some other valuable constituent than the first concentrate; it is termed a middling if it contains the same valuable constituent as the concentrate but in a more diluted condition. Thus a shaking table may make a lead concentrate, a zinc concentrate, and a tailing; or else a zinc concentrate, a zinc middling, and a tailing.

When the concentrate that is obtained is not of sufficiently high grade and it is graded up by retreatment, the primary oper-

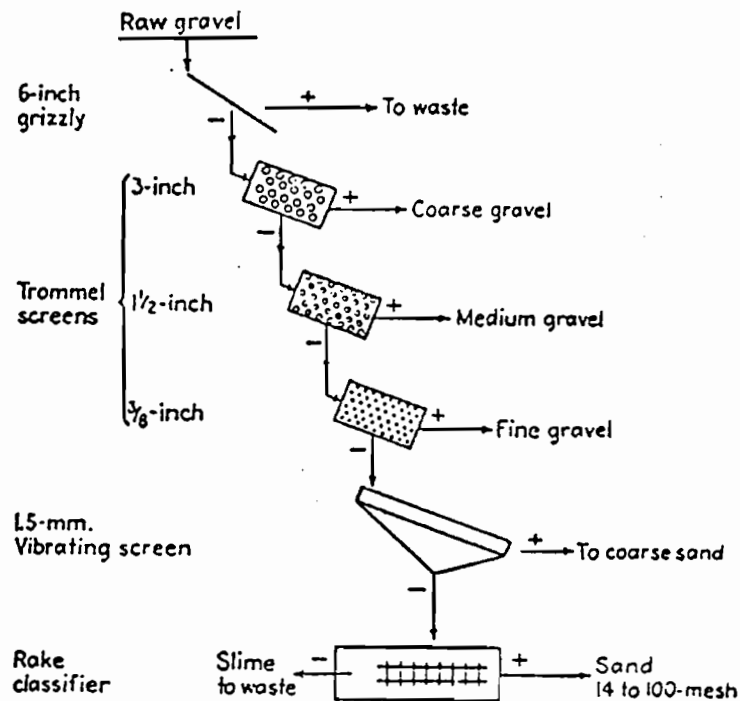


FIG. 1.—Plant for dressing gravel.

ation is known as a *roughing* operation and the retreatment operation as a *cleaning* operation. If several stages of retreatment are used, they may be termed *re-cleaning*, *re-re-cleaning*, etc. The concentrate from the primary operation is the *rougher concentrate*, that from the cleaning operation, the *cleaner concentrate*. The same terminology is adopted in connection with tailings or middlings.

Plant for Dressing Gravel.<sup>(4,5,36)</sup> Figure 1 represents a dressing plant for the preparation of concrete aggregate. It

28. IRON

Uses of iron are multitudinous; it is used almost entirely as cast iron or steel, both of which are alloys or mixtures of iron with carbon and other elements such as phosphorus, manganese, chromium, nickel, tungsten, vanadium, molybdenum, cobalt, silicon, titanium.

Ores. The economic minerals are hematite, magnetite, goethite, limonite, siderite, and very occasionally pyrite. For a deposit of one of the above minerals to constitute an ore it must be favorably located with respect to fluxes, fuel, and markets; it must be of high grade; must occur in large quantity; and must lie so that mining will be possible on a large scale at comparatively low cost. Furthermore, it should be relatively free of titanium, phosphorus, and (excepting the pyrite which will require oxidation and leaching) of sulphur, which are harmful in the finished iron and steel products and difficult or impossible to eliminate. Analyses of typical domestic ores are shown in Table 56.

Table 56. Average composition of typical iron ores

| Con-<br>tent                             | Ore                                     |                                        |                                  |                       |                                                   |                                                        |
|------------------------------------------|-----------------------------------------|----------------------------------------|----------------------------------|-----------------------|---------------------------------------------------|--------------------------------------------------------|
|                                          | High-grade<br>Lake Superior<br>hematite | Siliceous<br>Lake Superior<br>hematite | Clinton<br>hematite <sup>a</sup> | Limonite <sup>b</sup> | Magnetite                                         |                                                        |
|                                          |                                         |                                        |                                  |                       | Non-titan-<br>iferous,<br>N. Y.,<br>N. J.,<br>Pa. | Titanifer-<br>ous, N. Y.,<br>Colo.,<br>Minn.,<br>N. C. |
| Fe. . . . .                              | 55 to 61                                | 42 to 52                               | 20 to 53                         | 43 to 55              | 40 to 67.5                                        | 34 to 63                                               |
| P. . . . .                               | 0.035 to 0.060                          | 0.025 to 0.050                         | 0.30 to 0.50                     | 0.09 to 0.48          | 0.02 to 1.2                                       | 0 to 0.06                                              |
| S. . . . .                               | 0 to 0.009                              | 0 to 0.01                              | 0.04 to 0.11                     | 0.01 to 0.09          | 0.08 to 0.42                                      | 0 to 0.06                                              |
| SiO <sub>2</sub> . . . . .               |                                         | 20 to 40                               | 8 to 17                          | 11 to 19              | 1 to 20                                           | 0.8 to 18.0                                            |
| Al <sub>2</sub> O <sub>3</sub> . . . . . |                                         |                                        | 3 to 6                           | 2 to 6                | 0.7 to 4.5                                        | 2.5 to 10                                              |
| CaO . . . . .                            |                                         |                                        | 1 to 20                          | 0.1 to 1.0            | 0.3 to 5.6                                        | 0 to 3                                                 |
| MgO . . . . .                            |                                         |                                        | 0.4 to 8.0                       | 0 to 0.4              | 0.2 to 4.2                                        | 0 to 6                                                 |
| MnO <sub>2</sub> . . . . .               |                                         |                                        | 0 to 0.3                         | 0 to 3.0              | 0.04 to 1.4                                       | 0 to 0.3                                               |
| TiO <sub>2</sub> . . . . .               |                                         |                                        |                                  |                       | 0 to Tr.                                          | 12 to 16                                               |
| Cr <sub>2</sub> O <sub>3</sub> . . . . . |                                         |                                        |                                  |                       |                                                   | 0 to 2.5                                               |
| V <sub>2</sub> O <sub>5</sub> . . . . .  |                                         |                                        |                                  |                       |                                                   | 0.60                                                   |
| H <sub>2</sub> O . . . . .               | 5 to 12                                 | 1 to 4                                 | 0 to 2                           | 5 to 12               | 0 to 1.6                                          | 0 to 0.04                                              |

<sup>a</sup> Appalachians from N. Y. to Ala.

<sup>b</sup> Ala., Pa., Texas, Iowa.

Most of the iron ore now mined and that mined in the past have been of sufficiently high grade to smelt without concentration, but the end of the known high-grade deposits, located close enough to fuel and to consumption centers to make them presently profitable, is in sight, and an increasing proportion of lower-grade ores is concentrated every year.

Classification of ores (U. S.). No standard official classification exists, but most operators use an approximation of the following terminology:

Merchantable ore assays between 50 and 60% Fe and is smeltable without further enrichment. (See also *Alabama iron ores*.) Limitations as to maximum size and as to percentage of <85-m. may be imposed. Certain near-merchantable ore comprises soft iron mineral admixed with coarse hard siliceous gangue which is readily separated by screening, with or without supplemental hand picking, thus raising the ore to merchantable grade. Certain other ores of near-merchantable grade contain water, either physically held or chemically bound or both, in such quantities that when it is removed by heating the residue is merchantable.

Concentrating ore comprises rock assaying normally from 40 to 50% Fe from which a concentrate of approximately merchantable-ore character can be made, or from which a concentrate can be made that, when mixed with a high-grade merchantable ore, will form a merchantable mixture. Concentrating ores in which the iron minerals are hematite or hydrated oxides are further classified as wash ores and low-grade concentrating ores.

Wash ores. The typical wash ore occurs as alternating bands of high-grade iron oxide and lightly consolidated sand which is predominantly <80-m. After mining, these bands constitute a mixture of lump iron mineral sufficiently hard to resist serious breakage and abrasion when subjected to movement and tumbling such as is incurred in passage through a rotary screen or log washer, and fine relatively iron-free sand. (See Table 57.)

Low-grade concentrating ores are differentiated from wash ores in that the gangue is locked with the ore minerals to the extent that crushing is required to sever the two; they are normally further distinguished by the much coarser size of the gangue aggregates.

Magnetic ores are the ores of magnetite. They may be merchantable as mined, but usually require concentration. They never have the characteristics of wash ores. Estimated reserves (1939) in the Eastern U. S. are 600 million tons of 40 to 60% iron content in New Jersey, 900 million tons of the



same grade in east-northern New York, and 70 to 80 million tons in eastern Pennsylvania. The eastern Mesabi magnetites are of lower grade, but of enormous tonnage.

Nonconcentratable rock simply means iron-bearing rock which cannot be made to yield merchantable concentrate at a profit at present prices with presently known methods of concentration. In the Lake Superior district it embraces both low-grade (20 to 30% Fe) coarse-grained rock and medium to relatively high grade rock (35 to 45% Fe) of such fine texture that fine grinding is necessary to sever the gangue. Concentration is readily effected with both types of rock, but the first has too high a ratio of concentration while the second requires too costly treatment. Known reserves of this rock in the Lake Superior district alone are estimated to amount to 87 billion tons (28 s 12 MCI 20), much of it readily minable, and cheaper combinations of concentration and smelting may be expected when the deadening competition of merchantable and high-grade concentrating ores disappears. Not the least of the present deterrents to work on this material is the confederatory tax system now in effect.

Bessemer and non-Bessemer ores. The Bessemer process of steel making concentrates phosphorus in the steel. Hence shipping product containing more than 0.046% phosphorus is classed as non-Bessemer, and concentrating ore which yields such concentrate is likewise non-Bessemer.

Manganiferous iron ores are found on the Cuyuna range in Minnesota. The most abundant are the brown ores, which are low in manganese (<10%) and low in silica but high in phosphorus; the black ores comprise a very intimate mixture of magnetite, hematite, and ferruginous chert in which the manganese, which tends to predominate in the coarser sizes, may run as high as 25 to 30% in comparison to a 20 to 30% iron content. Phosphorus is lower than in the brown ore but silica is higher. The black ores as mined usually contain a large amount (up to 30%) of water, both free and combined, and hence are capable of considerable concentration by drying and sintering.

Objectionable impurities in iron ore are those which cannot be removed by concentration and which, if sent to the blast-furnace, carry through the pig iron into the steel in amounts which harm the properties of the steel. The principal impurities in this class are sulphur and phosphorus. Allowable limits are discussed in Art. 50. Silicon is objectionable because it must be slagged off, with attendant proportionate consumption of limestone and coke, which additionally occupy furnace space and thereby reduce furnace capacity and increase labor cost. Titanium requires very high temperatures for reduction; unreduced it thickens slag mechanically.

For production of metal from ores and concentrates see: *Ferrous Production Metallurgy*, J. L. Bray, John Wiley & Sons, Inc. (1942); *Blast Furnace Practice*, R. H. Sweetser, McGraw-Hill Book Co. (1938); *Blast Furnace Practice*, Fred Clements, Ernest Benn, Ltd. (London, 1920).

Production of iron ore in the United States, by states, is given in Table 58. Exports of iron and steel are three to four times greater than imports. World production of pig iron is given in Table 69.

Table 58. United States production of iron ore (thousands of gross tons) (USGS)

|                   | 1913   | 1918   | 1919   | 1921   | 1929   | 1932  | 1936   | 1937   | 1938   |
|-------------------|--------|--------|--------|--------|--------|-------|--------|--------|--------|
| Minnesota.....    | 43,300 | 41,954 | 36,001 | 17,811 | 45,761 | 5,154 | 31,634 | 48,417 | 14,449 |
| Michigan.....     | 14,400 | 16,899 | 15,439 | 7,075  | 15,456 | 2,555 | 9,178  | 12,085 | 6,004  |
| Alabama.....      | 5,850  | 5,755  | 5,053  | 2,876  | 6,453  | 1,375 | 4,180  | 6,308  | 4,303  |
| Pennsylvania..... | 548    | 523    | 627    | 147    | 1,092  | 103   | 1,132  | 2,625  | 2,121  |
| Wisconsin.....    | 1,140  | 1,089  | 1,087  | 257    | 1,609  | 430   | 970    | 1,156  | 855    |
| New York.....     | 1,633  | 906    | 871    | 470    | 822    | 31    | 778    | a      | c      |
| New Jersey.....   | 364    | 424    | 404    | 59     | 281    | 31    | 160    | 520    | 186    |
| Utah.....         | a      | 53     | 44     | a      | a      | 137   | 154    | 191    | 168    |
| Missouri.....     | a      | a      | a      | a      | a      | 30    | 3      | 20     | 29     |
| Tennessee.....    | 414    | 409    | 284    | a      | 102    | a     | 28     | 28     | 13     |
| Others b.....     | 1,795  | 1,647  | 1,155  | 588    | 1,451  | 1     | 572    | 744    | 319    |
| Total.....        | 69,444 | 69,658 | 60,965 | 29,283 | 73,028 | 9,847 | 48,789 | 72,094 | 28,447 |

a Included in "others."

b Includes Georgia, N. Carolina, Wyoming, N. Mexico, Colorado, Connecticut, Maryland, Massachusetts, Nevada, California, Iowa.

c Included in Pennsylvania.

Table 57. Sizing-assay test of typical wash ore (RI 3052)

| Size            | Per cent. weight | Per cent. iron |
|-----------------|------------------|----------------|
| > 1.050-in..... | 7.65             | 59.36          |
| 0.742.....      | 6.73             | 59.36          |
| 0.371.....      | 17.12            | 58.71          |
| 4-m.....        | 15.63            | 59.26          |
| 8.....          | 9.39             | 58.80          |
| 14.....         | 5.76             | 57.33          |
| 28.....         | 3.85             | 55.21          |
| 48.....         | 2.97             | 52.44          |
| 65.....         | 1.40             | 48.57          |
| 100.....        | 1.40             | 41.57          |
| < 100.....      | 28.10            | 13.46          |
| Unassd.....     | 100.00           | 45.30          |

Table 59. World production of pig iron (thousands of gross tons) (MI)

|                     | 1913               | 1918   | 1919   | 1921   | 1929   | 1932   | 1936   | 1937    | 1938   |
|---------------------|--------------------|--------|--------|--------|--------|--------|--------|---------|--------|
| United States.....  | 30,966             | 39,055 | 31,015 | 16,688 | 42,614 | 8,781  | 31,029 | 37,127  | 19,161 |
| Germany.....        | 16,499             | 10,513 | 5,566  | 7,725  | 13,401 | 3,933  | 15,303 | 15,957  | 18,226 |
| U.S.S.R.....        | 4,486 <sup>b</sup> |        | 110    | 100    | 4,018  | 6,370  | 14,400 | 14,520  | 14,479 |
| United Kingdom..... | 10,260             | 9,086  | 7,398  | 2,616  | 7,580  | 3,573  | 7,686  | 8,497   | 6,763  |
| France.....         | 5,126              | 1,286  | 2,373  | 3,308  | 10,439 | 5,549  | 6,237  | 7,917   | 5,956  |
| Belgium.....        | 2,446              | Nil    | 247    | 863    | 3,970  | 2,783  | 3,207  | 3,843   | 2,426  |
| Japan.....          | 56                 | 178    | 206    | 95     | 1,750  | 1,542  | 2,869  | 3,561   | 3,050  |
| Luxemburg.....      | 2,508              | 1,247  | 608    | 955    | 2,906  | 1,959  | 1,987  | 2,513   | 1,527  |
| Spain.....          | 1,371              |        |        |        | 2,088  | 1,349  | a      | a       | a      |
| Czechoslovakia..... |                    |        | 648    | 543    | 1,643  | 450    | 1,140  | 1,675   | 1,215  |
| India.....          | 204                | 265    | 320    | 371    | 1,343  | 699    | 1,541  | 1,598   | 1,628  |
| Canada.....         | 1,015              | 1,107  | 863    | 616    | 1,080  | 144    | 679    | 898     | 758    |
| Italy.....          | 429                | 328    | 252    | 76     | 678    | 461    | 816    | 790     | 850    |
| Poland.....         |                    |        |        |        | 704    | 199    | 582    | 724     | 952    |
| Sweden.....         | 732                | 766    | 501    | 314    | 490    | 262    | 585    | 646     | 647    |
| Others c.....       | 12,809             | 590    | 605    | 955    | 2,348  | 1,212  | 2,203  | 2,727   | 2,814  |
| World.....          | 77,536             | 64,421 | 50,712 | 35,223 | 96,263 | 39,275 | 89,802 | 102,848 | 80,452 |

<sup>a</sup> Included under Germany.

<sup>b</sup> Russia.

<sup>c</sup> Includes Spain, Austria, Hungary, China, Australia, Netherlands, Rumania, Brazil.

Selling. See Art. 50.

Lake Superior base prices f.o.b. Lake Erie docks for Old Range Bessemer ore have ranged from \$4.75 to \$5.25 per long ton over the period 1929-1943; Old Range non-Bessemer and Mesabi Bessemer bases have been 15¢ off these prices, and Mesabi non-Bessemer 30¢ off.

Treatment. Iron is the second most widely distributed metal and constitutes the fourth largest elementary component of the earth's crust. The iron content of most rocks is higher than that of the valuable-metal content of the ores of most other metals. But workable iron ores are relatively limited in distribution because iron is a low-priced commodity and consequently must be present in high natural concentration in a rock in order that the cost of mining, beneficiation, and reduction per unit of iron content may bring production cost below the market price of the metal.

The primary product from iron ore is pig iron, produced by smelting in a blast furnace. Hence the requirements for economic blast-furnace operation set the specifications for iron-ore shipments. These requirements differ in different parts of the world. The furnaces which treat the ores from the Lake Superior mines are located at the lower Great Lakes ports and south therefrom as far as Pittsburg; their schedule for merchantable ore is based on a minimum assay of 51.5% natural iron and a SiO<sub>2</sub> maximum of about 10 to 12%. In the Birmingham district, because of the self-fluxing nature of the ore, lower iron and somewhat higher silica contents are acceptable. Eastern and foreign furnaces have yet different standard requirements.

The desideratum in iron-ore treatment is maximum weight recovery with iron content in concentrate above a guaranteed minimum and size within specified maximum and minimum limits.

Crushing plants are those in which merchantable ore too coarse for ready passage around the blast-furnace bell are crushed to a maximum size ranging from 8-in. to, say, 3-in., according to the blast-furnace feed arrangements. The crushing is normally one-stage jaw crushing, but conceivably two stages with intermediate scalping would be necessary, if large lumps of hard ore needed crushing to 3-in. maximum. Crushing is the most widely used form of iron-ore dressing.

Drying plants and sintering plants. Cuyuna range ores may contain as high as 30% water as mined; fine concentrate will normally contain from 10 to 40% moisture, according to size and the method of dewatering. Marked changes in iron content on an as-shipped basis can, therefore, be made by drying, with an incidental saving in freight. Simple drying will not, in general, drive off combined water; it has also the disadvantage of increasing dusting in handling and furnacing. Sintering drives off combined water, agglomerates fines into porous lumps, and improves the furnace behavior markedly. Drying is usually done in direct-heat rotary driers (Sec. 17, Art. 3). For sintering practice see Bray; Sweetser. The heat in the discharge from the sintering machines is utilized to dry lump ore by dumping the two together into the steel gondola cars in which they are shipped from the mill.

Screening plant. The simplest form of concentration is typified by the early plant at the SUSQUEHANNA mine at Hibbing, Minn. (108 J 787), where masses of taconite occurred

scattered through the hematite. In the earliest operations the taconite was picked out ahead of the steam shovels and hauled away in dump cars. This expensive operation was replaced by screening.

The ore was loaded by steam shovel into 12-cyd. air-operated side-dump cars, taken to the screening plant and dumped onto a flat grizzly with 30-in. spacing. Overseize was sledged through into a bin. From the bin the ore was drawn into a 5x21-ft. revolving stone screen with 2-in. round holes. Overseize was waste, which discharged into a car-loading bin, whence it was hauled to a rock dump. Under-size went to the shipping bins. Capacity of this plant was about 260 t.p.h. and it required only about 30 hp.

Washing plants utilize tumbling in water to disintegrate lightly clay-bound sand and to abrade adhering sand from lump hematite, and sizing by classification and/or by screens to separate the resulting mixture of relatively coarser hematite and fine sand and clay. Such plants are typified by some twenty-odd mills in the western Mesabi district. Upward of 80% of all Minnesota iron concentrate is obtained by washing.

The older practice (see Fig. 83, Ed. 1, p. 140) was to hand-pick waste from >2-in. material, the residue being concentrate; log-wash <2-in. size, taking the washed product as concentrate; rewash the overflow in turbo washers, again taking the washed product as concentrate; desliming turbo-washer overflow in settling tanks, discarding slime, and concentrating the granular settlings on shaking tables.

Modern Mesabi practice is represented by the flowsheet of the CANISTEO plant (Fig. 84) in which the second stage of log washing and the tabling have been replaced by a bowl-rake classifier, and in which provision is made for crushing and hand-picking lump concentrate whenever this is desirable. In one plant screens and Akins classifiers have displaced the log washers.

Weight recovery in modern Mesabi washing plants averages about 65% on crude. Costs are 5 to 10¢ per ton treated.

DeVaney and Cogbill (RI 3148) point out that bowl-rake product, which contains 14 to 18% SiO<sub>2</sub>, must be admixed with high-grade material to make it salable, and that when the product runs much higher in silica than this it may even be wasted. They report a test on such a product, assaying 44% Fe and 34% SiO<sub>2</sub>, in which the material was sorted in a hindered-settling classifier, classifier overflow was wasted, six spigot products were tabled separately, with regrind and retabling of middling, resulting in a recovery of 40% by weight in a concentrate assaying 63% Fe and 9% insol., with an additional recovery of 55% by weight from the 20% of middling made in the primary run, in a concentrate assaying 61% Fe. Tailing from the primary run assayed 17% Fe. Their results indicate that the early spigots of the classifier could be taken as concentrate directly, leaving only the later spigots for tabling. They estimate, on the basis of commercial table performances on similar materials, that table capacities would average 2.5 tons feed per hr. See also Sec. 10, Art. 7.

Oliver Iron Mining Co., Canisteeo washing plant. Fig. 84 (142 #6 J 38).

Location: Coleraine, Minn.

Ore: Loose mixture of soft hematite and taconite sand.

Cost: \$0.06 to \$0.15 per ton of feed is an average range (1938) for this type of plant.

Legend for Fig. 84:

1. 1 @ 100-ton concrete ore pocket at pit;
- 1 @ 8-ft. pan conveyer.
2. Bar grizzly, 4-in. openings.
3. 1 @ 5-ft. pan conveyor, large waste rock dumped into rock chute from which it is trucked to waste in 1 1/2-ton dump trucks.
4. 1 @ 40x42-in. jaw crusher.
5. 3 @ 38-in. inclined (18°+) belt conveyors, 1,000 ft. total horizontal run.
6. 1 @ 5x41-ft. 2-deck vibrating screen.
7. 38-in. picking belts.
8. Cone crushers, set 5/8-in.
9. Log washers.
10. 4x6-ft. vibrating screens.
11. 17-ft. bowl-rake classifiers.
12. 24-in. conveyors to ore cars for shipment.

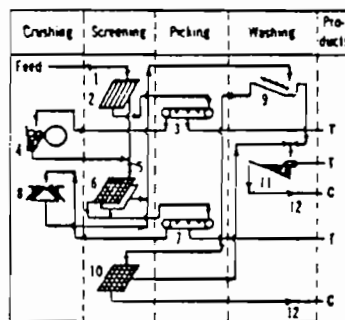
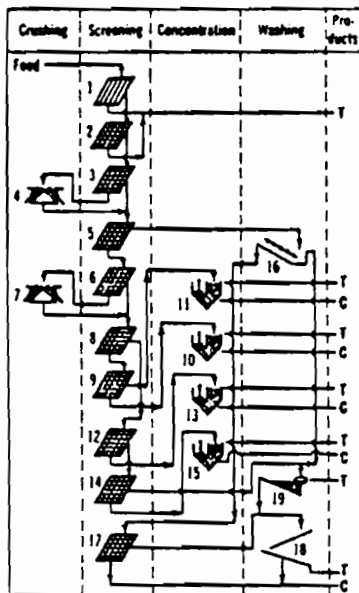


FIG. 84. OLIVER IRON MINING CO., CANISTEEO PLANT.

Concentrating plants for iron ores must be mechanically efficient, cheap to operate, and capable of handling large tonnages. Of the standard base price of \$4.50 per ton (1936) for non-Bessemer ore of 51.5% natural iron content at lower Lake ports, \$1.74 is freight, leaving a net value at the mine of \$2.76. Out of this must come mining and concentrating costs, royalties, and a multitude of onerous taxes. Consequently the ratio of concentration must

be low, if any profit at all is to come out of the operation. From an economic standpoint an ore or a concentrating process that requires fine crushing or grinding of any considerable part of the feed tonnage to effect separation is *prima facie* unsuitable at present.

The typical Lake Superior concentrating plant is a combination comprising coarse concentrators, normally jigs, for rejecting coarse gangue, and washing apparatus for removing the fine free sand and the fine gangue produced by crushing. Holt (88 #18 MCJ 80) gives a generalized flowsheet (Fig. 85), noting that the types of concentrating machines used vary considerably throughout the district. The CHARLSON plant (Fig. 86) is a modern plant of this type. In a new jig plant (141 #2 J 88) ore is crushed to <1/2-in.; jigged unseized in Conset jigs, which make coarse concentrate and coarse tailing;



Legend for Fig. 85:

1. Grizzly, 5 1/2-in. openings.
2. Revolving screen, 3 1/2-in. aperture.
3. Vibrating screen, 1 1/4-in. aperture. Horizontal shaking screens are displacing vibrating screens in some plants on account of saving in headroom and lower screen wear. (159 #2 J 68.)
4. Gyratory-type reduction crusher.
5. Vibrating screen, 1/4-in. aperture.
6. Vibrating screen, 1 1/4-in. aperture.
7. Gyratory-type reduction crusher.
8. Vibrating screen, 5/8-in. aperture.
9. Vibrating screen, 0.8-in. aperture.
10. 8-cell McLanahan jig.
11. 12-cell McLanahan jig.
12. Vibrating screen, 3/8-in. aperture.
13. As (11).
14. Vibrating screen, 1/8-in. aperture.
15. As (10).
16. Log washer.
17. Vibrating screen, 0.09-in. aperture.
18. Rheolavour.
19. Bowl classifier.

FIG. 85. Typical Mesabi jig plant.

a fine tailing which is declined in a hydroseparator and a rake classifier in series, with classifier sands returned to the jigs; and a middling which is ground in rod mills, declined in a rake classifier, and the resulting sand recirculated to the jigs. The advantageous results are: an increase in jig efficiency because the relatively high proportion of sand in the feed tends to produce heavy-medium character in the jig bed; and increased recovery of iron. Jig concentrate sinters readily. Weight recovery in the jigging plants is about 50% of the crude. The HARRISON PLANT of Butler Bros. employs a sink-float separating cone in place of coarse jigs, thus doing away with 3 screening and 3 jigging operations as compared to Fig. 85, and making a lower-grade tailing than can be made on jigs treating the same material (see Sec. 11, Art. 29). The roasting-magnetic plant of BUTLER BROS. is an experimental attack on the problem of treating high-grade jig tailing (containing much porous and consequently specifically light hematite particles), of which large tonnages are scattered through the western Mesabi district; it made exceptionally high grade concentrate and a good tailing for iron concentration, but costs were too high for present-day competition.

The number of plants on the Mesabi employing concentrators other than washers is relatively small, and concentrate shipped is only about one-eighth the tonnage of washed ore.

Charlson Iron Mining Co., Judd pit. Fig. 86 (C. H. Remer, Gen'l Sup't, 159 #3 J 38).

Location: Taconite, Minn.

Ore: Banded hematite and partly decomposed taconite.

Capacity: 300 long t.p.h.

Assays: Feed, 30 to 35% Fe; concentrate, 62 to 63% Fe.

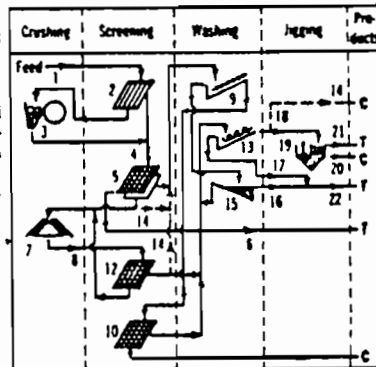
Recovery: 35 to 40%.

Power: 800 hp. under full load.

Summary. Two-stage crushing to 1/2-in. in closed circuit; washing at <1/2-in.; jigging at <1/4-in.

Legend for Fig. 36:

1. By truck from above to rock hopper in pit floor;
- 1 @ 5x12-ft. Robins reciprocating feeder.
2. Bar grizzly.
3. 1 @ 35x45-in. A-C jaw crusher, 5-in. set.
4. 3 @ 30-in. belt conveyors in series, 800-ft. total length, 200-ft. total lift, 360 f.p.m.; with Merrick weight-ometer, electrical interlock, magnetic head pulley on final.
5. 1 @ 6x12-ft. Robins 2-deck screen, 3 1/2x5-in. and 1/2-in. sq. apertures.
6. 24-in. conveyor.
7. 1 @ 4-ft. short-head cone.
8. 2 @ 24-in. inclined conveyors.
9. 1 @ 25-ft. A-C log washer.
10. 1 A-C low-head screen, 1/4-in. sq. aperture.
11. 1 @ 24-in. belt conveyor.
12. 2 @ 5x12-ft. A-C screens, 5/16-in. sq. aperture.
13. Akine classifier.
14. Alternative.
15. Rake classifier.
16. 80-m.; 15% Fe or less.
17. 66-m.
18. 2 @ 24-in. belt conveyors in series; 1 @ 400-ton bin.



19. 2 @ 3-cell plunger-type jigs, star gates and elevators.
20. Drag-belt; 2 @ 18-in. conveyors in series; bin.
21. Drag-belt, 24-in. stacking conveyor.
22. Sand pump, 2,000 g.p.m. capacity, 2,000 ft. to tailing pond.

FIG. 36. CHARLSEON IRON MINING Co., Judd pit.

Butler Bros., Harrison plant. Fig. 37 (Q; 141 # 9 J 34; 26 # 9 M C J 25).

Location: Cooley, Minn.

Ore: Concentrating ore, comprising soft hematite with taconite and sand.

Assays: Feed: 40 to 45% Fe; concentrate, 59% Fe, 7 to 9% SiO<sub>2</sub>.

Recovery: 80 to 85% Fe.

Water is pumped 1 mi. from Pickeral Lake.

Power: Purchased at 2,200 volts; motors, 440-volt, 60-cycle; consumption, 18 hp-hr. per ton.

Running time: 95%.

Mill building: Level site. Steel and concrete, galvanized-iron partial enclosure. Unheated (unused in winter).

Transportation: Mine (open-pit) to mill, 1 mi. Ore is trucked in pit to a conveyor-loading hopper, thence by conveyor to rim of pit, thence by dump car and locomotive to mill. Concentrate (7% moisture) is shipped to lower Great Lakes furnaces (Chicago, Cleveland).

Legend for Fig. 37:

1. Grizzly, 6 1/2-in. aperture.
2. Rock cars.
3. Storage bin; conveyor with automatic scale.
4. 1 @ 4x12-ft. vibrating screen, 3 1/2-in. aperture.
5. Conveyor.
6. 1 @ 6x12-ft. vibrating screen, 1 1/4-in. aperture.
7. 1 @ 4-ft. standard cone crusher.
8. 1 @ 6x16-ft. vibrating screen, 1/4-in. aperture.
9. Conveyor with magnetic head pulley; tramp iron to concentrate.
10. 1 @ 5x14-ft. Robins Elliptex screen, 1/4-in. aperture, with wash sprays.
11. 1 @ 25-ft. 2-log washer.
12. 1 @ 20-ft. bowl classifier.
13. 2 @ 7 1/2-ft. sink-float cones. See Sec. 11, Art. 28.
14. Conveyor.
15. 1 @ 4x8-ft. vibrating screen, 1/4-in. aperture.
16. 7 Bendelari and 1 Conset jigs.
17. 2 @ 4x6-ft. vibrating draining screens, 2-mm. apertures; 2 @ 5x16-ft. 2-mm. vibrating washing screens; washings to medium-recovery plant.
18. 2 @ 4x6-ft. vibrating draining screens, 2-mm. cloth; 2 @ 4x16-ft. 2-mm. vibrating washing screens; washings to medium-recovery plant.

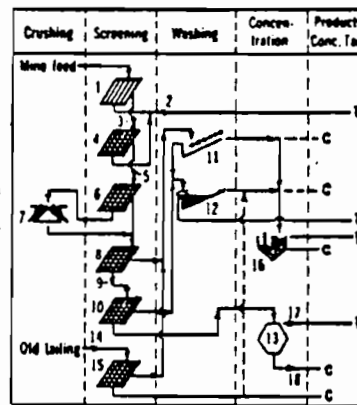


FIG. 37. BUTLER BROS., Harrison cone plant.

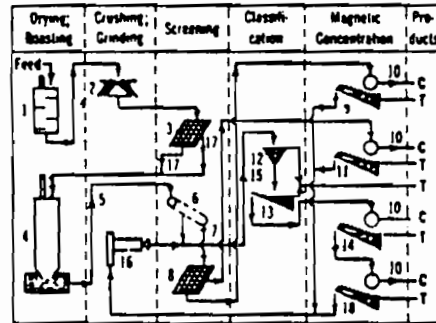
Summary. Run-of-mine material >3 1/2-in. rejected by screening; 3 1/2~1 1/4-in. crushed to <1 1/4-in. and screened on 1/4-in. 1 1/4~1/4-in. treated in sink-float cone making concentrate and tailing. <1/4-in. washed in log washers and bowl classifiers, the latter making overflow tailing, and both sending washed products to jigs which make concentrate and tailing.

**Butler Bros. roasting-magnetic plant. Fig. 88 (J. J. Craig, Sup't, 199 # 1 J 48; 153 A 645.**

**Location:** Cooley, Minn.  
**Ore:** <1 1/4-in. jig tailing consisting principally of comparatively clean hematite, comparatively clean silica, taconite, and locked combinations of the three.  
**Capacity:** 265 tons feed per 24 hrs.; limited by the furnace.  
**Assays:** Feed, 47% Fe; concentrate, 62.6%; SiO<sub>2</sub>, 11.4%; P, 0.048%; <100-m. size held at 10% or less; tailing, 20.6% Fe, including 6% magnetic Fe.  
**Recovery:** 90% based on furnace product; recovery of magnetic iron, 98.9%.  
**Ratio of concentration:** 1.6 : 1.  
**Costs:** The operation is marginal, i.e., dependent upon feeds against which mining cost need not be charged. Its inception was experimental. Roasting cost, Sept. 1935: fuel, \$0.565 per ton roasted; power, 0.060; labor, 0.072; total, \$0.677.

**Legend for Fig. 88:**

1. Vertical-shaft drier. Oil fuel. Moisture reduced from 8 or 10 to 3%.
2. Crusher.
3. Screen, 3/4-in. aperture.
4. Vertical-shaft roasting furnace with water-quench at base. Oil fuel; oil vapor for reduction from Fe<sub>2</sub>O<sub>3</sub> to Fe<sub>3</sub>O<sub>4</sub>. Reduction must be substantially complete (average conversion is 91%), a "skin roast" does not confer sufficient magnetic force to move the mass of unconverted hematite. Iron silicates do not reduce.
5. 2 pipe conveyors in series.
6. Trommel, 3/16-in. aperture.
7. Bucket elevator.
8. Vibrating screen, 3/16-in. aperture.
9. Magnetic cobbler, 31 (diam.) x 32-in. drums; see Sec. 13, Art. 4.
10. Conveyor; 220-volt a.-c. demagnetizing coil surrounding a 3 1/2-in. Micarta tube through which pulp flows; bin; mixed with other ores before shipment. Demagnetization enables water to drain and facilitates mixing.
11. As (9).



12. Settling cone.
13. Rake classifier.
14. As (9), 2 in parallel.
15. Sand pump.
16. 1 @ 5x4-ft. ball mill.
17. Separate elevators to separate feed bins.
18. As (9).

**FIG. 88. BUTLER BROS., ROASTING-MAGNETIC PLANT.**

**Summary.** One-stage crushing, reducing roast, wet magnetic separation with regrind and reconcentration of middling.

Recovery by this method is high, as is also the grade of concentrate, but costs at present are so high, compared with those for jigging and washing, as to make concentrate so produced of marginal value so long as concentrate from the latter plants sets the market price.

**Magnetic plants.** The Eastern magnetites have been mined spasmodically for more than 100 years. The WITKEMBEZ, SHERMAN Co. dry-magnetic mills (*Ed. 1*) are typical of the method used for many years on the coarsely crystalline, lower-grade ores. Modern demands for higher grade of concentrate with reduced phosphorus have made necessary finer crushing before making final concentrate, and the adoption of wet magnetic separators. All of the magnetite ores contain martite, the permeability of which is too low for the low-intensity separators used for magnetite; where the amount of martite is sufficiently large to justify saving it, gravity concentration supplements magnetic, as at ALAN WOOD. The ore at the BETHLEHEM STEEL property at Cornwall, Pa., contains chalcopyrite as well as magnetite, and the tailing from wet magnetic concentration is, therefore, reground and floated.

Costs of treatment at the eastern mills are about 20 to 25¢ per ton of feed.

Most magnetite concentrate is too fine for blast-furnace treatment without sintering, but sintered, the high-iron (>68%) low-silica product commands a premium. On the other hand, Eastern magnetite concentrate suffers at present from a freight differential to the steel centers.

The principle followed in concentration of all magnetite ores is to scalp out middling at coarse sizes at relatively high intensities and reject tailing, then to recrush the middling and direct the concentration to the production of high-grade concentrate from this enriched feed. This principle was carried to its logical extreme at the MESA BI IRON Co. mill, which was designed to treat the low-grade magnetite ores of the eastern Mesabi field. The mill was a technical success and represents the best method known to date for concentrating this





ON APPEAL  
FROM THE COURT OF THE SUPREME COURT OF WESTERN AUSTRALIA

B E T W E E N :

HAMERSLEY IRON PTY LIMITED

Appellant  
(Respondent)  
(Plaintiff)

- and -

1. THE NATIONAL MUTUAL LIFE ASSOCIATION OF AUSTRALASIA LIMITED,
2. LANGLEY GEORGE HANCOCK,
3. ERNEST ARCHIBALD MAYNARD WRIGHT,
4. HANCOCK PROSPECTING PTY LTD,
5. WRIGHT PROSPECTING PTY LTD AND
6. L.S.P. PTY LTD

Respondents  
(Appellants)  
(Defendants)

RECORD OF PROCEEDINGS

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PART II  
VOLUME I

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